St George Community Housing

Remedial Action Plan

9-11 Gibbons Street
Redfern NSW

28 September 2018

54877/116,840 (Rev 0)

JBS&G

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Abbreviations

Term	Definition
ACM	Asbestos Containing Material
AHD	Australian Height Datum
ASS	Acid Sulfate Soils
AF/FA	Asbestos Fines / Fibrous Asbestos
BF	Building Footprint
bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CEC	Cation Exchange Capacity
COC	Chain of Custody
COPC	Contaminants of Potential Concern
CSM	Conceptual Site Model
DA	Development Application
DEC	Department of Environment and Conservation
DOH	Department of Health
DP	Deposited Plan
DPI	Department of Primary Industry
DQI	Data Quality Indicator
DQO	Data Quality Objective
EC	Electrical Conductivity
EIL	Ecological Investigation Levels
ENM	Excavated Natural Material
EPA	NSW Environmental Protection Authority
ESA	Environmental Site Assessment
ESL	Ecological Screening Levels
HIL	Health Investigation Levels
HSL	Health Screening Levels
JBS&G	JBS&G Australia Pty Ltd
LEP	Local Environmental Plan
LOR	Limit of Reporting
NATA	National Association of Testing Authorities
NEPC	National Environmental Protection Council
NEPM	National Environmental Protection Measure
OCP	Organochlorine Pesticides
OEH	Office of Environment and Heritage
PASS	Potential Acid Sulfate Soils
PAH	Polycyclic Aromatic Hydrocarbons
PARCCS	Precision, Accuracy, Representativeness, Comparability, Completeness and Sensitivity
PCB	Polychlorinated Biphenyls
pH	Potential of Hydrogen
PID	Photo-ionisation Detector
ppm	Parts Per Million
QA/QC	Quality Assurance / Quality Control
RAP	Remedial Action Plan
RL	Relative Level
RPD	Relative Percent Difference
SPOCAS	Suspension Peroxide Oxidation Combined Acidity and Sulfur
TCLP	Toxicity Characteristic Leaching Procedure
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons
UCL	Upper Confidence Limit
VENM	Virgin Excavated Natural Material
WA	Western Australia

1. Introduction

1.1 Background

JBS&G Australia Pty Ltd (JBS&G) was engaged by St George Community Housing Ltd (SGCH, the client) to prepare a Remedial Action Plan (RAP) for 9-11 Gibbons Street, Redfern NSW (the site). The site is legally identified as Lots 1 – 11 in Deposited Plan (DP) 4209 and occupies an area of approximately 1580 m^2. The site location and layout are shown on **Figures 1** and **2**, respectively.

The site has historically been used for commercial/industrial purposes including a storage depot by the City of Sydney Council (CoS) and is currently occupied by two commercial/workshop buildings and asphalt/concrete surfaced areas. It is understood that the site is proposed for redevelopment for community housing purposes.

As part of the proposed redevelopment, the site has been subject to a preliminary site investigation (PSI), a hazardous material survey (HMS) and a data gap assessment as documented in CES (2018[1]), Greencap (2018[2]) and JBS&G (2018[3]), respectively.

The previous investigations have identified site contamination issues associated with the presence of potential fuel infrastructure in the northern portion of the site and fill material as variously impacted with heavy metals, PAHs and TRH that will require remediation/management such that the site can be considered suitable of the proposed residential with minimal soil access land use scenario.

This RAP was developed in accordance with guidelines made or approved by the NSW Environment Protection Authority (EPA) and relevant Australian Standards.

1.2 Objectives

The objective of this RAP is to document the procedures and standards to be followed in order to address the contamination impacts at the site, ensuring the protection of human health and the surrounding environment, such that the impact is remediated/managed in a manner as to make the site suitable for the proposed land uses.

1 Preliminary Site Investigation Report, 9-11 Gibbons Street, Redfern NSW, Consulting Earth Scientists Pty Ltd, reference: CES180204-SGC-AD, 29 March 2018 (CES 2018).

2 Demolition/ Refurbishment Hazardous Material Risk Assessment, 9-11 Gibbons Street, Redfern NSW 2016, Greencap Pty Ltd, ref: C122647:J155653, 15 March 2018 (Greencap 2018).

3 Data Gap Investigation, 9-11 Gibbons Street, Redfern NSW, ref: 54877/116843 Rev 1, 24 July 2018, JBS&G (JBS&G, 2018)

2. Site Condition & Surrounding Environment

2.1 Site Identification

The site location is shown on **Figure 1**. The extent of the site and associated cadastral boundaries are shown on **Figure 2**. The site details are summarised in **Table 2.1** and described in detail in the following sections.

Table 2.1 Summary Site Details

Lot / DP	Lots 1 – 11 in Deposited Plan (DP) 4209
Address	9-11 Gibbons Street, Redfern NSW
Local Government Authority	City of Sydney Council
Approximate MGA Coordinates of Corners (MGA 56)	Northeast: E 333514.47/ N 6248236.98 Northwest: E 333482.76/ N 6248241.24 Southeast: E 333495.83 / N 6248188.98 Southwest: E 333465.11/ N 6248193.14
Site Zoning	(E) Business Zone – Commercial Core, SEPP (State Significant Precincts) 2005
Current Use	Vacant Council Depot and Artist Workshop
Previous Use	Council Depot
Proposed Use	Mixed commercial and residential with minimal opportunities for soil access
Site Area	1,556 m^2

2.2 Site Description

As at the time of the JBS&G site inspection on 11 May 2018, the site appeared similar to the site inspection completed by CES (2018). The site comprised a rectangular parcel of land with two distinct portions: The CoS depot area in the north (Northern Portion) including a two-storey brick/concrete building and asphalt/concrete paved car park area; and a tenanted workshop area in the south (Southern Portion). The north and south portions of the site were separated by a brick wall, approximately 4m in height. The site boundary was secured by a combination of building frontage and two points of gated access located on Gibbons Street and William Lane.

Northern Portion

The CoS depot area located in the northern portion of the site was vacant at the time of the inspection.

The car park was covered in asphaltic pavement which was generally in good condition with a crack observed in the central portion. Two areas of cut-out and replacement were observed on the asphaltic pavement in the north-eastern extent of the site. However, it is noted that the potential USTs identified during the previous GPR survey (CES 2018) are not in alignment with these cuttings.

The CoS building comprised 3 garage spaces, a toilet, storerooms and office space on the ground floor with a kitchen area, showers and storerooms on the first floor.

Room 4 appeared to be used for tool storage and equipment maintenance and comprised a workbench, caged area, metal shelves. The concrete slab was reported to be intact and peeling paint was observed on the ceiling corner.

Southern Portion

The southern portion was occupied by a two-storey brick/concrete structure over the majority of the footprint. The building was being utilised as an artist's workshop at the time of the inspection, with the balance of the area covered by concrete hardstand.

No surface water existed at the site at the time of the investigation. No evidence of mass storage of waste or storage tanks were observed at the site. No evidence of pesticide or herbicides was observed and no asbestos containing materials were observed on the ground surfaces.

2.3 Surrounding Land Use

The current land uses of adjacent properties or properties across adjacent roads are summarised below.

- North – Marian Street and high density mixed commercial/residential tower beyond;
- West – Gibbons Street and Gibbons Street Reserve beyond, after which is the Redfern Station and railway line;
- East – William Lane and commercial premises fronting Regent Street beyond (café, computer repair store, printing store and medical centre), and automotive garage to the east of Regent Street;
- South – High density residential tower, and Margaret Street beyond. BP branded service station is located 20m to the south east and the Australian Technology Park is located approximately 200m to the south west of the site.

Inspection of nearby properties did not indicate that any significantly contaminating activities were being undertaken which may affect the suitability of the site for the allowable land uses.

2.4 Topography

Review of topographic information obtained from the NearMap spatial information database indicated that the site has an elevation of approximately 27-29 m Australian Height Datum (AHD).

The site inspection identified the site was relatively flat and slightly sloped to the south, consistent with the general topography of the area. The site was generally level with its surrounds. The ground surface in the northern car park area was observed to be split along the middle and graded to the southeast and southwest.

2.5 Geology and Soils

A review of the 1:250 000 scale Sydney Geological Map[4] identified the site is located in an area of Triassic Bringelly Shale, Minchinbury Sandstone and Ashfield Shale, part of the Wianamatta Group comprising Shale with some Sandstone beds.

Reference to the online ESPADE 2.0 tool hosted by the NSW Office of Environment and Heritage (OEH) (2017[5]) indicates that the site is underlain by residual Tuggerah soils. Limitations of soils in the Tuggerah group include extreme wind erosion hazard, noncohesive, highly permeable soil, very low soil fertility, localised flooding and permanently high watertables.

The site appeared to have been subject to previous cut and fill activities to create existing ground surface levels. It is noted that previous reports identified fill materials with anthropogenic inclusions of concrete, glass, slag ranging to depths of 1.1-1.6 m bgs. underlying the concrete hardstand present at the site.

2.6 Hydrology

The nearest surface water receptor is Sheas Creek located approximately 1.4 km to the southwest. Sheas Creek has been converted to a concrete lined stormwater channel which flows to the southwest and eventually into Alexandra Canal, approximately 2 km from the site.

As discussed in **Section 2.2**, the site footprint comprises sealed asphaltic hardstands and building footprints with engineered stormwater drainage. As such, surface water generated during periods of rainfall is anticipated to migrate from the site via discharge into onsite stormwater infrastructure.

[4] Sydney 1:250 000 Geological Sheet SI/56-05, 3rd edition, Geological Survey of New South Wales, Sydney.
[5] 'ESAPDE 2.0', NSW Office of Environment and Heritage, Accessed 23 October 2017, OEH (2017

Surface water leaving the site is anticipated to enter the regional stormwater system and ultimately discharge to the Alexandra Canal before flowing into the Cooks River, further to the southwest of the site, and then into Botany Bay. The Alexandra Canal is a brackish surface water body, flowing into a marine environment.

2.7 Hydrogeology

The site is identified to be located on Botany Sands Aquifer Management Area 2, where extraction of groundwater is prohibited for human consumption, consumption by animals, domestic purposes and any other purpose. The Botany Sand Beds Aquifer is reported as often less than 1-2 metres below the natural ground surface in low-lying areas, with the level varying in relation to rainfall and evaporation.

Aquifers underlying the site are described as porous, extensive, and highly productive aquifers. It is expected that groundwater would flow towards Alexandra Canal.

Registered groundwater bore information was obtained from the NSW Department of Primary Industries groundwater mapping tools (NSW DPI 2017[6]) in JBS&G (2018). A review of the registered bore information indicated that there were 49 bores within a 1 km radius of the site.

All bores on the database within 1km of the site are currently licensed for use as monitoring wells. The monitoring wells are installed to depths of between 6.0 and 180.0 m, with standing water levels reported at depths of approximately 2.95 and 11.6 m below ground surface (m bgs). Where the geology encountered was reported, it consisted of clay, shale and sandstone.

Review of CES (2018) indicated that the standing water levels (SWL) at the site was reported between 1.3 and 7.9 m bgs. CES (2018) reported the following in relation to the large variance reported between the eastern and western extent of the site:

- At borehole BH01 (see **Figure 3**), silty clay was encountered from 2.5m to 8.5 m bgs, with no overlying more permeable deposits (sand) and as a result, the low permeability of the underlying geology is likely to have precluded the presence of shallow groundwater.
- At boreholes BH03 and BH04, silty clay was encountered at a greater depth (4.5 m bgs), with permeable sands overlying and as a result, groundwater is likely to be present in the more permeable sands overlying the clays, with groundwater perching on top of the silty clays.
- The groundwater encountered in BH01 is likely to be derived from water within the underlying silty clays, whereas the groundwater encountered in BH03 and BH04 is likely to be perched groundwater on top of the silty clays.

2.8 Acid Sulfate Soils

Review of the Acid Sulfate Soil Risk Map for Botany Bay[7] indicates that the subject site is located within an area of 'no known occurrence of Acid Sulfate Soils'. Acid sulfate soils (ASS) are not known or expected to occur in areas having this classification. This is consistent with the topographic and geological setting of the site.

No indicators of ASS were observed during intrusive soil investigations. On this basis, it is considered that there are no further requirements for assessment or management of ASS.

[6] NSW Department of Primary Industries, 2015. Groundwater Monitoring Overview Map. Http://allwaterdata.water.nsw.gov.au/water.stm. Accessed 30 May 2018.

[7] *'Acid Sulphate Soil Risk Map – Botany Bay, Edition 2',* 1997 1:25 000, NSW Department of Land and Water Conservation (DLWC), Ref 9130S3 (NSW DLWC)

3. Site History and Contamination Status

3.1 Preliminary Site Investigation (CES 2018)

Consulting Earth Scientists Pty Ltd (CES) was engaged by SGCH to conduct a preliminary site investigation at the site. The objectives of this assessment were to establish the environmental conditions at the site with respect to soil and groundwater, confirm the suitability of the soil and groundwater for the proposed high density residential development and provide a preliminary waste classification for site soils.

The scope of works included a desktop assessment and soil and groundwater investigation at the site, comprising advancement of 11 boreholes and installation/sampling of 3 groundwater monitoring wells. As discussed above in **Section 2.2**, the site was primarily covered in building floor slabs and/or concrete pavements. Fill material was encountered in all locations, to depths below pavement ranging from 0.2 to 1.3 m, to a maximum depth of 1.6 m bgs. Natural material encountered was generally comprised of silty sand and silty clay underlain by shale.

CES (2018) reported that anecdotal information indicated the potential presence of a UST within the southern building. A ground penetrating radar (GPR) investigation during CES (2018) did not identify USTs within the southern building, however, two anomalies consistent with USTs were identified in the northern portion of the car park (**Figure 2**).

Analysis of selected samples of surficial and sub-surface soils for a broad range of contaminants of potential concern (COPCs) including heavy metals, PAH, TRH, Benzene, Toluene, Ethylbenzene and Xylene (BTEX), Volatile Halogenated Compounds, (VHCs), Polychlorinated Biphenyls (PCBs), Organochlorine and Organophosphate Pesticides (OCP/OPP), Per-and polyfluoroalkyl substances (PFAS), phenols and asbestos was undertaken. A number of samples were reported to have concentrations of Contaminants of Potential Concern (COPCs) above the health based assessment criteria. Impacts were reported in the fill material (PAH, TRH and heavy metals) in various locations and in natural material (arsenic) at BH11 (see **Figure 3**). Asbestos containing material (ACM) were not observed at the site or detected during laboratory analysis.

Analysis of water samples for a range of COPCs including heavy metals, PAHs, TRHs, BTEX, VHCs, Phenols and PFAS was undertaken. Concentration of zinc was reported at BH1 (41 µg/L) and BH3 (85 µg/L) exceeding the adopted groundwater investigation level (GIL) of 15 µg/L. Further, fluoranthene and benzo(a)pyrene (B(a)P) concentrations were reported at BH4, marginally exceeding the adopted GIL of 1.4 µg/L and 0.2 µg/L respectively. JBS&G note that GILs adopted in CES 2018 for fluoranthene and B(a)P are considered as interim indicative working levels only.

PFAS was reported in soil and groundwater samples, albeit below the screening criteria adopted consistent with the PFAS National Management Plan (HEPA 2018), and therefore was not considered to pose an unacceptable risk to future site users.

Preliminary waste classification of site materials provided in CES (2018) is summarised as below:

- Fill material on-site is classified as General Solid Waste (GSW), with the exception of soils surrounding BH6 and BH10 which have a preliminary waste classification of Hazardous (HW) Waste, and the soils surrounding BH11 which have a preliminary waste classification of Restricted Solid Waste (RSW). The materials were further evaluated in the data gap assessment (See **Section 3.3**); and
- Natural soils underlying the site fill is Virgin Excavated Natural Material (VENM) with the exception of the natural soils surrounding BH11 which are preliminarily classified as Hazardous Waste on the basis of arsenic concentration.

Previous soil and groundwater analytical results presented in CES (2018) are included in **Appendix B**.

Based on the findings of the investigation, CES concluded that remediation/management of contamination issues was likely required to render the site suitable for the proposed use. A number of additional works were recommended to inform the remedial strategy including further delineation of the soil impacts and hazardous/restricted solid waste classified areas, completion of a hazardous building material survey, confirmation on the presence/absence of USTs at the site, further assessment of groundwater to infer flow regime and groundwater condition downgradient of the USTs.

3.2 Demolition/ Refurbishment Hazardous Material Risk Assessment (Greencap 2018)

Greencap was engaged by SGCH to undertake a hazardous building material survey to identify types of hazardous materials and their condition (including asbestos, synthetic mineral fibres (SMF), ozone depleting substances (ODS), PCB, lead paint and lead dust) in accessible areas of the site, to identify the likelihood of hazardous materials in inaccessible areas, to assess the risk posed by the materials, and to complete a hazardous and flammable/combustible materials register for the site in line with the proposed refurbishment/demolition works.

Based on the scope of works completed, field screening, laboratory testing and/or visual identification, hazardous building material was encountered, including asbestos, lead paint, ODS and SMF, as summarised in the hazardous material register provided in Greencap (2018).

The Greencap 2018 report further noted that potential tanks or voids were present beneath the floor slab of the 'Mowers Shed', in the southern area of the site, however were inaccessible at the time.

3.3 Data Gap Assessment (JBS&G, 2018)

JBS&G was engaged by SGCH to undertake a data gap assessment to enable conclusions to be drawn regarding the suitability of the land for future land uses, or make recommendations to enable such conclusions.

The scope of the investigation included: a review of previous investigation reports, preparation of a Sampling and Analysis Quality Plan (SAQP), development and documentation of a conceptual site model (CSM), implementation of the plan inclusive of field sampling of potentially impacted media and subsequently laboratory analysis of samples; evaluation of the resulting data against site specific health and ecological assessment criteria; and documentation of the resulting outcomes as this assessment report.

Based on the scope of works completed for this assessment JBS&G concluded the following with regard to the site conditions:

- Previous investigations (Greencap 2018) have identified the presence of hazardous building materials including asbestos, lead paint, ODS and SMF within existing site structures that require appropriate removal/management during proposed demolition works.
- Previous investigations (CES 2018) have identified the presence of potential fuel infrastructure in the northern portion of the site, considered to represent a potential contamination source and as such requiring management/removal pursuant to DECCW (2010).
- Fill material at the site has previously been identified as variously impacted with heavy metals, PAHs and TRH. Further characterisation of conditions within the site has identified contaminant levels generally consistent with CES (2018), with the following impacts identified as requiring management/remediation:
- Fill material across the site identified as impacted with B(a)P TEQ in exceedance of the adopted health based investigation criteria. The elevated B(a)P TEQ concentrations are interpreted to be associated with ash/metalliferous slag inclusions in the fill material. As

such, the fill material will require management to address the potential exposure risk with respect to B(a)P TEQ prior to utilization of the site for the proposed land use and during the proposed redevelopment.

- Naphthalene, total PAH and light to mid fraction TRH (>C10-C16 and >C16-C34), as well as B(a)P TEQ impacts identified in the shallow fill material at BH103 0.3-0.5 with respect to human health. This impact is interpreted to be associated with ash/metalliferous slag inclusions, with the TRH concentrations expected to be associated with the high PAH concentrations within the soils rather than a fuel or oil related hydrocarbon source. The material in the vicinity of BH103 0.3-0.5 will require management to address the potential exposure risk prior to utilization of the area for the proposed land use and during the proposed redevelopment.
- Concentrations of copper, zinc, B(a)P and TRH >C16-C34 fractions were reported in various samples in exceedance of the adopted ecological criteria for the proposed landuse. As such, site won fill material are not considered suitable for utilisation as growing media. JBS&G notes that the shallow fill material at the site is unlikely to be used as a growing medium in the proposed development of the site. Therefore, JBS&G do not consider these impacts to constitute a risk to future plant growth or inhibit the future development of the site. JBS&G consider that the ecological impacts identified (where not concurrent with health-based impacts) do not warrant further assessment and/ or management.
- Groundwater conditions at the site are considered indicative of typical inner-Sydney industrial areas, with elevated concentrations of copper, zinc, lead and nickel in groundwater passing across the site. Low level petroleum hydrocarbon impacts and VOC compounds were also identified in inferred up-gradient locations, reported at concentrations below the adopted assessment criteria. There are no identified off-site migration issues relating to groundwater at the site.
- Assessment of potential soil vapour conditions did not identify unacceptable volatile contaminant risks associated with the site.
- Based on the available data set from past and present investigations (CES 2018 and JBS&G 2018), and observations made during the current investigation, fill material at the site is provisionally classified General Solid Waste (Non-putrescible). Previous investigations (CES 2018) have provisionally classified natural soils underlying the fill material as Virgin Excavated Natural Material (VENM) with the exception of the natural soils surrounding BH11 which have been provisionally classified as Hazardous Waste on the basis of the arsenic concentration.
- Subject to interim retention of existing site pavements (i.e. asphaltic/concrete hardstand and building concrete slabs within the site), there are considered to be no outstanding aesthetic concerns. Future management/remediation will be required to address the fuel infrastructure and anthropogenic inclusions identified within the fill glass, ceramic, brick fragments, ash, slag and coal in the absence of pavements.
- A RAP should be prepared to address the identified site contamination issues at the site via remediation/management such that the site can be considered suitable for the proposed residential with minimal soil access landuse scenario.
- Previous soil, groundwater and soil vapour analytical results presented in JBS&G (2018) are included in **Appendix B**.

3.4 Contamination Status

Based on previous assessment of the site contamination issues are primarily limited to the fill material with regard to heavy metals, TRH and PAHs in soil, arsenic in fill and natural soils and the potential for in-situ USTs.

Based on the extent of site investigation completed to date, significant groundwater or soil vapour impacts do not appear present at the site as a result of current or past features.

3.4.1 Underground Storage Tanks and Associated Infrastructure

- Greencap (2018) reported that potential tanks or voids were present beneath the floor slab of the 'Mowers Shed' in the southern portion of the site.
- CES (2018) reported that anecdotal information indicated the potential presence of a UST within the southern building. A ground penetrating radar (GPR) investigation during CES (2018) did not identify any USTs within the southern building, however, two anomalies consistent with USTs were identified in the northern portion of the car park (**Figure 2**).
- Potential fuel infrastructure as outlined above is considered to represent a potential contamination source and as such requiring management/removal pursuant to DECCW (2010) or visual confirmation the infrastructure is not present.

3.4.2 Hydrocarbon, Heavy Metals and Benzo(a)pyrene in Fill

The following impacts require management/remediation:

- Fill material across the site identified as impacted with B(a)P TEQ in exceedance of the adopted health based investigation criteria.
- Naphthalene, total PAH and light to mid fraction TRH (>C10-C16 and >C16-C34), as well as B(a)P TEQ impacts identified in the shallow fill material at BH103 0.3-0.5 with respect to human health.
- Fill material across the site was identified to contain anthropogenic inclusions consisting of glass, ceramic, brick fragments, ash, slag and coal. In the absence of pavements management/remediation will be required to address this.
- JBS&G consider that the ecological impacts identified (where not concurrent with health-based impacts) do not warrant further assessment and/ or management.

3.4.3 Arsenic Impacted Soils

Elevated levels of arsenic impact were identified to exceed the ecological and health based assessment criteria in the fill and natural soils at BH11 (0.3-0.7 and 1.3-1.6 m bgs) as reported in CES (2018). Arsenic impacts at BH11 will require management/remediation to address this. The lateral remediation extent has been estimated to be 3 m by 3 m, centred on the original borehole. The depth of remediation has been assumed as 2.0 m bgs.

3.5 Data Gaps

- As discussed in **Section 3.4** above, there are uncertainties associated with understanding the location of potential historical USTs at the site as a result of incomplete historical records and the limitations associated with making inferences based on discrete intrusive borehole data and representative laboratory analysis.
- For the purposes of development of this RAP, the following data gaps have been identified that will require considered in developing the proposed remedial/management strategy:
- The total number, location and condition of current, or former underground fuel storage infrastructure at the site; and

- The lateral extent of petroleum impacted fill/natural soil material associated with the current/former fuel infrastructure.

4. Remediation Options

Previous characterisation of site contamination conditions as outlined in **Section 3** has indicated the presence of a number of site contamination issues that will require remediation/management to address potential risks to human health, such that the site may be considered site suitable for the proposed land uses.

4.1 Remediation Objectives

The remediation objectives are outlined as follows:

- Removal of potential contamination sources, including redundant fuel infrastructure;
- Management and/or removal of unacceptable risks to human health and the environment from the identified impacted (fill material and natural) soils such that the site is suitable for the propose use;
- Close out any data gaps; and
- Validation of the remedial/management works in accordance with the relevant NSW EPA Guidelines and with reference to the adopted site criteria to demonstrate the successful remediation of the site.
- This RAP has been prepared with reference to the following guidelines and legislation:
- *Managing Land Contamination, Planning Guidelines, SEPP 55 – Remediation of Land.* Department of Urban Affairs and Planning. NSW Environment Protection Authority (DUAP 1998);
- *Contaminated Sites: Sampling Design Guidelines, September 1995*. NSW EPA (1995);
- *Guidelines for Consultants Reporting on Contaminated Sites.* Office of Environment and Heritage, 2011, OEH (2011);
- *Guidelines for the NSW Site Auditor Scheme (3rd Edition).* Environment Protection Authority, 2017, EPA (2017);
- *National Environment Protection (Assessment of Site Contamination Measure) Measure 1999 (as amended 2013).* National Environment Protection council NEPC (2013);
- *Work Health and Safety Act 2011*. NSW Government Legislation, *WHS Act (2011*);
- *How to Safely Remove Asbestos - Code of Practice*. NSW Government, Safe Work NSW, 2016, SWNSW (2016);
- *How to Manage and Control Asbestos in the Workplace - Code of Practice.* NSW Government Safe Work Australia, 2016, SWNSW (2016);
- *Management of Asbestos in the Non-occupational Environment*. enHealth Council, 2005, enHealth (2005);
- *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.* WA Department of Health, 2009, WA DoH (2009);
- *Guidelines for the Assessment and Management of Groundwater Contamination*. NSW DEC 2007 (DEC 2007); and
- *Technical Note: Investigation of Service Station Sites*. NSW EPA April 2014 (EPA 2014).

4.2 Extent of Remediation

Based on the findings of the site investigations (refer to **Section 3**) the extent of remediation works comprises the removal/decommissioning of the UST and management/remediation of impacted fill material and natural soils as identified in **Section 3**. The initial estimate of remediation and UST Investigation areas is presented as **Figure 4**.

4.3 EPA (2017) Guidance

The *Contaminated Land Management Guidelines for the NSW Auditor Scheme (3rd edition)* (EPA, 2017) lists the following order of preference for soil remediation and management:

1. On-site treatment of the soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level;
2. Off-site treatment of excavated soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site;
3. Removal of contaminated soil to an approved site or facility, followed where necessary by replacement with clean fill; and
4. Consolidation and isolation of the soil on-site by containment within a properly designed barrier.

In addition, it is also a requirement that remediation should not proceed in the event that it is likely to cause a greater adverse effect than leaving the site undisturbed. And, where there are large quantities of soil with low levels of contamination, alternative strategies are required to be considered or developed, EPA (2017).

With regard to management of the fuel infrastructure, consideration is also required with regard to the *Guidelines for Implementing the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008* and the requirements of the *Occupational Health and Safety (Dangerous Goods) Regulation 2001* in relation to the requirement to remove abandoned fuel storage infrastructure after 2 years.

4.4 Remedial Options

Consideration of each of the available options, as defined in EPA (2017) is presented in **Table 4.1**, taking into account the proposed future reuse of the site.

Table 4.1: Remedial Options Matrix

Option of Treatment	Applicability	Assessment
Option 1: Onsite treatment of the soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level.	Heavy Metals Metals are unable to be destroyed. However, there are a number of microencapsulation treatment technologies which can reduce the mobility of the identified inorganic contaminants of concern (e.g. cement stabilisation).	Heavy Metals Not a suitable option. Metals are unable to be destroyed, so this is not an option which is able to be considered. Microencapsulation is not considered necessary given the absence of identified groundwater impacts requiring remediation.
	Benzo(a)pyrene Polycyclic aromatic hydrocarbons present in site soils are typically restricted to heavier non-volatile constituents. These can be remediated by thermal processes. However, this requires substantial investment in plant and equipment and substantial energy use. Similarly, for heavy metals, there are a number of microencapsulation treatment technologies which can reduce the mobility of the identified organic contaminants of concern (e.g., cement stabilisation).	Benzo(a)pyrene Not the preferred option. Remediation options are available for PAH contaminated fill contaminants, generally restricted to thermal treatment processes which are energy intensive. Microencapsulation is not considered necessary given the absence of identified groundwater impacts requiring remediation.
	Potential Fuel Infrastructure and Petroleum Hydrocarbon Impacted Soils Given that soil contaminants associated with petroleum storage there is a potential that they may be able to be remediated on site by a bioremediation style remediation method. Bioremediation occurs where contaminants are chemically broken-down by the metabolic processes of micro-organisms into less toxic or non-toxic forms. Recent NSW EPA guidance requires bioremediation methods to demonstrate that pollutant emissions are not discharged to the atmosphere. On this basis, the lateral extent of the bioremediation activity requires to be restricted to ensure that air emissions from remediation materials are able to be collected.	Potential Fuel Infrastructure and Petroleum Hydrocarbon Impacted Soils Given the nature of soils, volume of material, restricted space and time it may take to remediate fill/soils to a level that they do not represent an unacceptable risk and/or contribute to groundwater impacts, this method is feasible but may not be practicable. Not the preferred option, however bioremediation of natural site soils may be further considered, subject to evaluation of time and available space constraints given the comparably low cost when compared to off-site disposal and need for reinstatement of excavations to achieve development levels.
Option 2: Offsite treatment of excavated soil/infrastructure so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site.	Heavy Metals Metals are unable to be destroyed. However, there are a number of microencapsulation treatment technologies which can reduce the mobility of the identified inorganic contaminants of concern (e.g. cement stabilisation).	Heavy Metals, Petroleum Hydrocarbons and Benzo(a)pyrene Energy/resource use associated with the transport and return of materials is not considered to be ecologically sustainable. Not a Suitable Option.
	Benzo(a)pyrene PAHs present in site soils are typically restricted to heavier non-volatile constituents. These can be remediated by thermal processes. However, this requires substantial investment in plant and equipment and substantial energy use. Similarly, for heavy metals, there are a number of microencapsulation treatment technologies which can reduce the mobility of the identified organic contaminants of concern (e.g., cement stabilisation).	

	Potential Fuel Infrastructure and Petroleum Hydrocarbon Impacted Soils As above (Option 1), however, additional time, energy and costs are incurred to take soils off site and return them to the site, in addition to there being no currently licensed facilities in close proximity of the site to undertake soil treatment.	
Option 3: Removal of contaminated soil/infrastructure to an approved site or facility, followed where necessary by replacement with clean fill.	Fill Materials (TRH, PAHs and heavy metals) There are currently suitably licensed waste facilities in the Sydney Metropolitan region capable of accepting the fill material based on a preliminary waste classification. This option provides for the remediation of the site without ongoing concerns with regard to monitoring/management of residual impacts. These are generally located a significant distance from the site and there are significant costs are associated with disposal as a result of the NSW Waste Levy, cartage and landfill gate fees. Dependent upon final development levels, where significant volumes of fill material require removal, suitable material may be required to be imported to site to reinstate resulting excavations. Where fill material and/or natural soils identified as requiring off-site disposal to achieve the remedial objectives extend beyond surficial levels, further consideration of potential site excavation stability requirements will be required to achieve excavation and off-site disposal.	Fill Materials Impacted by Benzo(a)pyrene), some Heavy Metals A potentially applicable option but inferior to on-site management (Option 4) for the majority of the impacted material. Requirements to retain excavation stability during excavation works so as to remove impacted material at depth may be significant at the site. Whilst this method is viable from a technical view point, because of disposal costs, resource consumption and waste generation volume considerations, this is not the most preferred remedial option available. However, where materials are identified as not being environmentally suitable under Option 4, or material is identified as surplus to future development levels, then this will be the preferred option.
		Arsenic Impacted Soils BH11 This is the preferred option for the management of the arsenic impacted natural soils at BH11. Given the relatively elevated levels of arsenic reported in the natural soils at BH11 this material has been identified as not environmental suitable to remain onsite.
		Potential Fuel Infrastructure and Petroleum Hydrocarbon Impacted Soils Given the requirements for removal of the in-situ fuel infrastructure, space constraints associated with options to bioremediate soil on site, overall, this is considered the more favourable option with regard to hydrocarbon impacted soils present at concentrations unable to be retained on site as per Option 4. Alternatively, consideration may be given to Option 1, dependent upon evaluation outcomes as discussed above.
4. On-site in situ management of the soil by physical separation, and ongoing management.	Fill Materials Impacted by Benzo(a)pyrene and Heavy Metals Fill materials, based on existing analytical data for the site, have been found to be largely free of constituents: • That will pose a potential groundwater risk by the demonstrated low levels of leachable contaminants and the absence of significant groundwater impacts; and	Fill Materials Impacted by Benzo(a)pyrene) and Heavy Metals This is the preferred option for the management of the majority of impacted fill material. The retention of the impacted fill will reduce the waste generation and resource requirements of the remediation of the site and require time and waste disposal cost inputs. Based on the preliminary site development plans, the site will be subject to significant areas of hardstand pavements which will provide physical

	• That will pose a potential inhalation risk as demonstrated by the assessment of vapour impacts. On this basis, the impacted fill materials are suitable for retention on site in areas where human/ecological exposures can be restricted.	separation between site users and retained fill materials. Additionally, where hardstand pavements are not proposed to be installed, it is considered feasible to install an alternative physical barrier (such as non-impacted soil). This option is of highest ranking as a result of the low waste volumes, time, cost and energy use. However, consideration of the practical implications of an ongoing site management plan is required prior to implementation to ensure there are suitable available mechanisms for ongoing management of the site.
	<u>Arsenic Impacted Soil BH11</u> The fill and natural soils at BH11 were reported to be impacted by elevated levels of arsenic exceeded the ecological and human health criteria adopted for the site. There is no leachate data available for BH11 at depth which was the sample with the highest arsenic impacts.	<u>Arsenic Impacted Soil BH11</u> On-site management of the arsenic impacted soils at BH11 is not the preferred option due to the potential for contribution to groundwater impacts. The leachability of arsenic impacts in soils at depth at BH11 are unknown. Although arsenic impacts were not identified in groundwater, if left onsite the elevated arsenic may contribute to groundwater impacts in the future.
	<u>Potential Fuel Infrastructure and Petroleum Hydrocarbon Impacted Soils</u> Aesthetic considerations in relation to odorous and/or discoloured soils would apply where material may be subject to exposure to future site users. However, where removal of additional impacted soil at depth is identified as impracticable as a result of groundwater intrusions, excavation stability or similar, consideration will be given to on-site in-situ retention of petroleum impacted material. Given the former infrastructure and majority of the impacted soils are likely able to be removed and the current data supports an absence of unacceptable risks associated with soil vapour and groundwater, adoption of an ongoing containment strategy, supported by the current natural attenuation processes are feasible.	<u>Potential Fuel Infrastructure and Petroleum Hydrocarbon Impacted Soils</u> Whilst on-site in-situ management of petroleum hydrocarbon impacted soil is not preferred given the aesthetic considerations, potential for contribution to groundwater impacts, etc; consideration of the potential for in-situ retention will be considered where material extends beyond the practicable depth of excavation works at the site. As for the fill material, further consideration of this option will be subject to identification of ongoing suitable management mechanisms.

4.5 Preferred Remedial Strategy

Based upon the above assessment of available remedial/management options the preferred remedial strategy for the site is:

- Excavation and off-site disposal of potential petroleum infrastructure including the USTs, associated pipework and former bowser plinths;
- Excavation and off-site disposal of arsenic impacted soils at BH11 and (subsequent to stockpiling and characterisation in accordance with the requirements for off-site disposal), removal of the excavated material from the site to a lawful waste facility;
- Excavation of tank pit backfill and associated impacted soil to the extent practicable and (subsequent to stockpiling and characterisation in accordance with the requirements for off-site disposal), removal of the excavated material from the site to a lawful waste facility; and
- Excavation and off-site disposal of impacted fill material as required to achieve proposed development subgrade levels and enable implementation of a cap/cover remedial strategy based on physical separation, with implementation of on-going management plan.

Subject to design of the final development scheme review of the preferred strategy will be completed to confirm the appropriateness of the adopted strategy as is discussed in the following sections.

5. Remedial Plan

5.1 Approvals, licences and notifications

Prior to the commencement of remediation works, appropriate approvals and notifications as discussed below will be implemented by the Site owner's representative, or Remediation Contractor, as appropriate, consistent with the details presented in **Section 9.1**:

- It is anticipated that the works will comprise "Category 2" as per the definition outlined in the S*tate Environmental Planning Policy No. 55* (SEPP 55). As such, the consent authority (Council) requires notification 30 days prior to the commencement of "Category 2" remediation works.

However, it is noted there is potential for other planning policies relevant to the subject land that requires development consent for the works.

5.2 Site Establishment

The boundary of the extent of remediation will be defined by the Remediation Consultant. The Remediation Contractor (herein referred to as the "Contractor") shall secure these areas to ensure that all safety and environmental controls are implemented. These controls will include, but not be limited to:

- Locate and isolate all required utilities in the proximity of the works;
- Assess need for and implement any necessary traffic controls;
- Assess need for additional work area security fencing;
- Site signage and contact numbers;
- Stabilised site entry gate;
- Appropriate decontamination areas for personnel and plant;
- Sediment fencing (attached to security fencing) where necessary; and
- Stormwater runoff and sediment controls (e.g. silt fences) where necessary.

5.3 Remedial Works

5.3.1 Removal and Disposal of Petroleum Infrastructure

Petroleum infrastructure shall be removed by a contractor experienced in the decommissioning and removal of fuel infrastructure. The Remediation Consultant will provide oversight during the works with regard only to management of contamination concerns.

Petroleum infrastructure present at the site requiring removal may potentially include:

- Underground storage tanks (USTs);
- Remote fill points;
- Vent points and associated vent lines;
- Fuel dispenser/bowser plinths;
- Feed pipework; and
- Tank anchors.

The procedure for undertaking this activity will in accordance with Section 5 of *The Removal and Disposal of Underground Petroleum Storage Tanks – Australian Standard 4976-2008*, Standards Australia (2008[8]) as per DECCW (2009[9]). The general procedure is detailed below:

- Documentation of work instructions and relevant permits shall be prepared and issued prior to the commencement of decommissioning works;
- Any residual product shall be removed via the dip points or other suitable fittings, using air operator pumps, suitable for hazardous areas. Care shall be taken to ensure that the pump, via hose or spear, reaches the bottom of the tanks (where accessible). Residual product shall be transferred to sealed drums or designated liquid waste trucks;
- Break up and remove concrete/asphaltic hardstand pavements overlying infrastructure;
- Ground level connections to the tanks will be isolated and sealed. All electrical cables, product pipelines, and any other services infrastructure within the vicinity of the tanks will be located and isolated prior to excavation;
- All piping servicing the tanks shall be drained and disconnected. All internal tubes shall be removed and plugged;
- The tanks shall be purged of product vapours where present;
- Any remaining pipework shall be disconnected and all openings, including vents, shall be plugged. One plug in each tank shall have a 3 mm hole to act as a pressure equalizing vent;
- The tank and pipework backfill will be excavated to expose the total width and length of the tanks with subsequent removal of concrete anchors where present, ensuring care is taken not to strike the tank with excavating equipment;
- Prior to removal, lifting lugs shall be inspected to ensure they are in good condition, and the removal equipment shall be suitably powerful to overcome potential ground suction effects;
- Once the tanks are clear of the excavations, excess soil shall be removed to facilitate inspection of the base and sides. If any holes are present, they shall be cold patched or plugged prior to loading the tanks onto the transport vehicle;
- Where the removal works result in the exposure of natural sandy soil underlying the site, any excavated and/or exposed natural sandy soil will require management in accordance with **Section 5.4;**
- Work shall be planned such that when the tank is fully exposed, it is able to be immediately loaded to a transport vehicle and removed from the site to an approved disposal facility;
- After removal, the tanks shall be marked with warning labels as follows, with minimum letter height of 50 mm placed to ensure visibility from each side and both ends of the tanks during transport:
    - NOT GAS FREE: NO SMOKING
    - NO NAKED LIGHTS
    - TANK HAS CONTAINED PETROL/DIESEL NOT SUITABLE FOR STORAGE OF FOOD OR LIQUIDS INTENDED FOR HUMAN OR ANIMAL CONSUMPTION.

[8] 'The Removal and Disposal of Underground Petroleum Storage Tanks – Australian Standard 4976-2008', AS 4976-2008, 26 November 2008, Standards Australia (2008)

[9] Guidelines for Implementing the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008. NSW Department of Environment, Climate Change and Water (DECCW 2009)

- As per DECCW (2009), notification to WorkSafe NSW of the removal of the USTs will be completed within 7 days of removal from the site.

5.3.2 Data Gap Close Out

During/following removal of the fuel infrastructure and site structures, appropriate additional intrusive investigation is required to be completed to confirm the presence/absence of fuel infrastructure as discussed in **Section 3.5**.

The extent of investigations to be completed will be subject to evaluation based upon visual inspection of the area following removal on site infrastructure. As such, the details will be developed at the time of the investigation with regard to the overall remedial objectives.

The outcomes of the above will guide application of the works as outlined in the following sections. However, should contaminant conditions be identified during implementation of the data gap close out that indicate significantly different conditions to those documented in **Section 3.4**, further consideration of remedial requirements will be undertaken via implementation of the **Section 6** contingency protocols inclusive of the Unexpected Finds Protocol (UFP).

5.3.3 Excavation and Disposal of Petroleum Impacted Soils

Following removal of the potential tank(s) and any associated infrastructure, the tank backfill material and further petroleum impacted soils (refer to **Section 3.4**) shall be 'chased' out to the extent practicable under the oversight of the Remediation Consultant with regard to the contamination aspects. The procedure for undertaking this excavation activity will be by:

- Excavation and stockpiling of surrounding and underlying backfill and apparent impacted natural soils using observations including odour, staining/discolouration and/or a photo-ionisation detector (PID).
- It is noted that excavation works will only extend to the site boundary, or a prior hold point as appropriate to ensure boundary stability (as evaluated by the Remediation Contractor or their nominated personnel). Validation sampling of the excavation face at the site boundary (or final extent) will be undertaken.
- Where hydrocarbon impacted groundwater/seepage is observed within the tankpit excavation, this shall be pumped out by a licensed liquid waste contractor. The pumped pit water shall be disposed of as 'liquid waste' as per EPA (2014a).
- Excavated soils will be stockpiled with like materials (fill material, natural sand, natural clay) within the site on existing pavements, durable plastic ground covers, placed in skip bins, or otherwise loaded directly onto a haulage vehicle. Representative characterisation samples will be collected from each material type to assess the material suitability for either on-site reuse, or alternatively provide a waste classification for off-site removal.
- Validation samples will be obtained from the base and walls of the excavation as outlined in **Section 7.5**. Other than at the site boundary, or practically achievable excavation extent, where validation sample contaminant concentrations exceed the adopted validation criteria, the excavation will be extended until such time as the validation assessment is achieved.
- Any unexpected finds will be managed as per **Section 6**.

5.3.4 Excavation and Disposal of Arsenic Impacted Soils at BH11

Arsenic impacted soil identified at BH11 will be excavated to the extent outlined in **Section 3.4.3**. The arsenic impacted soils in the vicinity of BH11 shall be 'chased' out to the extent practicable under the oversight of the Remediation Consultant with regard to the contamination aspects. The procedure for undertaking this excavation activity will be by:

- Excavation and stockpiling of arsenic impacted fill and natural soils with guidance of the extent using an x-ray fluorescence (XRF) analyser.
- It is noted that excavation works will only extend to the site boundary, or a prior hold point as appropriate to ensure boundary stability (as evaluated by the Remediation Contractor or their nominated personnel). Validation sampling of the excavation face at the site boundary (or final extent) will be undertaken.
- Excavated soils will be stockpiled with like materials within the site on existing pavements, durable plastic ground covers, placed in skip bins, or otherwise loaded directly onto a haulage vehicle. Representative characterisation samples will be collected from each material type to provide a waste classification for off-site removal.
- Validation samples will be obtained from the base and walls of the excavation as outlined in **Section 7.5**. Other than at the site boundary, or practically achievable excavation extent, where validation sample contaminant concentrations exceed the adopted validation criteria, the excavation will be extended until such time as the validation assessment is achieved.
- Any unexpected finds will be managed as per **Section 6**.

5.3.5 Excavation and Off-site Removal of Fill Materials

It is anticipated that some excavation of site fill material will be required to reach the required construction sub-grade levels, particularly where in-situ capping of material is proposed to retain fill material on-site.

Balance of the Site Fill Excavation

Where excavation of fill material is required across the balance of the site to achieve construction sub-grade levels, for the installation of services, etc; this material is proposed to be managed via off-site removal to an appropriately licensed facility. Following identification of the location and extent of material to be removed, a review of the existing data will be completed to identify whether a waste classification based on existing available data may be prepared for the material, or alternatively additional sampling and laboratory analysis will be implemented to appropriately characterise the material prior to off-site disposal.

The material will be excavated under the supervision of the Remediation Consultant with the material stockpiled on hardstand/durable plastic, placed in a skip bin or alternatively directly loaded onto a haulage vehicle for off-site disposal. The material will be removed from site under a waste classification as per EPA (2014a) for disposal to a facility lawfully able to accept the material.

5.3.6 Physical Separation (Cap and Containment) of Retained Fill Materials Strategy

Where proposed sub-grade levels occur in fill material at the site and/or in areas where petroleum hydrocarbon impacted soil remains in-situ, it is proposed that remedial works will comprise implementation of a ‘cap and containment’ management protocol with the following minimum requirements:

- Permanent concrete ground slabs, asphalt surfaced pavement, mortared stone/concrete pavers or similar. The pavement base course shall be underlain by a visual marker layer; or
- A minimum soil cover thickness of 500 mm is nominated as underlain by a ‘marker layer’ in areas of exposed site soil. Suitable backfill material may comprise one or a combination of imported virgin excavated natural material (VENM), material sourced from the site that has been validated as suitable for beneficial reuse within the site as discussed in **Section 7.5.3**, and/or imported material nominated via a beneficial reuse exemption as fit for the proposed purpose (eg ENM, drainage aggregate, growing media, etc); and/or

- Where underground services are required to be installed, excavation of impacted material from the services alignment will be required, followed by lining of the resulting trench with the visual marker layer, then service installation and backfilling with appropriate engineered material (typically VENM, imported recycled glass sand, aggregate or similar). Typically, the lined trench dimensions should be suitable to allow future maintenance workers space to work in non-impacted backfill material.

In vegetated/landscaped areas, the minimum soil cover depth of 500 mm is consisted appropriate for shallow rooted plants. For deep rooted plants including large shrubs and trees, a depth of growing media of up to 2 m below surrounding ground levels may be required, based upon arborist advice following consideration of individual species requirements, to facilitate a suitable zone depth for the plant(s). The underlying impacted material will be covered by a visual marker layer above which, suitable drainage/growing media will be placed within the root zone.

Material to be used above the marker layer must be demonstrated prior to placement as appropriate with respect to site contamination risks in addition to being fit for purpose for uses including growing media, engineered backfill or pavement subgrade material.

The purpose of the marker layer is to serve as a visual signal to those disturbing the capping system of the presence of potentially contaminated fill material at depth. The marker layer shall consist of a light coloured knitted HDPE constructed at least to a density greater than 300 grams per square metre (or equivalent). The marker layer should be of a distinctive bright colour such that future workers and/or site users will be alerted to conditions as documented in a site environmental management plan (EMP) prior to breaching the marker layer (see Section 7.6.2 – Long term Environmental management Plan).

The final extent of material capped in-situ will be dependent on conditions encountered during remediation and development works and as such, for planning purposes, the anticipated maximum extent of retained fill material is considered to be the entire site development area.

5.3.7 Off-site Disposal of Material

Any material requiring disposal shall be classified in accordance with *Waste Classification Guidelines* NSW EPA (2014a) and relevant waste regulations by the Remediation Consultant. Disposal of waste to licensed waste facilities in accordance with relevant waste regulations will be undertaken by the Contractor. All waste tracking documentation including disposal dockets must be maintained by the Contractor and must be provided to the Principal and the Remediation Consultant for inclusion in the validation report.

5.4 Validation

Validation of the remedial works will be conducted by the Remediation Consultant to demonstrate the remediation objectives have been achieved. Consideration to the requirements of the UPSS *Technical Notes: Site Validation Reporting* (DECCW 2010) will be considered in development of the validation program.

Details of the validation program are provided in **Section 7**.

5.5 Backfilling of Excavations

Upon confirmation of validation, excavations will be reinstated using validated excavated material sourced from within the site, or alternatively validated imported fill material. Imported fill material will require assessment prior to importation to confirm the material is consistent with Virgin Excavated Natural Material (VENM), Excavated Natural Material (ENM) as defined in EPA (2014b[10])

[10] The excavated natural material exemption 2014. NSW EPA (2014b)

or any other suitable material, granted an applicable EPA waste exemption under the *Protection of the Environment Operations (Waste) Regulation 2015*.

5.6 Site Disestablishment

On completion of the remediation works all plant/equipment and safety/environmental controls shall be removed from the site by the Contractor. If encountered, equipment used during asbestos remediation works will need to be appropriately decontaminated or disposed of as asbestos waste by the Contractor, in accordance with SWA (2016a), EPA (2014a) and relevant waste regulations

6. Contingency Plan

A review of remediation works has been undertaken to identify potential risks to meeting the specified site validation criteria. A number of potential risks have been identified. These are listed in **Section 6.2**, with contingencies that will be implemented to ensure that validation criteria are met.

Additionally, the associated remedial works health and environmental risks/hazards and their minimisation/mitigation are further discussed in **Sections 8** and **9**.

6.1 Unexpected Finds Protocol

It is acknowledged that previous investigations of the site have been undertaken to assess the identified contaminants of potential concern in selected parts of the site. However, ground conditions between sampling points may vary, and further hazards may arise from unexpected sources and/or in unexpected locations during remediation. The nature of any residual hazards which may be present at the site are generally detectable through visual or olfactory means, for example:

- The presence of significant aggregates of friable asbestos materials (visible) as opposed to minor occurrences of fragments or fibre bundles in soil;
- Bottles/containers of chemicals (visible);
- Excessive quantities of Construction/Demolition Waste (visible) in fill material;
- Drums, waste pits, former pipework or unrecorded USTs (visible);
- Tarry like impacted soil/fill material (visible/odorous);
- Chlorinated hydrocarbon impacted soils (sweet odour);
- Ash and/or slag contaminated soils/fill materials (visible).

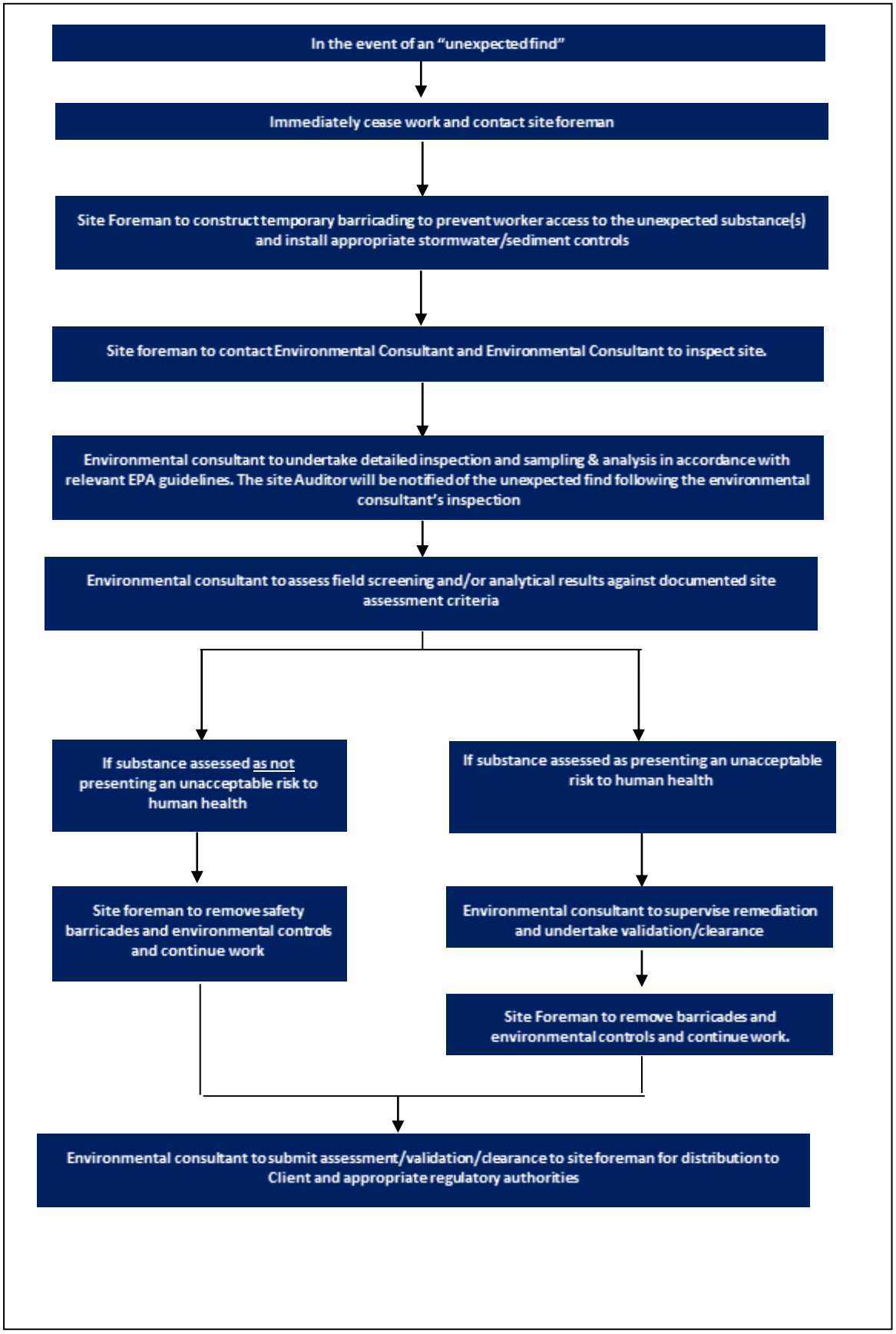
As a precautionary measure to ensure the protection of the workforce and surrounding community, should any of the abovementioned substances be identified (or any other unexpected potentially hazardous substance), the procedure summarised in **Flowchart 6.1** is to be followed.

An enlarged version of the unexpected finds protocol, suitable for use onsite, should be posted in the Site Office and referred to during the site-specific induction by the Contractor.

The sampling strategy for each “unexpected find” shall be designed by a suitably qualified environmental consultant. The strategy will, however, be aimed at determining the nature of the substance – that is, is it hazardous and, if so, is it at concentrations which pose an unacceptable risk to human health or the environment.

The sampling frequency of the identified substance/materials shall meet the minimum requirements outlined in EPA (1995), as well as those outlined in **Section 7.2.7**.

Flowchart 6.1 – Unexpected Finds Protocol



6.2 Contingency Scenarios

6.2.1 Remedial Strategy Constraints

In the event that the proposed remedial works do not meet the validation criteria, or if the selected remedial strategy is not able to proceed, the following actions will be considered to ensure, firstly, the safety and health of people and the environment and, secondly, that the overall project objectives are achieved:

- Reassessment of remedial and validation options for contaminated soils and anthropogenic impacted material; and
- Continued controlled excavation of impacted soils; or
- Alteration to the development and variation of the proposed long-term Environmental Management Plan (EMP) scope to manage any additional residual unacceptable contamination (if appropriate).

6.2.2 Tank Pit Excavation Validation Failure on Boundary

Given the location of the potential USTs close to the site boundary, there is a risk that remedial works to remove any associated impacted material will identified that contaminant impacts in soil exceed the site validation criteria at the boundary.

In this event, or where sampling cannot be undertaken to confirm the absence of impacted material on the boundary as a result of temporary shoring/excavation retention measures, a qualitative assessment of the potential for unacceptable risks to sensitive receptors will be initially completed, prior to issue of the site validation report. Where an unacceptable risk is identified, appropriate notification of conditions to the adjoining land owner and the NSW EPA will be initiated and a revised remediation strategy developed to address the unacceptable risks.

6.2.3 Identification of Additional Fuel Infrastructure

There is the potential, given the age of the fuel infrastructure that one or more additional USTs may be encountered during demolition of the pavements or subsequent earthworks. In the event of such an occurrence, the Unexpected Finds Protocol as discussed above (**Figure 6.1**) will be implemented and remedial actions defined with consideration to the requirements for known USTs.

6.2.4 Material Storage Breach

In the event any stockpiled materials escape (or have the potential to escape), then the management controls shall be rectified and investigations undertaken to review the adequacy of the controls and improvements implemented.

6.2.5 Identification of Oily or Tarry Materials

In the event that oily/tarry materials are encountered, the provisions outlined in the Unexpected Finds Protocol will be implemented, comprising inspection, testing and appropriate action as advised by the Remediation Consultant.

Any suspected oily/tarry materials must be segregated from other excavated materials and placed in a designated area with appropriate odour and sediment controls until such time as appropriate assessment is completed and a methodology is confirmed for their appropriate management.

In the event that the oily/tarry materials do not meet the Site Validation Criteria, then they shall be stored in a secure area for later treatment or classified and removed from the site for treatment and/or disposal at an appropriately licensed facility.

6.2.6 Identification of Chlorinated Hydrocarbon Impact

In the event that chlorinated hydrocarbon impacted materials are encountered (potentially as a result of the identification of sweet odours in soils), the provisions outlined in the Unexpected Finds Protocol will be implemented, comprising inspection, testing and appropriate action as advised by the Remediation Consultant.

Any suspected chlorinated hydrocarbon impacted materials must be segregated from other excavated materials and placed in a designated area with appropriate odour and sediment controls until such time as appropriate assessment is completed and a methodology is confirmed for their appropriate management. In the event that the materials do not meet the Site Validation Criteria, then they shall be stored in a secure area for later treatment or classified and removed from the site for treatment and/or disposal at an appropriately licensed facility.

6.2.7 Emissions Complaints

Due to the nature of the activities and type of contaminants identified at the site there is a potential for complaints to be received from members of the public relating to environmental emissions including:

- Dust emissions arising from contaminated soil excavation, material handling, transport, placement and capping;
- Offensive odours arising from the excavation and offsite disposal of petroleum impacted soils/infrastructure; and
- Noise and vibration from excavation.

Monitoring of all environmental emissions shall be undertaken as detailed in **Section 8** and appropriate actions taken to further control emissions following receipt of a complaint. Such additional controls may include the following actions:

- Increased application of odour screening/masking chemicals on odour materials;
- Disturbance of soils during meteorologically favourable periods only; and/or
- Increasing environmental controls including covering and/or wetting down soils which are generating dust.

6.2.8 Severe Weather

Weather will be monitored on a daily basis via checking an internet based weather service provider. Should severe weather be forecast, especially heavy rain and strong winds, works will stop until safe to re-commence. All site management controls will be implemented to the extent practicable as outlined in **Section 8** prior to any severe weather events.

7. Validation Plan

7.1 Overview

Validation data is required to be collected to verify the effectiveness of the remediation works and document the condition of the site as being suitable for the permissible land uses. Validation activities will be required for the following:

- Verification of the removal of petroleum infrastructure;
- Excavations formed by removal of petroleum impacted soils;
- Confirmation residual fill materials do not contain petroleum hydrocarbons representing an aesthetic issue;
- Excavations formed by removal of arsenic impacted soils at BH11;
- Waste materials (including soil and ground/seepage water) requiring off-site disposal was taken to a facility lawfully able to accept it; and
- Importation of materials to site (if required).

7.2 Data Quality Objectives

Data Quality Objectives (DQOs) were developed for the validation program, as discussed in the following sections.

7.2.1 State the Problem

The site, which has been used historically for a range of commercial/industrial uses, is proposed to be developed for commercial and residential land uses.

Previous assessment of site conditions has identified the presence of potential in-situ fuel infrastructure that will require removal in addition to soils impacted, to varying extents, by petroleum hydrocarbons, heavy metals and PAHs that will require management/remediation for the site to be considered suitable for future proposed land uses.

To appropriately demonstrate that the remedial/management works have been completed in accordance with this RAP, sufficient data in the form of observations, sample analytical data, material tracking records, survey data, disposal docket, etc. are required to be collected and assessed in a defensible manner.

7.2.2 Identify the Decision

The following decisions are required to be made during the validation works:

- Are risks to onsite or offsite receptors from any residual soil contamination, following the remedial works outlined in **Section 5.3** acceptable (subject to the proposed long term EMP)?
- If impacted materials are to remain on site, can any outstanding issues be appropriately managed by the adoption of a cap and containment strategy based on physical separation and an EMP?
- Have all aesthetic issues been addressed?
- Have excavated/sorted materials been classified and disposed of offsite to a facility licensed to accept the classified waste?
- Was imported material used as backfill suitable for the intended land use?
- Has the potential migration of contaminants from the site been mitigated?

- Have the works been completed in accordance with the RAP, or where variations to the works were required, have these met the objectives of the RAP?
- Is the site suitable for the proposed land use?

7.2.3 Identify Inputs to the Decision

The inputs to the decision are:

- Previous investigation data;
- Field observations, field test data, sampling and analytical data during remedial works;
- Field observations, sampling and analytical data for offsite disposal of waste materials;
- Documentation of appropriate classification of imported materials (if required);
- Assessment criteria for potentially impacted media; and
- Data quality indicators as assessed by quality assurance/quality control procedures (QA/QC).

7.2.4 Define the Study Boundaries

The lateral extent of the site for the purposes of the RAP comprises the lot/property boundaries as shown in **Figure 2**.

The vertical extent of the validation assessment will comprise the depth of impacted fill material and natural soil underlying the site. In practice the lateral and vertical extent shall be determined by validation samples that satisfy the adopted validation criteria.

Due to the nature of potential contaminants of concern at the site, seasonality and other temporal variables will not be assessed as part of this investigation. The temporary boundaries of the validation assessment will be limited to the period of field validation assessment activities.

7.2.5 Decision Rules

The decision rules adopted to answer the decisions identified in **Table 7.1** below.

Table 7.1: Decision Rules

Decision Required to be Made	Decision Rule
1. Following the remedial works outlined in **Section 5.3,** are risks to onsite or offsite receptors from residual soil contamination, acceptable (subject to the proposed long term EMP)?	Soil analytical data will be compared to EPA endorsed criteria as established in this RAP. For each of the validation data sets, where appropriate, statistical analysis of the data will be undertaken in accordance with relevant guidance documents to facilitate the decisions. The following statistical criteria will be adopted with respect to soils: Either: the reported concentrations are all below the site criteria; Or: the average site concentration for each analyte must be below the adopted site criterion; no single analyte concentration exceeds 250 % of the adopted site criterion; and the standard deviation of the results must be less than 50 % of the site criteria. And: the 95 % upper confidence limit (UCL) of the average concentration for each analyte must be below the adopted site criterion. If the statistical criteria stated above are satisfied, the decision is Yes. If the statistical criteria are not satisfied, refer to Decision Rule 2.
2. If impacted materials are to remain on site, can any outstanding issues be appropriately managed by the adoption of a cap and containment strategy based on physical separation and an EMP?	Validation/site characterisation sample contaminant data will be assessed by comparison with ANZECC (1999) and EPA endorsed documents as appropriate.

Decision Required to be Made	Decision Rule
	If the contaminants are considered to be appropriately managed via installation of a capping system based on physical separation, the answer to the decision is Yes. If the contaminants are considered to still represent a potential risk in relation to future site users following installation of a physical separation layer, then the answer to the decision would be No.
3. Have all aesthetic issues been addressed?	If there are any remaining unacceptable inclusions or soil discolouration, the answer to the decision will be No. Otherwise, the answer to the decision will be Yes.
4. Has all excess excavated soil been classified and disposed of offsite to a facility licensed to accept the classified waste?	Soil analytical data will be compared against presented criteria in EPA Waste Classification Guidelines (2014). Statistical analyses of the data in accordance with relevant guidance documents will be undertaken, if appropriate, to facilitate the decisions (as detailed above). Appropriate waste classification and disposal documents to be obtained. If the statistical criteria stated above are satisfied, the decision is Yes, and if receipts are provided recording the disposal of material to an offsite licensed facility, the decision is Yes. If criteria or statistical assessment are not satisfied, or no disposal receipts are provided, the answer is No.
5. Where material is imported to generate final development levels, has the material been identified as suitable for the intended land use?	Soil analytical data will be compared against the regulatory requirements for importations in addition to site land use assessment criteria. Statistical analyses of the data in accordance with relevant guidance documents will be undertaken, if appropriate, to facilitate the decisions (as detailed above). If both the regulatory requirements and the statistical criteria stated above are satisfied, or if supporting documentation from the source site is provided regarding suitability for use, the answer to the decision is Yes. If the material doesn't meet the regulatory requirements, inclusive of soil analytical data exceeding the EPA endorsed criteria or documentation from source site is not provided, the answer is No.
6. Has the potential migration of contaminants from the site been mitigated?	Where contaminants were to be retained on site, appropriate final characterisation data will be assessed in addition to existing groundwater contamination data to evaluate the potential impact on groundwater conditions at the site. If the assessment indicates any unacceptable risk then the answer to the decision will be No. Otherwise, the answer to the decision will be Yes.
7. Have all remediation works been completed in accordance with the requirements of the RAP, or where variations were required, have these been appropriate to meet the RAP objectives?	Evaluation of the RAP requirements and completed scope of works will be completed on a qualitative basis. If the completed works are inconsistent with the RAP objectives, the answer will be No. In this instance, evaluation of the works will be undertaken with consideration to the RAP objectives. If the works are inconsistent with the stated objectives, the answer is No. Otherwise the answer to the decision is Yes.
8. Is the site suitable for the proposed uses?	Is the answer to any of the above decisions No? If No, can the outstanding issues be appropriately addressed by incorporation into the proposed EMP? If the answer to the above is Yes, or if the issues can be appropriately addressed by incorporation into the proposed EMP, the answer to the above decision is Yes, subject to implementation of the EMP. Otherwise, the answer to the decision is No.

7.2.6 Specify Limits of Decision Error

This step seeks to establish the decision maker's tolerable limits on decision errors, which are used to establish performance goals for limiting inherent uncertainty in the data. Data generated during this project needs to robust and reliable to facilitate decisions to be made with confidence.

Specific limits for this project were adopted in accordance with the appropriate guidance from the NSW EPA, NEPC (2013), appropriate indicators of data quality indicators (DQIs) used to assess QA/QC and standard JBS&G procedures for field sampling and handling.

To assess the useability of the data prior to making decisions, the data were assessed against pre-determined DQIs to assess precision, accuracy, representativeness, comparability, completeness and sensitivity (PARCCS parameters). The acceptable limit on decision error was 95% compliance with DQIs.

The QA/QC program is documented in **Table 7.2**.

- **Precision** - measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is assessed by calculating the Relative Percent Difference (RPD) of duplicate samples for chemical COPCs. For asbestos precision is assessed by whether the identification results for duplicate samples were in agreement with the original sample.
- **Accuracy** - measures the bias in a measurement system. The accuracy of the laboratory data that are generated during this study is a measure of the closeness of the analytical results obtained by a method to the 'true' value. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards. Note only applied to chemical COPC.
- **Representativeness** –expresses the degree which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples on a representative basis across the site, and by using an adequate number of sample locations to characterise the site to the required accuracy.
- **Comparability** - expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples; and ensuring analysing laboratories use consistent analysis techniques; and reporting methods.
- **Completeness** – is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is set at there being sufficient valid data generated during the study.
- **Sensitivity** – expresses the appropriateness of the chosen laboratory methods, including the limits of reporting, in producing reliable data in relation to the adopted site assessment criteria.

Table 7.2 Summary of Data Quality Indicators for Soil Validation Program

Data Quality Indicators	Frequency	Data Quality Criteria
Precision		
Split duplicates (intra laboratory)	1 / 20 samples	<50% RPD[1]
Blind duplicates (inter laboratory)	1 / 20 samples	<50% RPD[1]
Laboratory Duplicates	1 / 20 samples	<50% RPD[1]
Accuracy		
Surrogate spikes	All organic samples	70-130%
Laboratory control samples	1 per lab batch	70-130%
Matrix spikes	1 per lab batch	70-130%
Representativeness		
Sampling appropriate for media and analytes	All samples	-[2]
Samples extracted and analysed within holding times.	All samples	Soil: organics (14 days), inorganics (6 months) Water: organics (7 days to extract and 14 days to analyses). Metals (6 months)
Laboratory Blanks	1 per lab batch	<LOR
Trip spike	1 per lab batch	70-130% recovery
Storage blank	1 per lab batch	<LOR
Rinsate sample	1 per sampling event/media	<LOR
Comparability		
Standard operating procedures for sample collection & handling	All Samples	All Samples
Standard analytical methods used for all analyses	All Samples extracted and analysed within holding times	NATA accreditation
Consistent field conditions, sampling staff and laboratory analysis	All Samples	All samples[2]
Limits of reporting appropriate and consistent	All Samples extracted and analysed within holding times	All samples[2]
Completeness		
Sample description and COCs completed and appropriate	All Samples	All samples[2]
Appropriate documentation	All Samples	All samples[2]
Satisfactory frequency and result for QC samples		95% compliance
Data from critical samples is considered valid	-	Critical samples valid
Sensitivity		
Analytical methods and limits of recovery appropriate for media and adopted Site assessment criteria	All samples	LOR<= Site assessment criteria

[1] If the RPD between duplicates is greater than the pre-determined data quality indicator, a judgment will be made as to whether the excess is critical in relation to the validation of the data set or unacceptable sampling error is occurring in the field.

[2] A qualitative assessment of compliance with standard procedures and appropriate sample collection methods will be completed during the DQI compliance assessment.

7.2.7 Optimise the Design for Obtaining Data

The purpose of this step is to identify a resource-effective field investigation sampling design that generates data that are expected to satisfy the performance criteria, as specified in the preceding steps of the DQO Process.

For these works, following the removal of petroleum storage infrastructure and associated impacted soil, the resultant excavation walls and base will be inspected/sampled in accordance with **Table 7.3** with the results assessed against the adopted validation criteria as discussed in **Section 7.5**. The resulting excavated material will be characterised based on the waste classification criteria set out in EPA (2014a) *Waste Classification Guidelines*.

Where fill material from beyond the fuel infrastructure excavations is required to be excavated to achieve proposed development levels, the resulting material will be characterised for the purposes of either on-site reuse (above or below a capping profile) or alternatively for off-site disposal. Where fill material is to be retained in-situ, characterisation sampling will be collected to verify the material is suitable to be retained under a capping profile. Alternatively, where excavation works result in the removal of all potentially impacted fill/natural soil material, validation sampling will be undertaken to verify that capping of these site areas will not be required for site suitability.

Imported materials (where/if required) will also require validation to ensure their appropriateness (from a contamination perspective) for use on the site. General sampling densities are outlined in **Table 7.3**, to be confirmed based on the specific material types to be imported at the time of the remediation works.

Table 7.3: Sampling Analytical Schedule

Item	Sampling Frequency			Analytes
	Excavation Base	Excavation Walls	Materials	
			(offsite disposal/on-site reuse suitability)	
Excavation formed by the removal of petroleum storage infrastructure	1 sample per UST, or a minimum of 1/25 m^2 where one large excavation	1 sample per wall per media, with minimum spacing of one per 5 linear metres	Sampling at 1/25 m^3, with analysis at 1/100 m^3 based on PID screening	TRH/BTEX Lead PAH
Excavation formed by the removal of arsenic impacted soils	1/25 m^2	one per 5 linear metres	See below	Arsenic
Characterisation of excavated materials from the balance of the site requiring off-site disposal	N/A	N/A	1/100 m^3 with a minimum of 3 samples	Heavy Metals TRH/BTEX PAHs OCPs/PCBs Asbestos (500 mL) TCLP Heavy Metals TCLP PAHs
Imported VENM	N/A	N/A	Minimum of 5 samples per material types/source site	Heavy Metals TRH/BTEX PAHs OCPs/PCBs Asbestos (500 mL)
Material the subject of a resource recovery exemption	N/A	N/A	As per exemption requirements, plus minimum of 5 samples per material type/source site	Heavy Metals TRH/BTEX PAHs Asbestos (500 mL) In addition to suite as required by exemption
Tankpit/Excavation Water	N/A	N/A	One per excavation/ pump out event, minimum of 1/10 000L	Heavy metals, TRH/BTEX low level PAHs EC and pH

7.3 Soil Validation Methodology

The soil sampling method shall be determined by the Remedial Consultant as consistent with the observations of the site sub-surface and appropriate to generate representative samples. It is anticipated the sampling methods may include:

- test pits/grab samples using an excavator/backhoe bucket for in-situ material characterisation and validation of deep excavations (including the former tank pits, etc);
- Boreholes completed by hand or using rig mounted drilling equipment; and
- Stockpile sampling using a shovel, trowel, hand auger, excavator/backhoe bucket or similar.

The soil sampling method shall be consistent with the data quality indicators in **Section 7.2.6** with due consideration to the general requirements for sampling as outlined in NEPC (2013).

In all instances, care will be taken to minimise the disturbance of material prior to and during sampling such that volatile contaminant lost may be minimised during sampling activities.

Re-useable sampling equipment will be thoroughly decontaminated during sampling activities using phosphate free detergent and distilled water between each sampling location. Field instruments including PIDs will be calibrated on a daily basis during use with the results recorded on daily field forms.

7.3.1 Soil Sample Containers

During the collection of soil samples, features such as seepage, discolouration, staining, odours and other indications of contamination shall be noted on field reporting sheets/field logs.

Collected soil samples shall be immediately transferred to sample containers of appropriate composition (glass jars for chemical analysis fitted with Teflon sealed lids). Where asbestos analysis is required, 500 mL samples (as per WA DOH 2009/NEPC 2013) shall be additionally collected and placed in new zip lock bags. Sample labels shall record sample identification number and date and time of sampling. Sample containers shall be transferred to a chilled ice box for sample preservation prior to and during shipment to the testing laboratory.

A chain-of-custody form shall be completed and forwarded with the samples to the testing laboratory, containing the following information:

- Sample identification;
- Signature of sampler;
- Date of collection;
- Type of sample;
- Number and type of container;
- Inclusive dates of possession; and
- Signature of receiver.

7.3.2 Field PID Screening

Soil validation/characterisation samples will be screened on site during works using a PID to assess the presence of VOCs including petroleum hydrocarbons. Samples obtained for PID screening will be placed in a sealed plastic bag for a period of approximately 5 minutes to equilibrate prior to a PID being attached to the bag. Readings will then be monitored for a period of approximately 1 minute or until values stabilised and the stabilised/highest reading was recorded. PID reading will be recorded on field notes during each sampling event. The PID calibration will be checked prior to each sampling event and the outcome documented in field notes.

7.3.3 Field XRF Screening

Soil validation/characterisation samples will be screened on site during works using an XRF to assess the presence of arsenic. XRF readings will be recorded on field notes during the sampling event. The XRF calibration will be checked prior to each sampling event and the outcome documented in field notes.

7.4 Laboratory Analysis

NATA accredited laboratories shall be used for all analysis of samples. Appropriate methods and limits of reporting (LORs) are required for comparison to relevant criteria. Laboratory methods and LORs are presented in **Table 7.4** below.

Table 7.4: Soil Laboratory Analysis Methods (all units in mg/kg unless stated)

Analyte	Limit of Reporting	Laboratory Method
Metals		
Arsenic	4.0	ICP-AES (USEPA 200.7)
Cadmium	1.0	ICP-AES (USEPA 200.7)
Chromium (total)	1.0	ICP-AES (USEPA 200.7)
Chromium (VI)	1.0	Alkali leach colorimetric (APHA3500-Cr/USEAP3060A)
Copper	1.0	ICP-AES (USEPA 200.7)
Lead	1.0	ICP-AES (USEPA 200.7)
Nickel	1.0	ICP-AES (USEPA 200.7)
Zinc	1.0	ICP-AES (USEPA 200.7)
Mercury (inorganic)	0.1	Cold Vapour ASS (USEPA 7471A)
TRH		
$C_6 – C_9$ Fraction	25	Purge Trap-GCMS (USEPA8260)
$C_{10} – C_{36}$ Fraction	250	Purge Trap-GCFID (USEPA8000)
BTEX		
Benzene	1.0	Purge Trap-GCMS (USEPA8260)
Toluene	1.0	Purge Trap-GCMS (USEPA8260)
Ethylbenzene	1.0	Purge Trap-GCMS (USEPA8260)
Total Xylenes	3.0	Purge Trap-GCMS (USEPA8260)
PAHs		
Benzo(a)pyrene	0.05	GCMS (USEPA8270)
Total PAHs	1.55	GCMS (USEPA8270)
PCBs		
PCBs (total)	0.7	GCECD (USEPA8140,8080)
OCPs		
Aldrin + Dieldrin	0.2	GCECD (USEPA8140,8080)
Chlordane	0.1	GCECD (USEPA8140,8080)
DDT + DDD + DDE	0.3	GCECD (USEPA8140,8080)
Endosulfan	0.3	GCECD (USEPA8140,8080)
Endrin	0.1	GCECD (USEPA8140,8080)
Methoxychlor	0.1	GCECD (USEPA8140,8080)
Heptachlor	0.1	GCECD (USEPA8140,8080)
Other		
Asbestos	Presence/ 0.1 g/kg	PLM / Dispersion Staining as per AS4964:2004
Soil pH	0.1	5:1 leach

7.5 Soil Validation Criteria

7.5.1 Site Characterisation Criteria

Based on the proposed land uses, and in accordance with the decision process for assessment of urban redevelopment sites (EPA, 2018), concentrations of contaminants in remediation areas (principally suspect USTs and arsenic impacted areas) shall be compared initially for the purposes of validation against adopted investigation/screening level criteria as presented in sourced from NEPC (2013). While decisions with respect to criteria have been developed conservatively with regards to

the proposed end uses, interpretation of the data will be undertaken in the context of the proposed capping of the site and implementation of an EMP (see **Section 5**).

Specifically, assessment criteria will be derived from published criteria as presented in NEPC (2013) prior to the commencement of remediation works based on final land use/earthworks plans as appropriate for each contaminant based on:

- Table 1A(1) Health Investigation Levels for Soil Contaminants; and
- Table 1A(3) Soil Health Screening Levels for Vapour Intrusion;
- Ecological Screening Levels (ESLs) from Table 1B(6) ESLs for TPH Fractions F1-F4, BTEX and Benzo(a)pyrene in Soil under the recreation with minimal access to soils land use scenario;
- Management Limits for TPH Fractions F1-F4 in Soil under the recreation with minimal access to soils land use scenario from table 1B(7);
- Soil Quality Guidelines (site specific ecological investigation levels) for Urban Residential/Public Open Space land uses – Schedule B5C, NEPC (2013); and
- Definition of asbestos contaminated soil as provided to SWA 2016/NSW WorkCover 2016.

Given the adopted criteria will in some instances be dependent upon soil texture and depth below final ground level, final site criteria will only be defined at the time of data evaluation. For reference, relevant NEPC (2013) tables have been reproduced in **Appendix C**.

Where consideration of the potential ecological risk is required for validation of growing media from soils other than VENM or ENM, representative soil samples will be the subject of total organic carbon (TOC %), CEC and soil pH analysis to support the development of the assessment criteria, or where appropriate published background levels may be used. Representative samples are likely to comprise both natural soils of various types and the proposed materials to be used as growing media.

Where multiple soil validation criteria can be derived based on the above, as for example in the case for F4 TRH, the lowest of the possible applicable values will be adopted as the assessment criteria. Where sufficient data sets are available, statistical criteria as nominated following will apply:

- all contaminant concentrations were less than the adopted site assessment criteria,

Or:

- The upper 95% confidence limit on the average concentration for each analyte (calculated for samples collected from consistent soil horizons, stratigraphy or material types) was below the adopted criterion;
- No single analyte concentration exceeded 250% of the adopted criterion; and
- The standard deviation of the results was less than 50% of the criterion.

In addition to the numerical criteria, the following observations will also supplement the validation process:

- There shall be no visible asbestos in addition to laboratory analyses results; and
- Soils shall not emit recognisable odours, be discoloured as a result of contamination and/or have any significant additional aesthetic concerns with respect to future site users.

7.5.2 Material Importation

In accordance with current EPA policy, only material that does not represent an environmental or health risk at the receiving site may be considered for resource recovery. Imported materials will

only be accepted to the site if they meet the restrictions placed on these materials and meet the definition of one or more of the following:

- Virgin Excavated Natural Material (VENM) as defined in the *Protection of the Environment Operations Act* (1997) Schedule 1;
- Excavated Natural Material (ENM) as defined in EPA (2014b); or
- Recycled materials as per an EPA exemption.

All material imported onto the site is required to be accompanied by appropriate documentation that has been verified by the appointed Remediation Consultant.

For recycled materials, sampling of materials as per an EPA exemption is required to be undertaken by the facility in accordance with the exemption. In addition, where materials are proposed to be imported to the site under a NSW EPA exemption the material will need to be further assessed by Remediation Consultant for land use suitability in accordance with the validation requirements nominated in **Section 7.2.7**.

7.5.3 Material Characterisation for Off-site Disposal

Materials shall be classified in accordance with EPA (2014a) *Waste Classification Guidelines* or an appropriate exemption as created under the *Protection of the Environment Operations (Waste) Regulation 2014*.

Material will require to be removed to a facility lawfully able to receive it.

7.6 Reporting

7.6.1 Validation Assessment Report

At the completion of remediation works, a validation report will be prepared in general accordance with EPA (2017) and OEH (2011) *Guidelines for Consultants Reporting on Contaminated Site*, documenting the works as completed.

This report will contain information including:

- Details of the remediation works conducted;
- Update relevant portions of the site description and CSM as relevant to the validation assessment footprint;
- Present all sampling field notes and laboratory data including calibration certificates for field monitoring equipment, environmental monitoring etc.;
- Undertake an assessment of QA/QC for analytical data generated by the works and identify data that is reliable for use in characterising site;
- Sort data into data sets as required by the decision rules;
- Assess whether sufficient data has been obtained to meet required limits on decision error;
- Undertake assessment to the decision rules and identify any environmental data which causes decision rules to be failed;
- Provide a summary of waste disposal activities and volumes of waste removed from the site including supply of all waste disposal dockets confirming final waste disposal/landfill destination;
- Provide a summary of material importation activities (general fill soil/crushed rock, growing media, earthworks aggregates, drainage backfill etc), including material source, type, assessment of suitability, approximate quantities, date of importation and final placement location;

- Document any variations to the strategy undertaken during the implementation of the remedial works;
- Results of all environmental monitoring undertaken during the course of the remedial works;
- Details of any environmental incidents occurring during the course of the remedial works and the actions undertaken in response to these incidents;
- Identify the requirements for the long term EMP (where appropriate) including inclusion of a survey clearly identifying the extent of the retained impacted material and associated capping;
- Provide a clear statement on the suitability of the site (or portions thereof) for the proposed use and requirements for any ongoing monitoring/management (where applicable).

The report will serve to document the remediation works for future reference.

7.6.2 Long Term Environmental Management Plan

In addition to the requirements of the validation plan, the proposed remediation strategy for the site will more than likely result in passive long term management requirements at the completion of the final development works.

To this end a long term EMP will be prepared to detail the ongoing management and monitoring requirements applicable to the site. The precise nature and extent of the management requirements will not be known until remediation/management works are conducted and the validation data obtained. It is anticipated that the long term EMP will be prepared for the relevant portions of the site following the completion of the validation report(s) such that the requirements may be reviewed and endorsed by the appointed Site Auditor in preparation of the Part A SAS (may potentially be a Part C SAS if the new Site Auditor guidelines are endorsed prior to/during remedial/development works).

The long term EMP(s) are required to document the following elements:

- A statement of the objectives of the long term EMP – i.e., to ensure continued suitability of the site following remediation.
- Identification of residual environmental contamination issues at the site that require ongoing management/monitoring to meet the long term EMP objectives, including the type of contamination and location within the site (including a survey plan prepared by a registered surveyor).
- Documentation of environmental management measures which have been implemented to address the identified environmental issues at the site.
- Description of management controls to limit the exposure of site users to known impacted material to acceptable levels.
- Description of responsibilities for implementing various elements of the provisions contained in the long-term EMP.
- Timeframes for implementing the various control/monitoring, etc. elements outlined in the long-term EMP.
- Environmental monitoring and reporting requirements (if required) for the future management of environmental impact underlying the site including:
    - Appropriate monitoring locations and depth within and down-gradient of any residual contamination;

- Relevant assessment criteria to be used in evaluating monitoring results;
- Frequency of monitoring and reporting;
- Process for reviewing monitoring data and how decisions will be made regarding the ongoing management strategy;
- The length of time for which monitoring is expected to continue;
- The regulatory authorities involved and the management inputs required from each;
- The integration of environmental management and monitoring measures for soil;
- Health and safety requirements for particular activities;
- A program of review and audits;
- The provisions in the long term EMP are feasible (i.e., able to be implemented) and able to be legally enforceable (i.e., a mechanism exists, such as development consent conditions, Section 88b instruments, etc to give the plan a basis in law); and
- The relevant consent authority (where appropriate) is satisfied that the inclusion of a development consent condition relating to the implementation of the long term EMP is acceptable.

- Corrective action procedures to be implemented where long term EMP assessment criteria are breached.

8. Site Management Plan

Prior to the commencement of site works, it is anticipated that the appointed Principal Contractor will be responsible for the preparation of a site works Construction Environmental Management Plan (CEMP) to document the required management and monitoring measures, corrective actions and reporting requirements.

In addition to the following issues identified below, consideration would also need to be given to any additional requirements as may be defined by a development consent/Review of Environmental Factors (REF) process, in addition to the controls nominated in:

- City of Sydney Contaminated Land Development Control Plan 2004. City of Sydney Council, June 2004.

8.1 Hours of Operation

All remediation works shall be conducted within the standard City of Sydney hours of construction and work, or as otherwise designated in the REF documentation.

8.2 Erosion and Sediment Control Policy

All works shall be conducted in general accordance with site specific soil and surface water management plan to be prepared prior to the commencement of works in general accordance with the *Soils and Construction Managing Urban Stormwater* (Landcom 2004) publication.

All installed erosion and sediment controls must be maintained in a functions conditions throughout the remediation works.

To prevent the migration of contaminated soil off-site, silt fences are required to be constructed at the down-gradient site boundaries. Any material which is collected behind the sediment control structures shall be removed offsite with the contaminated soil.

In the event of a significant storm/rainfall event, the sediment, surface water control measures shall be monitored and replaced and/or altered as necessary. Collected material shall be managed in accordance with the requirements of impacted material as discussed in the RAP.

8.3 Stockpile Management

All materials stockpiled onsite will be managed by the Contractor. Unique numbers should be provided for each stockpile, the source of the stockpile, its estimated volume, material characterisation and its location onsite should also be recorded in a site register.

The following procedures will be implemented by the Contractor:

- No stockpiles of soil or other materials shall be placed on footpaths or road reserves unless prior Council approval has been obtained;
- All stockpiles of soil or other materials shall be placed away from drainage lines, gutters or stormwater pits or inlets;
- All stockpiles of soil or other materials likely to generate dust or odours shall be covered (where practical); and
- All stockpiles of chemically contaminated soil shall be stored in a secure area and be covered if remaining more than 24 hours (where practical).

8.4 Site Access

During remediation works, site perimeter fencing must be maintained to restrict access to the site to only authorised and appropriated inducted persons.

The Remediation Contractor will be required to arrange appropriate traffic management plans to be implemented prior to commencement of site works.

All vehicle access to the site shall be stabilised to prevent the tracking of sediment onto the roads and footpaths. All materials must be removed from the roadway on a daily or as required basis.

8.5 Excavation Pump-out

Given the depth to groundwater at the site (between 3.3 to 6.7 m bgs), unless a significant rainfall event occurs during excavation, it is considered unlikely that excavation pump-out may be required.

However, if necessary the following is required:

Prior to the commencement of pump out, a sample of the excavation water should be assessed for potential petroleum impacts. Where the groundwater/seepage is identified either visually or via lab analysis as being impacted by hydrocarbons, the pump out will be required to be disposed of off-site as 'liquid waste'. Should the water not appear to be impacted with hydrocarbons, laboratory analysis of a sample for TRH/BTEX, total suspended solids (TSS), turbidity, heavy metals and pH would be required to demonstrate the water is of a suitable standard for discharge to the council stormwater system.

Based on the available information, it has been assumed that only a small volume of water will be required to be pumped from the excavation during remediation works. Therefore, it is not considered likely that a temporary dewatering licence would be required. However, should significant dewatering activities be required (in the order of days to weeks or more), consideration of regulatory thresholds in relation to a temporary dewatering licence is required. Such a licence would require the preparation of a Dewatering Management Plan (DMP) and associated application to the Department of Primary Industries, Office of Water.

8.6 Noise and Vibration

Remediation work shall not give rise to 'offensive noise' as defined in the *Protection of the Environment Operations* (POEO) Act 1997and its *Noise Control Regulations 2000*. All plant and site operations shall comply with the NSW EPA's *Environmental Noise Control Manual* for the control of noise from construction sites.

Noise and vibrations generated should be managed so as not to adversely impact the amenity or residents/business adjoining or nearby the site.

All machinery and equipment used on site should be in good working order and fitted with appropriate silencers when necessary.

8.7 Air Quality (Dust)

During site remediation works, including disturbance of fill and petroleum impacted soils, dust levels should be monitored and minimised by using water/mist sprays as necessary. Consideration may also be given to the application of temporary covers over exposed soils (either geofabric, a surface dust suppressant application or similar measures) in the event of high wind conditions, or site closure events (weekends, etc).

Dust shall also be controlled by ensuring vehicles leave via the designated (stabilised) site access point.

8.8 Transport of Material Offsite

Trucks should be loaded in designated areas. The Contractor shall ensure that there is no material tracked out onto the street and that the load is securely covered. In addition, all site vehicles must leave the site in a forward direction.

The Contractor shall also log truck movements and approximate volume, via registration number and consignment number (where applicable), into and out of the site. Truck load details should be included as part of the Validation Report.

All appropriate road rules shall be observed, and state roads will be selected as far as practicable over local roads when deciding on the transport route to the off-site material disposal location.

8.9 Odours

Should odours associated with impacted soils be detectable at the site boundary, appropriate actions will be required to reduce the odours, possible including the amount of covering of the excavation/stockpiled material, application of water/mist sprays with odour suppressants, etc.

Records of odour emission observations and any associated actions shall be kept within the site diary.

8.10 Hazardous Materials

Hazardous and/or intractable wastes arising from the remediation work shall be removed and disposed of in accordance with the requirements of NSW EPA, SafeWork NSW and the relevant regulations by the Contractor.

In particular, any hazardous wastes should be transported by a NSW EPA licensed transporter.

8.11 Disposal of Contaminated Soil

All soils should be classified, managed and disposed in accordance with the *Waste Classification Guidelines* (EPA 2014). Documentary evidence for all waste disposal, including the fuel infrastructure, shall be kept for inclusion in the Validation Report.

Additional requirements for offsite disposal of soils are presented in **Section 7**.

8.12 Imported Fill

Any materials imported on site by the Contractor to re-establish ground levels following remedial excavations must be validated, environmentally suitable material, consistent with the definition of VENM.

8.13 Site Signage and Contact Numbers

A sign/s shall be displayed adjacent to the site access point/s throughout the duration of the works with the contact details of the Contractor and project manager as provided and maintained by the Contractor.

8.14 Site Security

The remedial areas shall be secured against unauthorised access by means of an appropriate fence or barricade or other means by the Contractor. All persons working in asbestos remedial areas must be inducted, have undertaken required training and don appropriate PPE. The access gates to the site should be locked at all times when remedial works are not occurring.

8.15 Community Consultation

Owners and/or occupants of adjacent premises and across the road from the site should be notified at least seven days prior to the commencement of preparation for the remediation works. As a minimum, the notification shall include the details of an appropriate contact person.

8.16 Health and Safety Management

A Work Health & Safety Management Plan (WHSP) shall be prepared by the Contractor prior to commencement of remediation works on the site. The Plan shall contain procedures and requirements that are to be implemented as a minimum during the works.

The objectives of the WHSP are:

- Ensure all regulatory requirements for the proposed works are satisfied;
- To apply standard procedures that minimises risks resulting from the works;
- To ensure all employees are provided with appropriate training, equipment and support to consistently perform their duties in a safe manner; and
- To have procedures to protect other site workers and the general public.

These objectives will be achieved by:

- Assignment of responsibilities;
- An evaluation of hazards;
- Establishment of personal protection standards, mandatory safety practices and procedures;
- Monitoring of potential hazards and implementation of corrective measures; and
- Provision for contingencies that may arise while operations are being conducted at the site.

8.16.1 Additional Site-Specific Elements/Procedures

In addition to the normal construction-related matters, the WHSP shall address the following site-specific specific hazards associated with the works relating to the management of contaminated soil and groundwater:

- Under/aboveground services, specifically former petroleum infrastructure;
- Use of plant and machinery within confined spaces (i.e. excavations);
- Contact to asbestos contaminated soils;
- Contact with contaminated soil (heavy metals, TRH and PAHs), and potentially groundwater and vapours, including requirements for specific Personal Protective Equipment (PPE); and
- Heat/cold stress.

8.16.2 Additional Consideration of Chemical Contaminants

As a precautionary measure, the WHSP should include the requirement for the plan to be revised in the event of an unexpected find of contaminated material during remediation and/or construction.

When working with contaminated materials in general, care needs to be taken to ensure that the contamination is not introduced to the worker via ingestion, inhalation or absorption. The WHSP must detail the PPE and decontamination requirements to be followed to control the risks posed by potential exposure to chemical contaminants at the site.

9. Regulatory Approvals/Licensing

9.1 Environmental Planning and Assessment Act 1979 and State Environment Planning Policy Number 55 (SEPP55) Remediation of Land

The proposed remediation works are considered to be classified as 'Category 2' Remediation Works – i.e., not requiring consent. The notification requirements of SEPP 55 require the consent authority to be notified 30 days before 'Category 2' remediation works commence, providing the consent authority with the information needed to verify the work is not 'Category 1' by reference to the following criteria:

- The work is not designated development under schedule 3 of the *EPA&A Regulation* or under a planning instrument;
- The work proposed is not on land identified as critical habitat under the *Threatened Species Conservation Act 1995*;
- Consideration of s.5A of the *EP&A Act* indicates the remediation work is not likely to have a significant effect on threatened species, populations, ecological communities or their habitats;
- The work is not proposed in an area or zone identified in a planning instrument as being an area of environmental significance such as scenic areas or wetlands; and/or
- The work does not require consent under another SEPP or regional environmental plan.

In addition, the notification will also include relevant contact details and a proposed remediation schedule. Notice is also required to be given to the consent authority within 30 days of remediation works completion.

It is noted there may be other planning policies relevant to the subject land that requires development consent for the works.

9.2 Environmental Planning and Assessment Regulation 2000 – Schedule 3 Designated Development

The proposed remediation/validation activities are not considered to comprise designated development.

It is not anticipated that the proposed remediation works will incorporate any on-site treatment of soil. However, in the event that soil is required to be pre-treated prior to off-site disposal, an assessment of potential triggers for the works to be designated development as presented in Schedule 3 – Clause 15 will be required to be completed.

9.3 Protection of the Environment Operations Act 1997

All potential discharges from the site during remediation works will require to be maintained below applicable assessment criteria/threshold guidelines during the remediation works. This would apply to potential emissions in air, water and discharges to surface and groundwater. Levels of discharges are typically assessed at a site boundary.

The RAP prepared for the assessment area has provided a process to be followed during the remediation activities and subsequent development works to ensure that the beneficial re-use of materials does not cause pollution of groundwater and/or waters by reference to any applicable criteria as may be used to assess pollution under the POEO Act (including s120).

The proposed remediation/validation activities are not required to be licensed under *the Protection of the Environment Operation Act (1997)* since the works do not involve:

- Treat otherwise than by incineration and store more than 30 000 cubic metres of contaminated soil originating exclusively from the site, or
- Disturb more than an aggregate area of 3 hectares of contaminated soil originating exclusively from the site.

9.4 Waste Classification Guidelines (EPA 2014)

All wastes generated and proposed to be disposed offsite shall be assessed, classified and managed in accordance with this guideline. Where wastes require immobilisation prior to offsite disposal (to reduce waste classifications) an immobilisation approval shall be sought in accordance with Part 2 of this guideline. Immobilisations are only anticipated to be required with unexpected finds that cannot be retained on site and cannot be disposed directly offsite to a licensed facility.

9.5 Protection of the Environment Operations (Underground Storage Systems UPSS) Regulation 2014

The removal of potential USTs and associated infrastructure will be undertaken in accordance with WorkSafe NSW requirements and a validation report should be provided in accordance with the provisions of the *Protection of the Environment Operations (UPSS) Regulation 2014* as per guidance provided in DECCW (2009). The removal of underground petroleum storage infrastructure should be undertaken in accordance with *The Removal and Disposal of Underground Petroleum Storage Tanks – Australian Standard 4976-2008*.

The validation process detailed in this RAP and the unexpected finds protocol meets the requirements of the regulation.

9.6 City of Sydney (2004) 'Contaminated Land Development Control Plan'

The Council development control plan (DCP) provides a number of environmental and site management provisions required to be employed during remediation works.

9.7 Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997

It is not expected that implementation of the works presented in this RAP would result in a 'Duty to Report' as defined in the guidelines. Consistent with the scope of works, no works will be permitted within the validation footprint that will potentially cause levels of site constituents to be present at points of exposure and/or the site boundary that will cause any NSW EPA published or endorsed criteria to be exceeded.

9.8 Work Health and Safety Act 2011 No 10 and Work Health and Safety Regulation 2011

The information and data provided in this RAP should be considered by the Principal/Remediation Contractor in preparation of their health and safety plans for the remedial works.

10. Conclusions

Overall, it is considered that the proposed actions outlined in this RAP conform to the requirements of the *Contaminated Land Management Guidelines for the NSW Site Auditor Scheme (3rd Edition)* (EPA 2018) because they are: technically feasible; environmentally justifiable; and consistent with relevant laws policies and guidelines endorsed by NSW EPA.

Subject to the successful implementation of the measures described in this RAP and with consideration to the Limitations presented in Section 11, it is considered that the site can be made suitable for the intended uses and that the risks posed by contamination can be managed in such a way as to be adequately protective of human health and the environment.

11. Limitations

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the client and other parties.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by JBS&G, and should not be relied upon by other parties, who should make their own enquires.

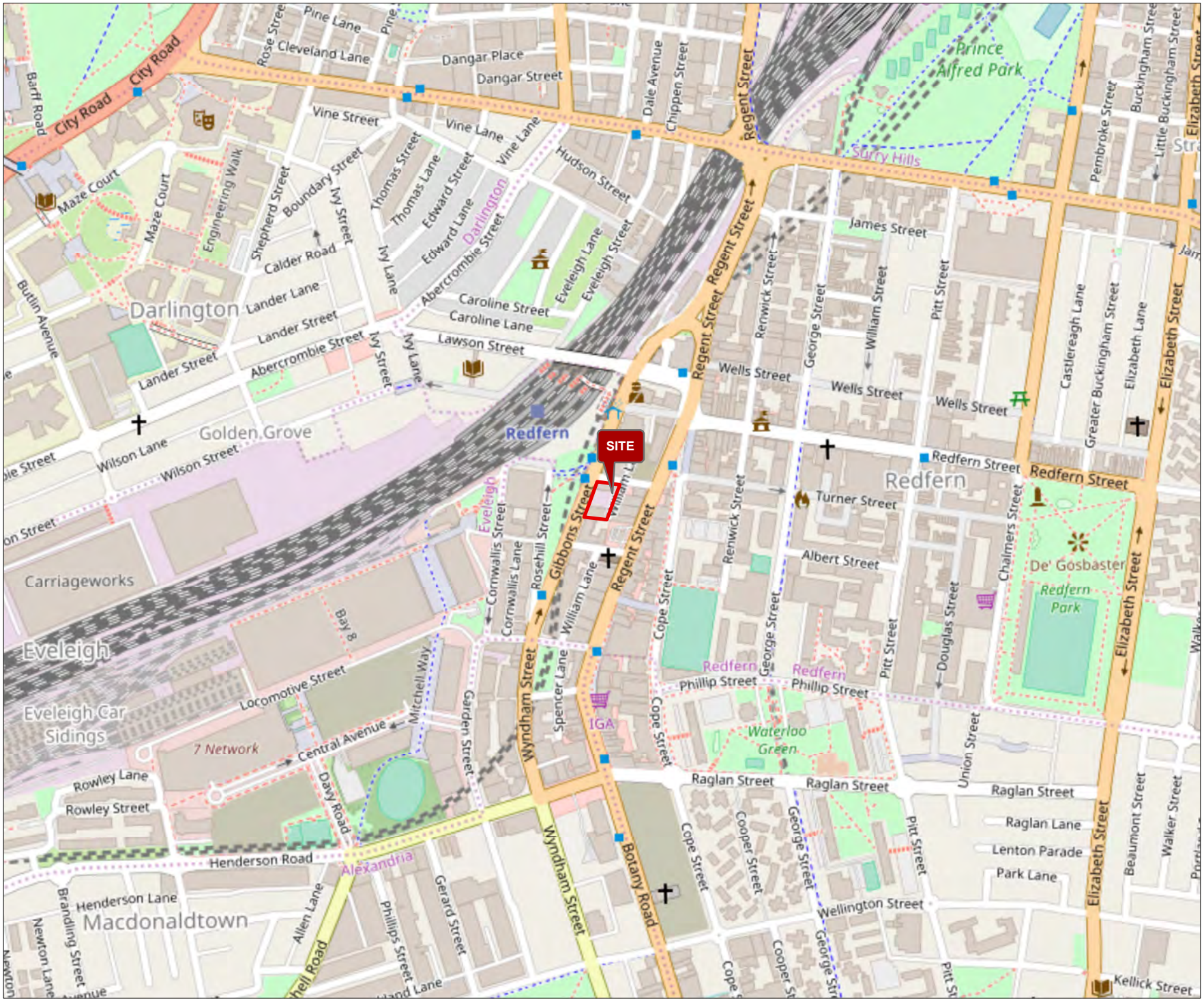
Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements.

Limited sampling and laboratory analyses were undertaken as part of the investigations undertaken, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

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 information become available regarding conditions at the site including previously unknown sources of contamination, JBS&G reserves the right to review the report in the context of the additional information.

Figures



Legend:

Approximate Site Location

JBS&G

Job No: 54877

Client: St George Housing

Version: R02 Rev A	Date: 23-Jul-2018
Drawn By: AV	Checked By: EH

Scale 1:7,000

0 80 160

metres

Coor. Sys. GDA 1994 MGA Zone 56

9-11 Gibbons Street
Redfern, NSW

SITE LOCATION

FIGURE 1

File Name: 54877_01

Legend:

- Approximate Site Location
- City of Sydney Council Depot Area
- Tenanted Workshop Area
- Potential UST (CES 2018)

JBS&G

Job No: 54877

Client: St George Housing

Version: R02 Rev A	Date: 24-Jul-2018
Drawn By: AV	Checked By: EH

Scale 1:500

0 6 12

metres

Coor. Sys. GDA 1994 MGA Zone 56

9-11 Gibbons Street
Redfern, NSW

SITE LAYOUT

FIGURE 2

File Name: 54877_02
Reference: www.nearmap.com - Imagery 20180411

Legend:

- Approximate Site Location
- City of Sydney Council Depot Area
- Tenanted Workshop Area
- Potential UST (CES 2018)

CES Sample Locations

- Borehole Location (CES 2018)
- Borehole/Groundwater Well Location (CES 2018)

JBS&G Sample Locations

- Borehole Location
- Borehole/ Groundwater Monitoring Well
- Soil Vapour Location

JBS&G

Job No: 54877

Client: St George Housing

Version: R02 Rev A	Date: 24-Jul-2018
Drawn By: AV	Checked By: SG

Scale 1:400

0 5 10
metres

Coor. Sys. GDA 1994 MGA Zone 56

9-11 Gibbons Street
Redfern, NSW

SITE INVESTIGATION
SAMPLING LOCATIONS

FIGURE 3

File Name: 54877_03
Reference: www.nearmap.com - Imagery 20180411

Legend:

- Approximate Site Location
- City of Sydney Council Depot Area
- Tenanted Workshop Area

CES Sample Locations

- Borehole Location (CES 2018)
- Borehole/Groundwater Well Location (CES 2018)

JBS&G Sample Locations

- Borehole Location
- Borehole/ Groundwater Monitoring Well
- Soil Vapour Location

Approximate Remedial Extents

- BH11

UST Investigation Areas

- Potential Location of UST (Greencap 2018)
- Potential UST (CES 2018)

JBS&G

Job No: 54877

Client: St George Housing

Version: R02 Rev A	Date: 24-Jul-2018
Drawn By: AV	Checked By: EH

Scale 1:500

0 6 12

metres

Coor. Sys. GDA 1994 MGA Zone 56

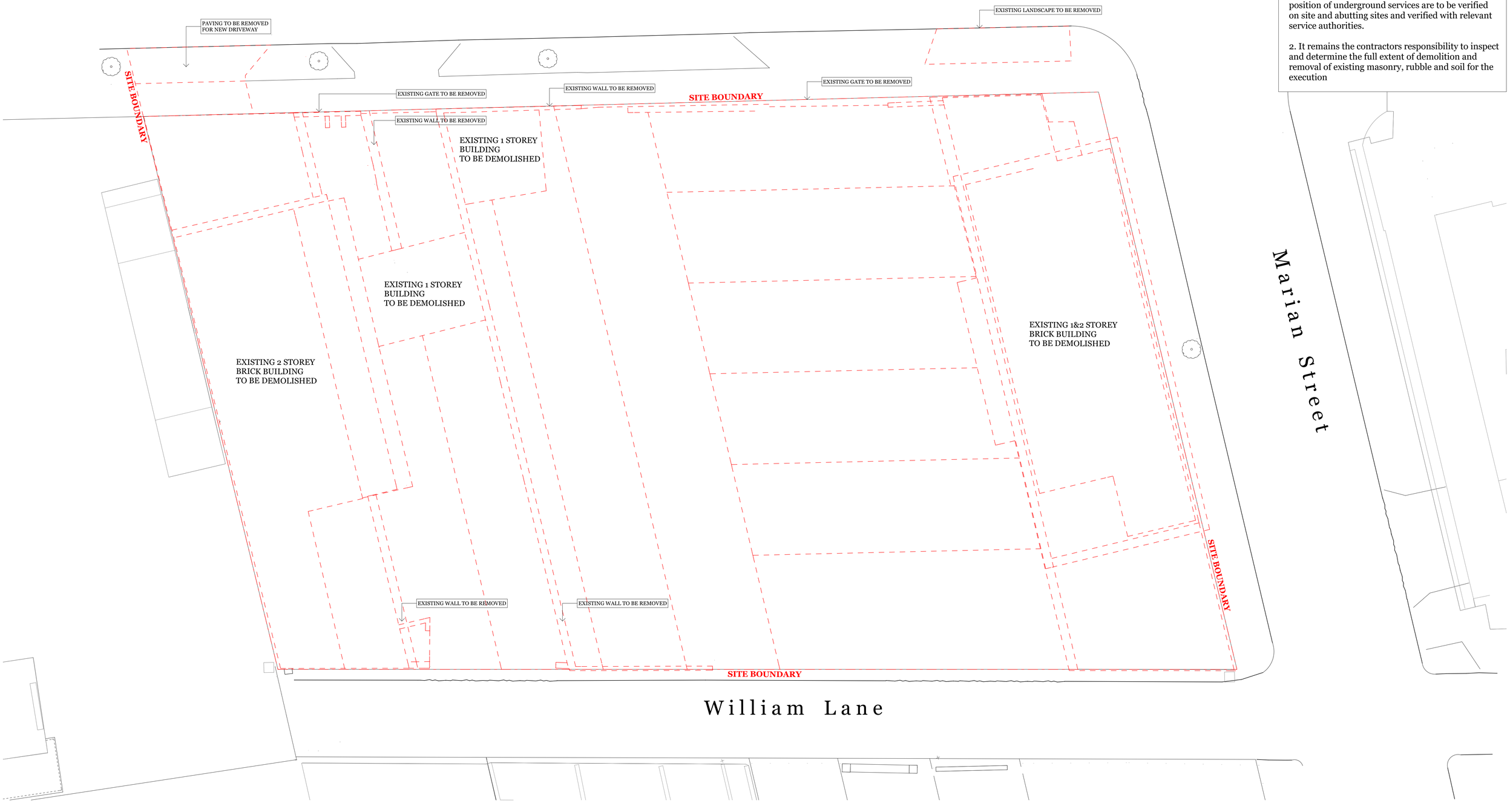
9-11 Gibbons Street
Redfern, NSW

APPROXIMATE REMEDIAL EXTENT AND INVESTIGATION AREAS FOR POTENTIAL USTS

FIGURE 4

File Name: 54877_04
Reference: www.nearmap.com - Imagery 20180411

Appendix A Development Plans



Legend

Proposed areas of excavation and site clearing

Demolish and Remove from site:
All wall, floor, roof structures, footings, redundant pipework below natural ground level and vegetation

Demolition Notes:
1. Reference is to be made to service authority plans prior to commencement of demolition works. The position of underground services are to be verified on site and abutting sites and verified with relevant service authorities.

2. It remains the contractors responsibility to inspect and determine the full extent of demolition and removal of existing masonry, rubble and soil for the execution

Consultants

Access - Morris Goding
David Goding
david@mgac.com.au
0407 246 115

Acoustic - Renzo Tonin
Tony Wong
tony.wong@renzotonin.com.au
8218 0515

Building Services - Arrow
Brian Calcutt
bcalcutt@arrowce.com.au
0416 684 260

Civil - ABC Consultants
Ryan Campbell
ryan@abc-consultants.com.au
0402 343 139

Communication - Straight Talk
Jessica Stapleton
jessica@straight-talk.com.au
0433 522 069

ESD - Northrop
Amir Girgis
AGirgis@northrop.com.au

Fire - Core Engineering
Neil Campbell
neil@coreengineering.com.au
0410 610 928

Flood - WMA Water
Catherine Goonan
goonan@wmawater.com.au
9299 2855

Geotechnical - CES
Tristan Goodbody
8569 2200

HAZMAT - Greencap
James Stewart
james.stewart@greencap.com.au
0427 701 502

Heritage - Artefact
Sandra Wallace
Sandra.Wallace@artefact.net.au
0403 565 086

Landscape - In View
Isabel Lester
Isabel@inviewdesign.com.au
0416 110 058

Surveyor - Norton Survey
Andrew Whitfield
awhitfield@nspartners.com.au
0418 255 072

Planner - Keylan
Michael Woodland
michael@keylan.com.au
0448 726 214

QS - WT Partnership
Paul Elphick
pelphick@wtpartnership.com.au
0407 243 711

Site Contamination - JBS&G
Daniel Denaro
DDenaro@jbsg.com.au
0468 425 921

Traffic - TTM
Callum Hutcheson
CHutcheson@ttmgroup.com.au
0402 095 256

Waste - TTM
Arthur Stamatiou
astamatiou@ttmgroup.com.au
(07) 3327 9500

Wind - Windtech
Simon Ronald
simon@windtechglobal.com
9503 0308

St George Community Housing

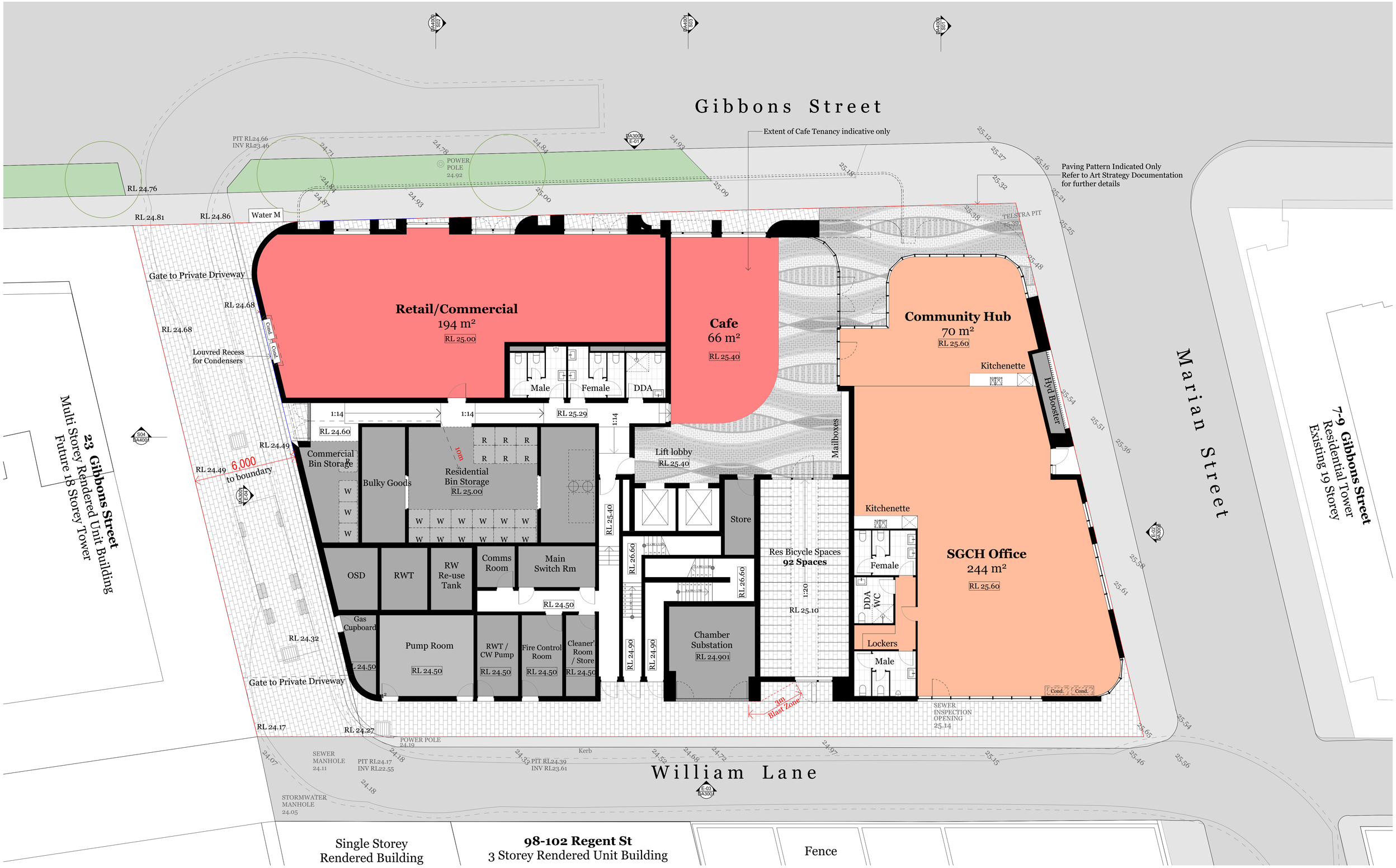
Rev.	Date	By	Ckd	Description
P1	07/09/18	RY	KL	Plans for Review
P2	18/09/18	RY	SO	Arch Set for Review
A	27/09/18	RY	SO	Arch Set for DA Submission

DKO Architecture (NSW) Pty Ltd
119 Redfern Street
Redfern, NSW 2016
T +61 2 8346 4500
info@DKO.com.au
www.DKO.com.au
ABN: 81956706590

DKO

Project Name	11 Gibbons street
Project Address	11 Gibbons Street, Redfern, NSW 2016
Client	SGCH
Project Number	11929
Drawing Name	Demolition Plan
Scale	1:100@A1
Date	September 2018
Drawing Number	DA1007
Revision	A

Issue for Approval



Consultants

Access - Morris Goding
David Goding
david@mgac.com.au
0407 246 115

Acoustic - Renzo Tonin
Tony Wong
tony.wong@renzotonin.com.au
8218 0515

Building Services - Arrowe
Brian Calcutt
bcalcutt@arrowee.com.au
0416 084 260

Civil - ABC Consultants
Ryan Campbell
ryan@abc-consultants.com.au
0402 343 139

Communication - Straight Talk
Jessica Stapleton
jessica@straight-talk.com.au
0433 522 069

ESD - Northrop
Amir Girgis
AGirgis@northrop.com.au

Fire - Core Engineering
Neil Campbell
neil@coreengineering.com.au
0410 610 928

Flood - WMA Water
Catherine Goonan
goonan@wmawater.com.au
9299 2855

Geotechnical - CES
Tristan Goodbody
8569 2200

HAZMAT - Greencap
James Stewart
james.stewart@greencap.com.au
0427 701 502

Heritage - Artefact
Sandra Wallace
Sandra.Wallace@artefact.net.au
0403 565 086

Landscape - In View
Isabel Lester
Isabel@inviewdesign.com.au
0416 110 058

Surveyor - Norton Survey
Andrew Whitfield
awhitfield@nspartners.com.au
0418 255 072

Planner - Keylan
Michael Woodland
michael@keylan.com.au
0448 726 214

QS - WT Partnership
Paul Elphick
pelphick@wtpartnership.com.au
0407 243 711

Site Contamination - JBS&G
Daniel Denaro
DDenaro@jbsg.com.au
0468 425 921

Traffic - TTM
Callum Hutcheson
CHutcheson@ttmgroup.com.au
0402 095 356

Waste - TTM
Arthur Stamatiou
astamatiou@ttmgroup.com.au
(07) 3327 9500

Wind - Windtech
Simon Ronald
simon@windtechglobal.com
9593 0308

SGCH
St George Community Housing

Rev.	Date	By	Ckd	Description
P1	07/09/18	RY	KL	Plans for Review
P2	18/09/18	RY	SO	Arch Set for Review
A	27/09/18	RY	SO	Arch Set for DA Submission

DKO Architecture (NSW) Pty Ltd
119 Redfern Street
Redfern, NSW 2016
T +61 2 8346 4500
info@DKO.com.au
www.DKO.com.au
ABN: 81956706590

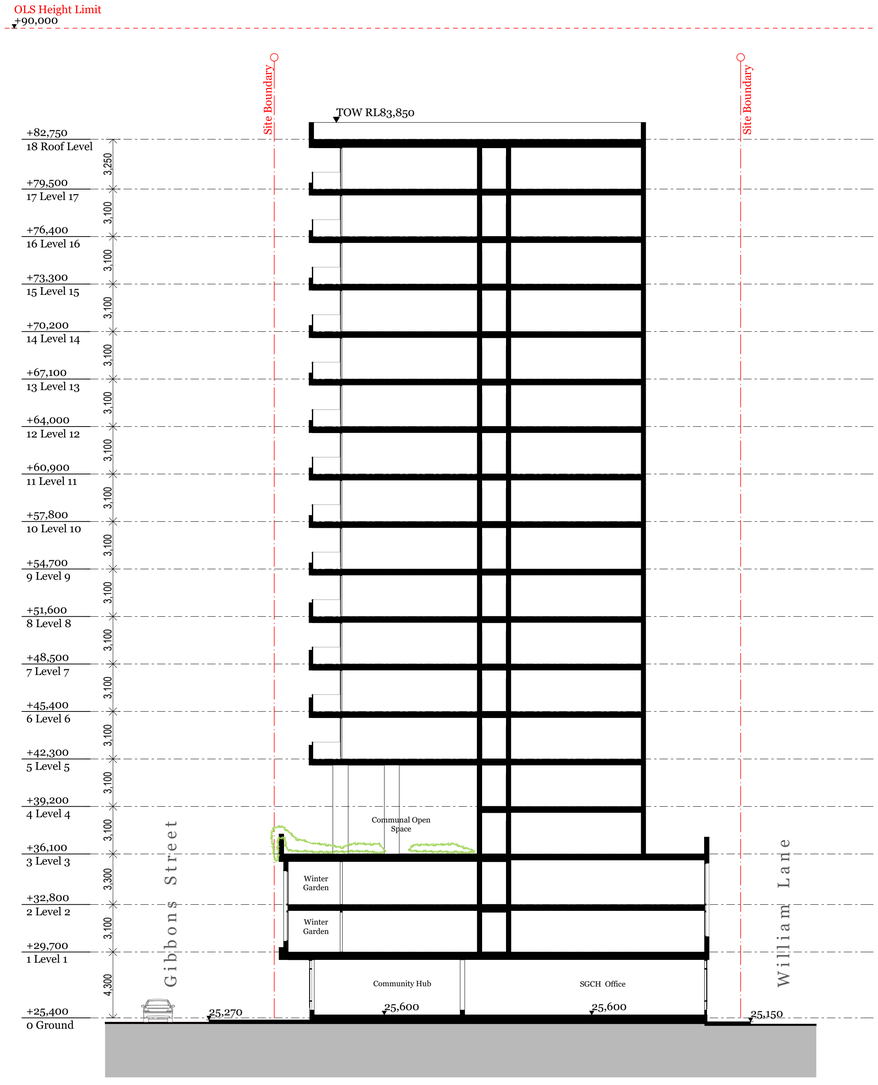
DKO

Project Name	11 Gibbons street
Project Address	11 Gibbons Street, Redfern, NSW 2016
Client	SGCH

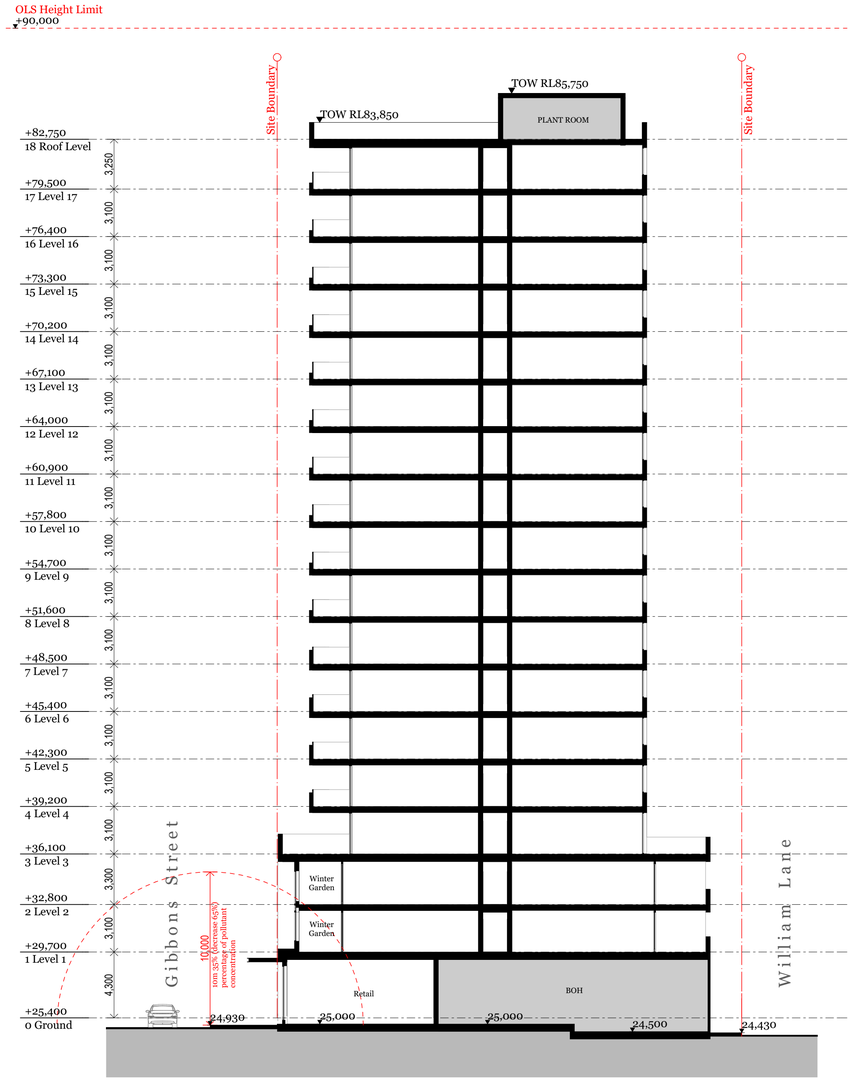
Project Number	11929
Drawing Name	Ground Level
Scale	1:100@A1
Date	September 2018

Issue for Approval

Drawing Number **DA2000**
Revision **A**



S01 Section 1 1:200



S02 Section 2 1:200

Consultants

Access - Morris Goding
David Goding
david@mgac.com.au
0407 246 115

Acoustic - Renzo Tonin
Tony Wong
tony.wong@renzotonin.com.au
8218 0515

Building Services - Arrow
Brian Calcutt
bcalcutt@arrowce.com.au
0416 084 260

Civil - ABC Consultants
Ryan Campbell
ryan@abc-consultants.com.au
0402 343 139

Communication - Straight Talk
Jessica Stapleton
jessica@straight-talk.com.au
0433 522 069

ESD - Northrop
Amir Girgis
AGirgis@northrop.com.au

Fire - Core Engineering
Neil Campbell
neil@coreengineering.com.au
0410 610 928

Flood - WMA Water
Catherine Goonan
goonan@wmawater.com.au
9299 2855

Geotechnical - CES
Tristan Goodbody
8569 2200

HAZMAT - Greencap
James Stewart
james.stewart@greencap.com.au
0427 701 502

Heritage - Artefact
Sandra Wallace
Sandra.Wallace@artefact.net.au
0403 565 086

Landscape - In View
Isabel Lester
Isabel@inviewdesign.com.au
0416 110 058

Surveyor - Norton Survey
Andrew Whitfield
awhitfield@nspartners.com.au
0418 255 072

Planner - Keylan
Michael Woodland
michael@keylan.com.au
0448 726 214

QS - WT Partnership
Paul Elphick
pelphick@wtpartnership.com.au
0407 243 711

Site Contamination - JBS&G
Daniel Denaro
DDenaro@jbsg.com.au
0468 425 921

Traffic - TTM
Callum Hutcheson
CHutcheson@ttmgroup.com.au
0402 095 256

Waste - TTM
Arthur Stamatiou
astamatiou@ttmgroup.com.au
(07) 3327 9500

Wind - Windtech
Simon Ronald
simon@windtechglobal.com
9503 0308

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DKO Architecture (NSW) Pty Ltd
119 Redfern Street
Redfern, NSW 2016
T +61 2 8346 4500
info@DKO.com.au
www.DKO.com.au
ABN: 81956706590

DKO

Project Name	11 Gibbons street
Project Address	11 Gibbons Street, Redfern, NSW 2016
Client	SGCH

Project Number	11929
Drawing Name	Sections 1 & 2
Scale	1:200@A1
Date	September 2018

Issue for Approval

Drawing Number **DA4000**
Revision **A**

Appendix B Sample Analysis Summary Tables

Project: 9-11 Gibbons Street, Redfern
Client: St George Community Housing
CES Project Number: CES180204-SGC
Table 4: Soil Analytical Results - HIL/HSL, EIL/ESL Assessment

Parameters	Unit	PQL	EIL, Urban residential and public open space	ESL, Urban residential and public open space	Residential, Soil HIL B / HSL B	Recreational C, Soil HIL C/ HSL C	Sample Type	BH3_0.3-0.6	BH3_1.2-1.5	BH3_1.2-1.5	BH2_0.3-0.6	BH2_2.0-2.3	BH1_0.4-0.8	BH1_0.4-0.8	QAQC1_BH1_0.4-0.8	BH1_1.2-1.5	BH4_0.3-0.8	BH4_1.2-1.5	BH4_1.2-1.5	BH6_0.3-0.8	BH6_0.3-0.8
Sample ID								BH3_0.3-0.6	BH3_1.2-1.5	BH3_1.2-1.5	BH2_0.3-0.6	BH2_2.0-2.3	BH1_0.4-0.8	BH1_0.4-0.8	QAQC1_BH1_0.4-0.8	BH1_1.2-1.5	BH4_0.3-0.8	BH4_1.2-1.5	BH4_1.2-1.5	BH6_0.3-0.8	BH6_0.3-0.8
Depth (mbgl)								0.3-0.6	1.2-1.5	1.2-1.5	0.3-0.6	2.0-2.3	0.4-0.8	0.4-0.8	0.4-0.8	1.2-1.5	0.3-0.8	1.2-1.5	1.2-1.5	0.3-0.8	0.3-0.8
Date Sampled								27/02/2018	27/02/2018	27/02/2018	27/02/2018	27/02/2018	28/02/2018	28/02/2018	28/02/2018	28/02/2018	01/03/2018	01/03/2018	01/03/2018	02/03/2018	02/03/2018
Soil Unit								Fill	Natural	Natural	Fill	Natural	Fill	Fill	Fill	Natural	Fill	Natural	Natural	Fill	Fill
Laboratory report								186116	186116	186116	186116	186116	186212	186212	186212	186212	186295	186295	186295	186376	186376
TRH C6 - C9	mg/kg	25						<25	<25		<25	<25	<25		<25	<25	<25			<25	<25
TRH C6 - C10	mg/kg	25						<25	<25		<25	<25	<25		<25	<25	<25			<25	<25
FRACTION 1	mg/kg	25		180	45	NL		<25	<25		<25	<25	<25		<25	<25	<25			<25	<25
Benzene	mg/kg	0.2		50	0.5	NL		<0.2	<0.2		<0.2	<0.2	<0.2		<0.2	<0.2	<0.2			<0.2	<0.2
Toluene	mg/kg	0.5		85	160	NL		<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5			<0.5	<0.5
Ethylbenzene	mg/kg	1		70	55	NL		<1	<1		<1	<1	<1		<1	<1	<1			<1	<1
m+p-xylene	mg/kg	2			40			<2	<2		<2	<2	<2		<2	<2	<2			<2	<2
o-Xylene	mg/kg	1			40			<1	<1		<1	<1	<1		<1	<1	<1			<1	<1
Xylenes (total)	mg/kg			105	40	NL		<1	<1		<1	<1	<1		<1	<1	<1			<1	<1
Naphthalene	mg/kg	1			3	NL		<1	<1		<1	<1	<1		<1	<1	<1			85	160
Total Phenolics	mg/kg	5																			
TRH C10 - C14	mg/kg	50						<50	<50		<50	<50	<50		<50	<50	<50			150	66
TRH C15 - C28	mg/kg	100						<100	<100		280	<100	<100		<100	<100	<100			1000	390
TRH C29 - C36	mg/kg	100						<100	<100		160	<100	<100		<100	<100	<100			360	150
TRH total C10 - C36	mg/kg	50																			
TRH >C10-C16	mg/kg	50						<50	<50		<50	<50	<50		<50	<50	<50			270	110
FRACTION 2	mg/kg	50		120	110			<50	<50		<50	<50	<50		<50	<50	<50			190	<50
TRH >C16-C34	mg/kg	100						<100	<100		400	<100	<100		<100	<100	<100			1200	470
TRH >C34-C40	mg/kg	100						<100	<100		<100	<100	<100		<100	<100	<100			140	<100
Total +ve TRH (>C10-C40)	mg/kg							<50	<50		400	<50	<50		<50	<50	<50			1600	580
Naphthalene	mg/kg	0.1	170		3			<0.1	<0.1		0.3	<0.1	<0.1		<0.1	<0.1	<0.1			200	28
Acenaphthylene	mg/kg	0.1						<0.1	<0.1		2.3	<0.1	0.1		<0.1	<0.1	<0.1			58	7.9
Acenaphthene	mg/kg	0.1						<0.1	<0.1		0.2	<0.1	<0.1		<0.1	<0.1	<0.1			18	1.8
Fluorene	mg/kg	0.1						<0.1	<0.1		0.8	<0.1	<0.1		<0.1	<0.1	<0.1			94	10
Phenanthrene	mg/kg	0.1						0.1	<0.1		10	0.1	0.7		<0.1	0.2	0.5			360	45
Anthracene	mg/kg	0.1						<0.1	<0.1		2.6	<0.1	0.2		<0.1	<0.1	0.2			92	11
Fluoranthene	mg/kg	0.1						0.3	<0.1		18	0.3	1.5		0.2	0.4	0.9			250	29
Pyrene	mg/kg	0.1						0.3	<0.1		20	0.4	1.7		0.2	0.3	0.8			250	29
Benzo(a)anthracene	mg/kg	0.1						0.2	<0.1		9.7	0.2	0.8		0.1	0.2	0.4			110	12
Chrysene	mg/kg	0.1						0.1	<0.1		6.9	0.2	1		0.1	0.2	0.5			98	11
Benzo(b+k)fluoranthene	mg/kg	0.2						0.3	<0.2		11	0.3	3.6		0.4	0.6	0.7			130	15
Benzo(a)pyrene	mg/kg	0.05		33 (CRC-Care)				0.2	<0.05		7.5	0.2	1.1		0.1	0.2	0.4			98	11
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1						<0.1	<0.1		3.3	<0.1	0.8		<0.1	<0.1	0.3			37	4
Dibenzo(a,h)anthracene	mg/kg	0.1						<0.1	<0.1		1.3	<0.1	0.2		<0.1	<0.1	<0.1			12	1.1
Benzo(g,h,i)perylene	mg/kg	0.1						<0.1	<0.1		4.1	0.1	0.9		<0.1	<0.1	0.2			47	5.3
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.5						<0.5	<0.5		11	<0.5	1.8		<0.5	<0.5	0.5			140	15
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.5						<0.5	<0.5		11	<0.5	1.8		<0.5	<0.5	0.6			140	15
Benzo(a)pyrene TEQ	mg/kg	0.5			4	3		<0.5	<0.5		11	<0.5	1.8		<0.5	<0.5	0.6			140	15
Total +ve	mg/kg	-			400	300		1.4	<0.05		98	1.9	13		1.2	2	4.7			1900	220
Total PCB	mg/kg	0.1			1	1		<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	0.1			<1	<1
Arsenic	mg/kg	4	100		500	300		5	<4		7	<4	41	33	7	9	52			6	4
Cadmium	mg/kg	0.4			150	90		<0.4	<0.4		<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.5			<0.4	<0.4
Chromium	mg/kg	1						11	<1		9	13	5	8	4	4	6			11	8
Copper	mg/kg	1	100		30000	17000		40	<1		53	21	24	33	8	10	18			150	120
Lead	mg/kg	1	1100		1200	600		440	2		220	43	100	130	31	32	190			330	300
Mercury	mg/kg	0.1			120	80		1	<0.1		0.9	0.2	0.9	1	0.2	0.2	0.9			0.5	0.5
Nickel	mg/kg	1	25		1200	1200		6	<1		6	3	4	5	1	2	4			4	4
Zinc	mg/kg	1	320		60000	30000		200	17		120	32	170	180	28	28	410			150	150
pH1:5 soil:water	pH Units							11	8		9	13	5	8	4	4	6	7.8		11	8
Electrical Conductivity1:5 soil:water	µS/cm																				
Perfluorohexanesulfonic acid (PFHxS)	µg/kg	0.01			2000	1000														<0.1	<0.1
Perfluorooctanesulfonic acid (PFOS)	µg/kg	0.01	10 (*)		2000	1000														<0.1	<0.1
Perfluorooctanoic acid (PFOA)	µg/kg	0.01			20000	10000														<0.1	<0.1
6:2 FTS	µg/kg	0.01																		<0.1	<0.1
8:2 FTS	µg/kg	0.01																		<0.1	<0.1
Exchangeable Ca	meq/100g	0.1							1.1	0.7								3.4	3.2		
Exchangeable K	meq/100g	0.1							<0.1	<0.1								0.3	0.3		
Exchangeable Mg	meq/100g	0.1							0.13	<0.1								0.35	0.33		
Exchangeable Na	meq/100g	0.1							<0.1	<0.1								<0.1	<0.1		
Cation Exchange Capacity	meq/100g	1							1.3	<1								4.1	3.8		
Sample Mass Tested	g							1185.5			1428.97		1426.8				1007.93			909.85	
Foreign Material	%	0.05																			

Project: 9-11 Gibbons Street, Redfern
Client: St George Community Housing
CES Project Number: CES180204-SGC
Table 4: Soil Analytical Results - HIL/HSL, EIL/ESL Assessment

Parameters	Unit	PQL	EIL, Urban residential and public open space	ESL, Urban residential and public open space	Residential, Soil HIL B / HSL B	Recreational C, Soil HIL C/ HSL C	Sample ID	BH3_0.3-0.6	BH3_1.2-1.5	BH3_1.2-1.5	BH2_0.3-0.6	BH2_2.0-2.3	BH1_0.4-0.8	BH1_0.4-0.8	QAQC1_BH1_0.4-0.8	BH1_1.2-1.5	BH4_0.3-0.8	BH4_1.2-1.5	BH4_1.2-1.5	BH6_0.3-0.8	BH6_0.3-0.8
							Depth (mbgl)	0.3-0.6	1.2-1.5	1.2-1.5	0.3-0.6	2.0-2.3	0.4-0.8	0.4-0.8	0.4-0.8	1.2-1.5	0.3-0.8	1.2-1.5	1.2-1.5	0.3-0.8	0.3-0.8
							Date Sampled	27/02/2018	27/02/2018	27/02/2018	27/02/2018	27/02/2018	28/02/2018	28/02/2018	28/02/2018	28/02/2018	01/03/2018	01/03/2018	01/03/2018	02/03/2018	02/03/2018
							Soil Unit	Fill	Natural	Natural	Fill	Natural	Fill	Fill	Fill	Natural	Fill	Natural	Natural	Fill	Fill
							Laboratory report	186116	186116	186116	186116	186116	186212	186212	186212	186212	186295	186295	186295	186376	186376
							Sample Type	Primary	Primary	Lab Duplicate	Primary	Primary	Primary	Lab Duplicate	Filed Duplicate	Primary	Primay	Primary	Lab Duplicate	Primary	Lab Duplicate
HCB	mg/kg	0.1			15	10		<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
alpha-BHC	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
gamma-BHC	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
beta-BHC	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Heptachlor	mg/kg	0.1			10	10		<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
delta-BHC	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Aldrin	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Heptachlor Epoxide	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
gamma-Chlordane	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
alpha-chlordane	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Chlordane	mg/kg	0.1			90	70															
Endosulfan I	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
pp-DDE	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Dieldrin	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Aldrin and Dieldrin	mg/kg	0.1			10	10		<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1					
Endrin	mg/kg	0.1			20	20		<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
pp-DDD	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Endosulfan II	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Endosulfan	mg/kg	0.1			400	340							<0.1		<0.1	<0.1					
pp-DDT	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
DDT (Total)	mg/kg	0.1	180										<0.1		<0.1	<0.1					
DDT+DDE+DDD	mg/kg	0.1			600	400		<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Endrin Aldehyde	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Endosulfan Sulphate	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Methoxychlor	mg/kg	0.1			500	400		<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Bromophos-ethyl	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Chlorpyriphos	mg/kg	0.1			340	250		<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Diazinon	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Dichlorvos	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Dimethoate	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Ethion	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Fenitrothion	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Malathion	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Parathion	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Ronnel	mg/kg	0.1						<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1
Dichlorodifluoromethane	mg/kg	1									<1		<1								
Chloromethane	mg/kg	1									<1		<1								
Vinyl Chloride	mg/kg	1									<1		<1								
Bromomethane	mg/kg	1									<1		<1								
Chloroethane	mg/kg	1									<1		<1								
Trichlorofluoromethane	mg/kg	1									<1		<1								
1,1-Dichloroethene	mg/kg	1									<1		<1								
trans-1,2-dichloroethene	mg/kg	1									<1		<1								
1,1-dichloroethane	mg/kg	1									<1		<1								
cis-1,2-dichloroethene	mg/kg	1									<1		<1								
bromochloromethane	mg/kg	1									<1		<1								
chloroform	mg/kg	1									<1		<1								
2,2-dichloropropane	mg/kg	1									<1		<1								
1,2-dichloroethane	mg/kg	1									<1		<1								
1,1,1-trichloroethane	mg/kg	1									<1		<1								
1,1-dichloropropene	mg/kg	1									<1		<1								
carbon tetrachloride	mg/kg	1									<1		<1								
dibromomethane	mg/kg	1									<1		<1								
1,2-dichloropropane	mg/kg	1									<1		<1								
trichloroethene	mg/kg	1									<1		<1								
bromodichloromethane	mg/kg	1									<1		<1								
trans-1,3-dichloropropene	mg/kg	1									<1		<1								
cis-1,3-dichloropropene	mg/kg	1									<1		<1								
1,1,2-trichloroethane	mg/kg	1									<1		<1								
1,3-dichloropropane	mg/kg	1									<1		<1								
dibromochloromethane	mg/kg	1									<1		<1								
1,2-dibromoethane	mg/kg	1									<1		<1								
tetrachloroethene	mg/kg	1									<1		<1								
1,1,1,2-tetrachloroethane	mg/kg	1									<1		<1								
chlorobenzene	mg/kg	1									<1		<1								
bromoform	mg/kg	1									<1		<1								
1,1,2,2-tetrachloroethane	mg/kg	1									<1		<1								
1,2,3-trichloropropane	mg/kg	1									<1		<1								
bromobenzene	mg/kg	1									<1		<1								
2-chlorotoluene	mg/kg	1									<1		<1								
4-chlorotoluene	mg/kg	1									<1		<1								
1,3-dichlorobenzene	mg/kg	1									<1		<1								
1,4-dichlorobenzene	mg/kg	1									<1		<1								
1,2-dichlorobenzene	mg/kg	1									<1		<1								
1,2-dibromo-3-chloropropane	mg/kg	1									<1		<1								
1,2,4-trichlorobenzene	mg/kg	1									<1		<1								
hexachlorobutadiene	mg/kg	1									<1		<1								
1,2,3-trichlorobenzene	mg/kg	1									<1		<1								
Asbestos ID in soil																					
Trace Analysis																					
Sample mass tested	g							1185.5			1428.9		1426.8				1007.93			909.85	
Sample Description	-							Brown coarse-grained soil & rocks			Brown coarse-grained soil & rocks		Grey sandy soil & rocks				Brown fine-grained soil & rocks			Brown coarse- grained soil & rocks	
Asbestos ID in soil (as per AS4964)	-							No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected			No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected		No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected				No asbestos detected at reporting limit of 0.1g/kg; Organic fibre detected			No asbestos detected at reporting limit of 0.1g/kg; Organic fibre detected	
Trace Analysis	-							No asbestos detected			No asbestos detected		No asbestos detected				No asbestos detected			No asbestos detected	
Total Asbestos	g/kg	<0.1						<0.1			<0,1		<0.1				<0.1			<0,1	
Asbestos ID in soil <0.1g/kg	-	N/A						No visible asbestos detected			No visible asbestos detected		No visible asbestos detected				No visible asbestos detected			No visible asbestos detected	
ACM >7mm Estimation	g	--			0.04%	0.02%		–			–		–				–			–	
FA and AF Estimation	g	--						–			–		–				–			–	
ACM >7mm Estimation	%(w/w)	<0.01						<0.01			<0.01		<0.01				<0.01			<0.01	
FA and AF Estimation	%(w/w)	<0.001			0.001%	0.001%		<0.001			<0.001		<0.001				<0.001			<0.001	

Notes:

Benzo(a)pyrene - High reliability ecological guideline for fresh B(a)P, Urban residential and public open space, 85% level of protection, derived ecological guideline (95% confidence limit), Table 11, Technical Report No. 39, Risk based management and remedaition guidance for benzo(a)pyrene, CRC-CARE, January 2017
Ecological Investigation Levels - Exposure Setting - Urban Residential/Public Open Space; EIL for copper, nickel and zinc are based on CEC value for BH4_1.2-1.5 and this may be conservative for all soil/fill types.

Ecological Screening Levels - Exposure Setting - Urban Residential/Public Open Space - fine soil texture

(*)-PFOS value is interim soil- ecological indirect exposure for Residential and Parkland from PFAS National Enviormental Management Plan, January 2018

Project: 9-11 Gibbons Street, Redfern
Client: St George Community Housing
CES Project Number: CES180204-SGC
Table 4: Soil Analytical Results - HIL/HSL, EIL/ESL Assessment

Parameters	Unit	PQL	EIL, Urban residential and public open space	ESL, Urban residential and public open space	Residential, Soil HIL B / HSL B	Recreational C, Soil HIL C/ HSL C	BH6_1.2-1.5	BH5_0.3-0.9	BH5_1.2-1.5	BH7_0.3-0.9	BH7_1.2-1.5	BH8_0.3-0.9	BH8_1.2-1.5	BH9_0.3-0.9	BH9_1.2-1.5	BH8_1.2-1.5	BH8_1.2-1.5	BH10_0.3-0.9	BH10_0.3-0.9	BH10_1.2-1.5	BH10_1.2-1.5	BH11_0.3-0.7	BH11_0.3-0.7
							1.2-1.5	0.3-0.9	1.2-1.5	0.3-0.9	1.2-1.5	0.3-0.9	1.2-1.5	0.3-0.9	1.2-1.5	1.2-1.5	1.2-1.5	0.3-0.9	0.3-0.9	1.2-1.5	1.2-1.5	0.3-0.7	0.3-0.7
							02/03/2018	02/03/2018	02/03/2018	02/03/2018	02/03/2018	02/03/2018	02/03/2018	02/03/2018	02/03/2018	02/03/2018	02/03/2018	06/03/2018	06/03/2018	06/03/2018	06/03/2018	06/03/2018	06/03/2018
							Natural	Fill	Natural	Fill	Natural	Fill	Natural	Fill	Natural	Natural	Natural	Fill	Fill	Natural	Natural	Fill	Fill
							186376-B	186376	186376	186376	186376-B	186376	186376-B	186376	186376-B	186376-A	186376-A	186597	186597	186597	186597	186597	186597
							Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Lab Duplicate	Primary	Lab Duplicate	Primary	Lab Duplicate	Primary	Lab Duplicate
TRH C6 - C9	mg/kg	25					<25	<25		<25		<25		<25		<25	<25	<25	<25	<25		<25	
TRH C6 - C10	mg/kg	25					<25	<25		<25		<25		<25		<25	<25	<25	<25	<25		<25	
FRACTION 1	mg/kg	25		180	45	NL	<25	<25		<25		<25		<25		<25	<25	<25	<25	<25		<25	
Benzene	mg/kg	0.2		50	0.5	NL	<0.2	<0.2		<0.2		<0.2		<0.2		<0.2	<0.2	<0.2	<0.2	<0.2		<0.2	
Toluene	mg/kg	0.5		85	160	NL	<0.5	<0.5		<0.5		<0.5		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	
Ethylbenzene	mg/kg	1		70	55	NL	<1	<1		<1		<1		<1		<1	<1	<1	<1	<1		<1	
m+p-xylene	mg/kg	2			40		<2	<2		<2		<2		<2		<2	<2	<2	<2	<2		<2	
o-Xylene	mg/kg	1			40		<1	<1		<1		<1		<1		<1	<1	<1	<1	<1		<1	
Xylenes (total)	mg/kg			105	40	NL	<1	<1		<1		<1		<1		<1	<1	<1	<1	<1		<1	
Naphthalene	mg/kg	1			3	NL	<1	<1		<1		5		<1		<1	<1	<1	<1	<1		<1	
Total Phenolics	mg/kg	5																					
TRH C10 - C14	mg/kg	50					<50	<50		<50		<50		<50		<50	<50	<50	<50	<50		<50	
TRH C15 - C28	mg/kg	100					<100	<100		450		240		<100		<100	<100	970	1200	<100		390	
TRH C29 - C36	mg/kg	100					<100	<100		260		160		<100		<100	<100	800	1100	<100		410	
TRH total C10 - C36	mg/kg	50																					
TRH >C10-C16	mg/kg	50					<50	<50		<50		<50		<50		<50	<50	<50	<50	<50		<50	
FRACTION 2	mg/kg	50		120	110		<50	<50		<50		<50		<50		<50	<50	<50	<50	<50		<50	
TRH >C16-C34	mg/kg	100					<100	<100		640		360		<100		<100	<100	1600	2000	<100		690	
TRH >C34-C40	mg/kg	100					<100	<100		200		120		<100		<100	<100	390	570	<100		190	
Total +ve TRH (>C10-C40)	mg/kg						<50	<50		830		480		<50		<50	<50	2000	2600	<50		880	
Naphthalene	mg/kg	0.1	170		3		0.6	0.2		0.8	<0.1	4	0.2	0.4	<0.1	0.3	0.2	2.3	2.1	<0.1		0.4	
Acenaphthylene	mg/kg	0.1					0.2	0.2		2.8	<0.1	2	0.2	0.7	0.2	0.4	0.2	2.8	3.6	<0.1		1.7	
Acenaphthene	mg/kg	0.1					<0.1	<0.1		0.5	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<1	<1	<0.1		<0.1	
Fluorene	mg/kg	0.1					<0.1	0.1		3.2	<0.1	0.3	0.1	0.5	<0.1	0.2	0.2	2.9	2.3	<0.1		0.2	
Phenanthrene	mg/kg	0.1					0.4	1.1		22	<0.1	5.2	1.1	4.3	0.6	2	1.2	28	25	<0.1		7.8	
Anthracene	mg/kg	0.1					0.2	0.3		6.4	<0.1	1.8	0.4	1.3	0.2	0.8	0.4	12	10	<0.1		2.4	
Fluoranthene	mg/kg	0.1					1.1	1.2		24	<0.1	14	1.5	6.2	1.2	3.1	1.8	61	70	<0.1		16	
Pyrene	mg/kg	0.1					1.2	1.1		22	<0.1	15	1.5	6.3	1.3	3	1.9	61	80	<0.1		17	
Benzo(a)anthracene	mg/kg	0.1					0.9	0.6		12	<0.1	8	0.8	3.3	0.7	1.7	1	28	35	<0.1		8.7	
Chrysene	mg/kg	0.1					0.8	0.5		8.6	<0.1	6.7	0.7	2.6	0.7	1.4	0.8	32	39	<0.1		8	
Benzo(b+k)fluoranthene	mg/kg	0.2					1	0.8		15	<0.2	10	0.8	4.5	0.8	2.5	1	53	63	<0.2		15	
Benzo(a)pyrene	mg/kg	0.05		33 (CRC-Care)			1	0.5		10	<0.05	7	0.76	3	0.73	1.8	0.98	37	44	<0.05		2.7	
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1					0.6	0.2		4.1	<0.1	2.8	0.4	1.3	0.4	0.8	0.4	35	42	<0.1		6	
Dibenzo(a,h)anthracene	mg/kg	0.1					0.2	<0.1		1.4	<0.1	1	0.1	0.5	0.1	0.3	0.1	6.3	7.4	<0.1		0.5	
Benzo(g,h,i)perylene	mg/kg	0.1					0.8	0.2		4.9	<0.1	3.5	0.5	1.5	0.5	1	0.5	35	43	<0.1		8.8	
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.5					1.4	0.6		15	<0.5	10	1.1	4.4	1.1	2.6	1.4	56	66	<0.5		6.3	
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.5					1.4	0.7		15	<0.5	10	1.1	4.4	1.1	2.6	1.4	56	66	<0.5		6.3	
Benzo(a)pyrene TEQ	mg/kg	0.5			4	3	1.4	0.7		15	<0.5	10	1.1	4.4	1.1	2.6	1.4	56	66	<0.5		6.3	
Total +ve	mg/kg	-			400	300	9	7		140	<0.05	81	9.1	36	7.5	19	11	400	470	<0.05		95	
Total PCB	mg/kg	0.1			1	1		<0.1		<0.5		<0.5		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.5	
Arsenic	mg/kg	4	100		500	300	4	10	<4	5	8	7		8		<4	<4	<4	<4	<4		490	
Cadmium	mg/kg	0.4			150	90	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4		<0.4		<0.4	<0.4	<0.4	<0.4	<0.4		0.7	
Chromium	mg/kg	1					10	12	5	13	4	10		12		3	3	6	5	<1		12	
Copper	mg/kg	1	100		30000	17000	110	750	10	90	8	73		84		8	10	47	48	<1		60	
Lead	mg/kg	1	1100		1200	600	120	220	54	170	39	660		240		39	42	89	100	1		280	
Mercury	mg/kg	0.1			120	80	1	1.5	0.3	0.5	0.2	0.5		1.1		0.3	0.4	0.3	0.4	<0.1		0.9	
Nickel	mg/kg	1	25		1200	1200	22	5	1	8	6	17		8		3	3	6	5	<1		8	
Zinc	mg/kg	1	320		60000	30000	140	340	24	330	27	160		240		47	48	110	130	9		500	
pH1:5 soil:water	pH Units																						
Electrical Conductivity1:5 soil:water	µS/cm																						
Perfluorohexanesulfonic acid (PFHxS)	µg/kg	0.01			2000	1000		<0.1		<0.1		<0.1		<0.1									
Perfluorooctanesulfonic acid (PFOS)	µg/kg	0.01	10 (*)		2000	1000		<0.1		<0.1		0.2		<0.1									
Perfluorooctanoic acid (PFOA)	µg/kg	0.01			20000	10000		<0.1		<0.1		<0.1		<0.1									
6:2 FTS	µg/kg	0.01						<0.1		<0.1		<0.1		<0.1									
8:2 FTS	µg/kg	0.01						<0.1		<0.1		<0.1		<0.1									
Exchangeable Ca	meq/100g	0.1																					
Exchangeable K	meq/100g	0.1																					
Exchangeable Mg	meq/100g	0.1																					
Exchangeable Na	meq/100g	0.1																					
Cation Exchange Capacity	meq/100g	1																					
Sample Mass Tested	g							1122.91		1185.08		1290.67		704.73									
Foreign Material	%	0.05																					

Project: 9-11 Gibbons Street, Redfern
Client: St George Community Housing
CES Project Number: CES180204-SGC
Table 4: Soil Analytical Results - HIL/HSL, EIL/ESL Assessment

Parameters	Unit	PQL	EIL, Urban residential and public open space	ESL, Urban residential and public open space	Residential, Soil HIL B / HSL B	Recreational C, Soil HIL C/ HSL C	BH6_1.2-1.5 1.2-1.5 02/03/2018 Natural 186376-B Primary	BH5_0.3-0.9 0.3-0.9 02/03/2018 Fill 186376 Primary	BH5_1.2-1.5 1.2-1.5 02/03/2018 Natural 186376 Primary	BH7_0.3-0.9 0.3-0.9 02/03/2018 Fill 186376 Primary	BH7_1.2-1.5 1.2-1.5 02/03/2018 Natural 186376-B Primary	BH8_0.3-0.9 0.3-0.9 02/03/2018 Fill 186376 Primary	BH8_1.2-1.5 1.2-1.5 02/03/2018 Natural 186376-B Primary	BH9_0.3-0.9 0.3-0.9 02/03/2018 Fill 186376 Primary	BH9_1.2-1.5 1.2-1.5 02/03/2018 Natural 186376-B Primary	BH8_1.2-1.5 1.2-1.5 02/03/2018 Natural 186376-A Primary	BH8_1.2-1.5 1.2-1.5 02/03/2018 Natural 186376-A Lab Duplicate	BH10_0.3-0.9 0.3-0.9 06/03/2018 Fill 186597 Primary	BH10_0.3-0.9 0.3-0.9 06/03/2018 Fill 186597 Lab Duplicate	BH10_1.2-1.5 1.2-1.5 06/03/2018 Natural 186597 Primary	BH10_1.2-1.5 1.2-1.5 06/03/2018 Natural 186597 Lab Duplicate	BH11_0.3-0.7 0.3-0.7 06/03/2018 Fill 186597 Primary	BH11_0.3-0.7 0.3-0.7 06/03/2018 Fill 186597 Lab Duplicate
HCB	mg/kg	0.1			15	10		<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
alpha-BHC	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
gamma-BHC	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
beta-BHC	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Heptachlor	mg/kg	0.1			10	10		<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
delta-BHC	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Aldrin	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Heptachlor Epoxide	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
gamma-Chlordane	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
alpha-chlordane	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Chlordane	mg/kg	0.1			90	70																	
Endosulfan I	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
pp-DDE	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Dieldrin	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Aldrin and Dieldrin	mg/kg	0.1			10	10																	
Endrin	mg/kg	0.1			20	20		<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
pp-DDD	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Endosulfan II	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Endosulfan	mg/kg	0.1			400	340																	
pp-DDT	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
DDT (Total)	mg/kg	0.1	180																				
DDT+DDE+DDD	mg/kg	0.1			600	400		<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Endrin Aldehyde	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Endosulfan Sulphate	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Methoxychlor	mg/kg	0.1			500	400		<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Azinphos-methyl (Guthion)	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Bromophos-ethyl	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Chlorpyriphos	mg/kg	0.1			340	250		<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Chlorpyriphos-methyl	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Diazinon	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Dichlorvos	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Dimethoate	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Ethion	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Fenitrothion	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Malathion	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Parathion	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Ronnel	mg/kg	0.1						<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1		<0.1	
Dichlorodifluoromethane	mg/kg	1						<1		<1												<1	<1
Chloromethane	mg/kg	1						<1		<1												<1	<1
Vinyl Chloride	mg/kg	1						<1		<1												<1	<1
Bromomethane	mg/kg	1						<1		<1												<1	<1
Chloroethane	mg/kg	1						<1		<1												<1	<1
Trichlorofluoromethane	mg/kg	1						<1		<1												<1	<1
1,1-Dichloroethene	mg/kg	1						<1		<1												<1	<1
trans-1,2-dichloroethene	mg/kg	1						<1		<1												<1	<1
1,1-dichloroethane	mg/kg	1						<1		<1												<1	<1
cis-1,2-dichloroethene	mg/kg	1						<1		<1												<1	<1
bromochloromethane	mg/kg	1						<1		<1												<1	<1
chloroform	mg/kg	1						<1		<1												<1	<1
2,2-dichloropropane	mg/kg	1						<1		<1												<1	<1
1,2-dichloroethane	mg/kg	1						<1		<1												<1	<1
1,1,1-trichloroethane	mg/kg	1						<1		<1												<1	<1
1,1-dichloropropene	mg/kg	1						<1		<1												<1	<1
carbon tetrachloride	mg/kg	1						<1		<1												<1	<1
dibromomethane	mg/kg	1						<1		<1												<1	<1
1,2-dichloropropane	mg/kg	1						<1		<1												<1	<1
trichloroethene	mg/kg	1						<1		<1												<1	<1
bromodichloromethane	mg/kg	1						<1		<1												<1	<1
trans-1,3-dichloropropene	mg/kg	1						<1		<1												<1	<1
cis-1,3-dichloropropene	mg/kg	1						<1		<1												<1	<1
1,1,2-trichloroethane	mg/kg	1						<1		<1												<1	<1
1,3-dichloropropane	mg/kg	1						<1		<1												<1	<1
dibromochloromethane	mg/kg	1						<1		<1												<1	<1
1,2-dibromoethane	mg/kg	1						<1		<1												<1	<1
tetrachloroethene	mg/kg	1						<1		<1												<1	<1
1,1,1,2-tetrachloroethane	mg/kg	1						<1		<1												<1	<1
chlorobenzene	mg/kg	1						<1		<1												<1	<1
bromoform	mg/kg	1						<1		<1												<1	<1
1,1,2,2-tetrachloroethane	mg/kg	1						<1		<1												<1	<1
1,2,3-trichloropropane	mg/kg	1						<1		<1												<1	<1
bromobenzene	mg/kg	1						<1		<1												<1	<1
2-chlorotoluene	mg/kg	1						<1		<1												<1	<1
4-chlorotoluene	mg/kg	1						<1		<1												<1	<1
1,3-dichlorobenzene	mg/kg	1						<1		<1												<1	<1
1,4-dichlorobenzene	mg/kg	1						<1		<1												<1	<1
1,2-dichlorobenzene	mg/kg	1						<1		<1												<1	<1
1,2-dibromo-3-chloropropane	mg/kg	1						<1		<1												<1	<1
1,2,4-trichlorobenzene	mg/kg	1						<1		<1												<1	<1
hexachlorobutadiene	mg/kg	1						<1		<1												<1	<1
1,2,3-trichlorobenzene	mg/kg	1						<1		<1												<1	<1
Asbestos ID in soil																							
Trace Analysis																							
Sample mass tested	g							1122.91		1185.08		1290.67		704.73				1588.3				1041.99	
Sample Description	-							Brown coarse- grained soil & rocks		Brown coarse- grained soil & rocks		Brown coarse- grained soil & rocks		Brown coarse- grained soil & rocks				Brown sandy soil & rocks				Brown sandy soil & rocks	
Asbestos ID in soil (as per AS4964)	-							No asbestos detected at reporting limit of 0.1g/kg: Organic fibre detected		No asbestos detected at reporting limit of 0.1g/kg: Organic fibre detected		No asbestos detected at reporting limit of 0.1g/kg: Organic fibre detected		No asbestos detected at reporting limit of 0.1g/kg: Organic fibre detected				No asbestos detected at reporting limit of 0.1g/kg: Organic fibre detected				No asbestos detected at reporting limit of 0.1g/kg: Organic fibre detected	
Trace Analysis	-							No asbestos detected		No asbestos detected		No asbestos detected		No asbestos detected				No asbestos detected				No asbestos detected	
Total Asbestos	g/kg	<0.1						<0.1		<0.1		<0.1		<0.1				<0.1				<0.1	
Asbestos ID in soil <0.1g/kg	-	N/A						No visible asbestos detected		No visible asbestos detected		No visible asbestos detected		No visible asbestos detected				No visible asbestos detected				No visible asbestos detected	
ACM >7mm Estimation	g	--			0.04%	0.02%		–		–		–		–				–				–	
FA and AF Estimation	g	--						–		–		–		–				–				–	
ACM >7mm Estimation	%(w/w)	<0.01						<0.01		<0.01		<0.01		<0.01				<0.01				<0.01	
FA and AF Estimation	%(w/w)	<0.001			0.001%	0.001%		<0.001		<0.001		<0.001		<0.001				<0.001				<0.001	

Notes:

Benzo(a)pyrene - High reliability ecological guideline for fresh B(a)P, Urban residential and public open space, 85% level of protection, derived ecological guideline (95% confidence limit)
Ecological Investigation Levels - Exposure Setting - Urban Residential/Public Open Space; EIL for copper, nickel and zinc are based on CEC value for BH4_1.2-1.5 and this may be conservative for all soil/fill types.
Ecological Screening Levels - Exposure Setting - Urban Residential/Public Open Space - fine soil texture
(*)-PFOS value is interim soil- ecological indirect exposure for Residential and Parkland from PFAS National Enviormental Management Plan, January 2018

Project: 9-11 Gibbons Street, Redfern
Client: St George Community Housing
CES Project Number: CES180204-SGC
Table 4: Soil Analytical Results - HIL/HSL, EIL/ESL Assessment

Parameters	Unit	PQL	EIL, Urban residential and public open space	ESL, Urban residential and public open space	Residential, Soil HIL B / HSL B	Recreational C, Soil HIL C/ HSL C	BH11_1.3-1.6 1.3-1.6 06/03/2018 Natural 186597-A Primary	BH11_1.3-1.6 1.3-1.6 06/03/2018 Natural 186597-A Lab Duplicate	BH1_0.4-0.8 0.4-0.8 28/02/2018 Fill 1806508 Primary	QAQC1 0.4-0.8 28/02/2018 Fill 1806508 Field Duplicate of BH1_0.4-0.8	QAQC2 0.4-0.8 28/02/2018 Fill 1806508 Field Triplicate of BH1_0.4-0.8	BH2_1.2-1.5 1.2-1.5 28/02/2018 Natural 1806508
TRH C6 - C9	mg/kg	25									<10	
TRH C6 - C10	mg/kg	25									<10	
FRACTION 1	mg/kg	25		180	45	NL					<10	
Benzene	mg/kg	0.2		50	0.5	NL					<0.2	
Toluene	mg/kg	0.5		85	160	NL					<0.5	
Ethylbenzene	mg/kg	1		70	55	NL					<0.5	
m+p-xylene	mg/kg	2			40						<0.5	
o-Xylene	mg/kg	1			40						<0.5	
Xylenes (total)	mg/kg			105	40	NL					<0.5	
Naphthalene	mg/kg	1			3	NL					<1	
Total Phenolics	mg/kg	5										
TRH C10 - C14	mg/kg	50									<50	
TRH C15 - C28	mg/kg	100									<100	
TRH C29 - C36	mg/kg	100									<100	
TRH total C10 - C36	mg/kg	50									<50	
TRH >C10-C16	mg/kg	50									<50	
FRACTION 2	mg/kg	50		120	110						<50	
TRH >C16-C34	mg/kg	100									<100	
TRH >C34-C40	mg/kg	100									<100	
Total +ve TRH (>C10-C40)	mg/kg										<50	
Naphthalene	mg/kg	0.1	170		3		<0.1				<0.5	
Acenaphthylene	mg/kg	0.1					<0.1				<0.5	
Acenaphthene	mg/kg	0.1					<0.1				<0.5	
Fluorene	mg/kg	0.1					<0.1				<0.5	
Phenanthrene	mg/kg	0.1					<0.1				<0.5	
Anthracene	mg/kg	0.1					<0.1				<0.5	
Fluoranthene	mg/kg	0.1					<0.1				<0.5	
Pyrene	mg/kg	0.1					<0.1				<0.5	
Benzo(a)anthracene	mg/kg	0.1					<0.1				<0.5	
Chrysene	mg/kg	0.1					<0.1				<0.5	
Benzo(b+k)fluoranthene	mg/kg	0.2					<0.2					
Benzo(a)pyrene	mg/kg	0.05		33 (CRC-Care)			<0.05				<0.5	
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1					<0.1				<0.5	
Dibenzo(a,h)anthracene	mg/kg	0.1					<0.1				<0.5	
Benzo(g,h,i)perylene	mg/kg	0.1					<0.1				<0.5	
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.5					<0.5				<0.5	
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.5					<0.5				0.6	
Benzo(a)pyrene TEQ	mg/kg	0.5			4	3	<0.5				1.2	
Total +ve	mg/kg	-			400	300	<0.05					
Total PCB	mg/kg	0.1			1	1					<0.1	
Arsenic	mg/kg	4	100		500	300	820	770			<5	
Cadmium	mg/kg	0.4			150	90	<0.4	<0.4			<1	
Chromium	mg/kg	1					11	11			3	
Copper	mg/kg	1	100		30000	17000	2	2			6	
Lead	mg/kg	1	1100		1200	600	14	12			23	
Mercury	mg/kg	0.1			120	80	<0.1	<0.1			0.1	
Nickel	mg/kg	1	25		1200	1200	1	2			2	
Zinc	mg/kg	1	320		60000	30000	46	40			19	
pH1:5 soil:water	pH Units											
Electrical Conductivity1:5 soil:water	µS/cm											
Perfluorohexanesulfonic acid (PFHxS)	µg/kg	0.01			2000	1000						
Perfluorooctanesulfonic acid (PFOS)	µg/kg	0.01	10 (*)		2000	1000						
Perfluorooctanoic acid (PFOA)	µg/kg	0.01			20000	10000						
6:2 FTS	µg/kg	0.01										
8:2 FTS	µg/kg	0.01										
Exchangeable Ca	meq/100g	0.1										
Exchangeable K	meq/100g	0.1										
Exchangeable Mg	meq/100g	0.1										
Exchangeable Na	meq/100g	0.1										
Cation Exchange Capacity	meq/100g	1										
Sample Mass Tested	g											
Foreign Material	%	0.05										

Project: 9-11 Gibbons Street, Redfern
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Table 4: Soil Analytical Results - HIL/HSL, EIL/ESL Assessment

Parameters	Unit	PQL	EIL, Urban residential and public open space	ESL, Urban residential and public open space	Residential, Soil HIL B / HSL B	Recreational C, Soil HIL C/ HSL C	BH11_1.3-1.6 1.3-1.6 06/03/2018 Natural 186597-A Primary	BH11_1.3-1.6 1.3-1.6 06/03/2018 Natural 186597-A Lab Duplicate	BH1_0.4-0.8 0.4-0.8 28/02/2018 Fill 1806508 Primary	QAQC1 0.4-0.8 28/02/2018 Fill 1806508 Field Duplicate of BH1_0.4-0.8	QAQC2 0.4-0.8 28/02/2018 Fill 1806508 Field Triplicate of BH1_0.4-0.8	BH2_1.2-1.5 1.2-1.5 28/02/2018 Natural 1806508
HCB	mg/kg	0.1			15	10					<0.05	
alpha-BHC	mg/kg	0.1									<0.05	
gamma-BHC	mg/kg	0.1									<0.05	
beta-BHC	mg/kg	0.1									<0.05	
Heptachlor	mg/kg	0.1			10	10					<0.05	
delta-BHC	mg/kg	0.1									<0.05	
Aldrin	mg/kg	0.1									<0.05	
Heptachlor Epoxide	mg/kg	0.1									<0.05	
gamma-Chlordane	mg/kg	0.1										
alpha-chlordane	mg/kg	0.1										
Chlordane	mg/kg	0.1			90	70						
Endosulfan I	mg/kg	0.1									<0.05	
pp-DDE	mg/kg	0.1										
Dieldrin	mg/kg	0.1									<0.05	
Aldrin and Dieldrin	mg/kg	0.1			10	10					<0.05	
Endrin	mg/kg	0.1			20	20					<0.05	
pp-DDD	mg/kg	0.1									<0.05	
Endosulfan II	mg/kg	0.1										
Endosulfan	mg/kg	0.1			400	340						
pp-DDT	mg/kg	0.1									<0.2	
DDT (Total)	mg/kg	0.1	180									
DDT+DDE+DDD	mg/kg	0.1			600	400					<0.05	
Endrin Aldehyde	mg/kg	0.1									<0.05	
Endosulfan Sulphate	mg/kg	0.1									<0.05	
Methoxychlor	mg/kg	0.1			500	400					<0.2	
Azinphos-methyl (Guthion)	mg/kg	0.1									<0.05	
Bromophos-ethyl	mg/kg	0.1									<0.05	
Chlorpyriphos	mg/kg	0.1			340	250					<0.05	
Chlorpyriphos-methyl	mg/kg	0.1									<0.05	
Diazinon	mg/kg	0.1									<0.05	
Dichlorvos	mg/kg	0.1									<0.05	
Dimethoate	mg/kg	0.1									<0.05	
Ethion	mg/kg	0.1									<0.05	
Fenitrothion	mg/kg	0.1										
Malathion	mg/kg	0.1									<0.05	
Parathion	mg/kg	0.1									<0.2	
Ronnel	mg/kg	0.1										
Dichlorodifluoromethane	mg/kg	1					<1					
Chloromethane	mg/kg	1					<1					
Vinyl Chloride	mg/kg	1					<1					
Bromomethane	mg/kg	1					<1					
Chloroethane	mg/kg	1					<1					
Trichlorofluoromethane	mg/kg	1					<1					
1,1-Dichloroethene	mg/kg	1					<1					
trans-1,2-dichloroethene	mg/kg	1					<1					
1,1-dichloroethane	mg/kg	1					<1					
cis-1,2-dichloroethene	mg/kg	1					<1					
bromochloromethane	mg/kg	1					<1					
chloroform	mg/kg	1					<1					
2,2-dichloropropane	mg/kg	1					<1					
1,2-dichloroethane	mg/kg	1					<1					
1,1,1-trichloroethane	mg/kg	1					<1					
1,1-dichloropropene	mg/kg	1					<1					
carbon tetrachloride	mg/kg	1					<1					
dibromomethane	mg/kg	1					<1					
1,2-dichloropropane	mg/kg	1					<1					
trichloroethene	mg/kg	1					<1					
bromodichloromethane	mg/kg	1					<1					
trans-1,3-dichloropropene	mg/kg	1					<1					
cis-1,3-dichloropropene	mg/kg	1					<1					
1,1,2-trichloroethane	mg/kg	1					<1					
1,3-dichloropropane	mg/kg	1					<1					
dibromochloromethane	mg/kg	1					<1					
1,2-dibromoethane	mg/kg	1					<1					
tetrachloroethene	mg/kg	1					<1					
1,1,1,2-tetrachloroethane	mg/kg	1					<1					
chlorobenzene	mg/kg	1					<1					
bromoform	mg/kg	1					<1					
1,1,2,2-tetrachloroethane	mg/kg	1					<1					
1,2,3-trichloropropane	mg/kg	1					<1					
bromobenzene	mg/kg	1					<1					
2-chlorotoluene	mg/kg	1					<1					
4-chlorotoluene	mg/kg	1					<1					
1,3-dichlorobenzene	mg/kg	1					<1					
1,4-dichlorobenzene	mg/kg	1					<1					
1,2-dichlorobenzene	mg/kg	1					<1					
1,2-dibromo-3-chloropropane	mg/kg	1					<1					
1,2,4-trichlorobenzene	mg/kg	1					<1					
hexachlorobutadiene	mg/kg	1					<1					
1,2,3-trichlorobenzene	mg/kg	1					<1					
Asbestos ID in soil												
Trace Analysis												
Sample mass tested	g											
Sample Description	-											
Asbestos ID in soil (as per AS4964)	-											
Trace Analysis	-											
Total Asbestos	g/kg	<0.1										
Asbestos ID in soil <0.1g/kg	-	N/A										
ACM >7mm Estimation	g	--			0.04%	0.02%						
FA and AF Estimation	g	--										
ACM >7mm Estimation	%(w/w)	<0.01										
FA and AF Estimation	%(w/w)	<0.001			0.001%	0.001%						

Notes:

Benzo(a)pyrene - High reliability ecological guideline for fresh B(a)P, Urban residential and public open space, 85% level of protection, derived ecological guideline (95% confidence limit).
Ecological Investigation Levels - Exposure Setting - Urban Residential/Public Open Space; EIL for copper, nickel and zinc are based on CEC value for BH4_1.2-1.5 and this may be conservative for all soil/fill types.
Ecological Screening Levels - Exposure Setting - Urban Residential/Public Open Space - fine soil texture
(*)-PFOS value is interim soil- ecological indirect exposure for Residential and Parkland from PFAS National Enviormental Management Plan, January 2018

Project: 9-11 Gibbons Street, Redfern
Client: St George Community Housing
CES Project Number: CES180204-SGC
Table 9: Groundwater Analytical Results

Parameter	HSL B - High Density Residential - SAND 2m- <4m	ANZECC 2000 Marine Aquatic Ecosystems 95% Level of Protection	AS 2159-2009 Piling - Design and installation: Exposure Classification for Concrete Piles - Piles in Soil (Table 6.5.2(B))		Sample ID	BH01	BH01	BH03	BH04	QAQC 1_BH4	QAQC 2_BH4
					Date Sampled	05/03/2018	05/03/2018	05/03/2018	05/03/2018	05/03/2018	5/03/2018
					Laboratory Report	186497	186497	186497	186497	186497	ES1806886
					Sample Type	Primary	Lab Duplicate	Primary	Primary	Field Duplicate for BH04	Field Triplicate for BH04
				Units	**PQL**						
TRH C_6 - C_9				ug/L	**10**	19	23	<10	210	200	160
TRH C_6 - C_{10}				ug/L	**10**	46	53	<10	450	440	400
$TPH C_6$-C_{10} less BTEX (F1)	1000			ug/L	**10**	33	40	<10	320	310	290
Benzene	800	700		ug/L	**1**	<1	<1	<1	<1	<1	<1
Toluene	NL	180 [1]		ug/L	**1**	<1	<1	<1	<1	<1	<2
Ethylbenzene	NL	80 [1]		ug/L	**1**	<1	<1	<1	7	7	6
m+p-xylene		m-xylene - 75 [1] p-xylene - 200 [1]		ug/L	**2**	8	8	<2	84	82	70
o-Xylene		350		ug/L	**1**	5	5	<1	40	39	35
Xylenes total	NL	-		ug/L	**3**	13	13	<PQL	124	121	105
naphthalene	NL	70		ug/L	**1**	<1	<1	<1	4	4	<5
TRH C10 - C14				ug/L	**50**	150	81	<50	270	410	120
TRH C15 - C28				ug/L	**100**	<100	<100	<100	<100	<100	<100
TRH C29 - C36				ug/L	**100**	<100	<100	<100	<100	<100	<50
C10-C36 Petroleum Hydrocarbons				ug/L	**100**						
TRH >C10-C16				ug/L	**50**	120	66	<50	170	260	<100
TRH >C10 - C16 less Naphthalene (F2)	1000			ug/L	**50**	120	[NT]	<50	170	250	<100
TRH >C16-C34				ug/L	**100**	<100	<100	<100	<100	<100	<100
TRH >C34-C40				ug/L	**100**	<100	<100	<100	<100	<100	<100
Naphthalene		70		ug/L	**1**	<1	<1	<1	3	4	<1
Acenaphthylene				ug/L	**1**	<1	<1	<1	<1	<1	<1
Acenaphthene				ug/L	**1**	<1	<1	<1	<1	<1	<1
Fluorene				ug/L	**1**	<1	<1	<1	<1	<1	<1
Phenanthrene		2 [1]		ug/L	**1**	<1	<1	<1	<1	<1	<1
Anthracene		0.4 [1]		ug/L	**1**	<1	<1	<1	<1	<1	<1
Fluoranthene		1.4 [1]		ug/L	**1**	<1	<1	<1	<1	2	<1
Pyrene				ug/L	**1**	<1	<1	<1	<1	2	<1
Benzo(a)anthracene				ug/L	**1**	<1	<1	<1	<1	<1	<1
Chrysene				ug/L	**1**	<1	<1	<1	<1	<1	<1
Benzo(b,j+k)fluoranthene				ug/L	**2**	<2	<2	<2	<2	<2	
Benzo(a)pyrene		0.2 [1]		ug/L	**1**	<1	<1	<1	<1	1	<0.5
Indeno(1,2,3-c,d)pyrene				ug/L	**1**	<1	<1	<1	<1	<1	<1
Dibenzo(a,h)anthracene				ug/L	**1**	<1	<1	<1	<1	<1	<1
Benzo(g,h,i)perylene				ug/L	**1**	<1	<1	<1	<1	<1	<1
Benzo(a)pyrene TEQ calc (zero)				ug/L	**5**						
Benzo(a)pyrene TEQ calc(half)				ug/L							
Benzo(a)pyrene TEQ calc(PQL)				ug/L							
Total Positive PAHs				ug/L	**1**	NIL (+)VE	NIL (+)VE	NIL (+)VE	3.4	8.6	
Arsenic (Total)		2.3 [2]		ug/L	**1**	<1		<1	<1	<1	29 *
Cadmium		5.5		ug/L	**0.1**	0.1		0.2	<0.1	<0.1	1.3
Chromium (total)				ug/L	**1**	<1		<1	<1	<1	442
Copper		1.3		ug/L	**1**	<1		<1	<1	<1	499 *
Lead		4.4		ug/L	**1**	<1		<1	<1	<1	449 *
Nickel		70		ug/L	**1**	10		2	3	3	90 *
Zinc		15		ug/L	**1**	41		85	3	<1	1080 *
Chloride			<1,000	mg/L	**1**	490		33	44		
Sulphate			<5,000	mg/L	**1**	84		67	95		
Dichlorodifluoromethane				ug/L	**10**	<10	<10	<10	<10	<10	<50
Chloromethane				ug/L	**10**	<10	<10	<10	<10	<10	<50
Vinyl Chloride				ug/L	**10**	<10	<10	<10	<10	<10	<50
Methyl tert-butyl ether (MTBE)				ug/L	**0.1**						
Bromomethane				ug/L	**10**	<10	<10	<10	<10	<10	<50
Chloroethane				ug/L	**10**						<50
Trichlorofluoromethane				ug/L	**10**	<10	<10	<10	<10	<10	<50
1,1-Dichloroethene				ug/L	**1**	<1	<1	<1	<1	<1	<5
Trans-1,2-dichloroethene				ug/L	**1**	<1	<1	<1	<1	<1	<5
1,1-dichloroethane				ug/L	**1**	<1	<1	<1	<1	<1	<5
Cis-1,2-dichloroethene				ug/L	**1**	<1	<1	<1	<1	<1	<5
Bromochloromethane				ug/L	**1**	<1	<1	<1	<1	<1	<5
Chloroform		770 [1]		ug/L	**1**	2	2	4	7	7	<5
2,2-dichloropropane				ug/L	**1**	<1	<1	<1	<1	<1	<5
1,2-dichloroethane		1900 [1]		ug/L	**1**	<1	<1	<1	<1	<1	<5
1,1,1-trichloroethane		270 [1]		ug/L	**1**	<1	<1	<1	<1	<1	<5
1,1-dichloropropene				ug/L	**1**	<1	<1	<1	<1	<1	<5
Carbon tetrachloride		240 [1]		ug/L	**1**	<1	<1	<1	<1	<1	<5
Benzene		700		ug/L	**1**						<1
Dibromomethane		-		ug/L	**1**	<1	<1	<1	<1	<1	<5
1,2-dichloropropane		900 [1]		ug/L	**1**	<1	<1	<1	<1	<1	<5
Trichloroethene				ug/L	**1**	<1	<1	<1	<1	<1	<5
Bromodichloromethane				ug/L	**1**	<1	<1	<1	<1	<1	<5
trans-1,3-dichloropropene				ug/L	**1**	<1	<1	<1	<1	<1	<5
cis-1,3-dichloropropene				ug/L	**1**	<1	<1	<1	<1	<1	<5
1,1,2-trichloroethane		1900		ug/L	**1**	<1	<1	<1	<1	<1	<5
Toluene		180 [1]		ug/L	**1**						<2
1,3-dichloropropane		1100 [1]		ug/L	**1**	<1	<1	<1	<1	<1	<5
Dibromochloromethane				ug/L	**1**	<1	<1	<1	<1	<1	<5
1,2-dibromoethane				ug/L	**1**	<1	<1	<1	<1	<1	<5
Tetrachloroethene				ug/L	**1**	<1	<1	<1	<1	<1	<5
trans-1,4-Dichloro-2-butene				ug/L	**1**						<5
cis-1,4-Dichloro-2-butene				ug/L	**1**						<5
1,1,1,2-tetrachloroethane				ug/L	**1**	<1	<1	<1	<1	<1	<5
Chlorobenzene				ug/L	**1**	<1	<1	<1	<1	<1	<5
Ethylbenzene		80 [1]		ug/L	**1**						6
Iodomethane				ug/L	**1**						<5
Bromoform				ug/L	**1**	<1	<1	<1	<1	<1	<5
m+p-xylene		m-xylene - 75 [1] p-xylene - 200 [1]		ug/L	**2**	8	8	<2	84	82	70
1,1,2,2-tetrachloroethane		400 [1]		ug/L	**1**	<1	<1	<1	<1	<1	<5
o-xylene				ug/L	**1**	5	5	<1	40	39	35
1,2,3-trichloropropane				ug/L	**1**	<1	<1	<1	<1	<1	<5
Pentachloroethane				ug/L	**1**						<5
Bromobenzene				ug/L	**1**	<1	<1	<1	<1	<1	<5
2-chlorotoluene				ug/L	**1**						<5
4-chlorotoluene				ug/L	**1**						<5
1,3-dichlorobenzene				ug/L	**1**	<1	<1	<1	<1	<1	
1,4-dichlorobenzene		60		ug/L	**1**	<1	<1	<1	<1	<1	
Vinyl acetate				ug/L	**10**	<10	<10	<10	<10	<10	
1,2-dichlorobenzene		160		ug/L	**1**	<1	<1	<1	<1	<1	
1,2-dibromo-3-chloropropane				ug/L	**1**	<1	<1	<1	<1	<1	<5
1,2,4-trichlorobenzene		170		ug/L	**1**	<1	<1	<1	<1	<1	<5
Hexachlorobutadiene				ug/L	**1**	<1	<1	<1	<1	<1	<5
1,2,3-trichlorobenzene		10		ug/L	**1**	<1	<1	<1	<1	<1	<5
Phenol		320		ug/L	**1**	0.07	0.06	<0.05	0.09	0.1	

Perfluorohexanesulfonic acid (PFHxS)				µg/L	0.01	0.001		0.018	0.0078	0.0084	0.02
Perfluorooctanesulfonic acid (PFOS)		0.13		µg/L	0.01	0.001		0.036	0.0054	0.0059	0.01
Perfluorooctanoic acid (PFOA)		220		µg/L	0.01	0.001		0.01	0.0028	0.0033	0.01
6:2 FTS				µg/L	0.01	<0.0004		0.0005	0.001	0.001	0.05
8:2 FTS				µg/L	0.01	<0.0004		<0.0004	<0.0004	<0.0004	0.05

* The metals results for QAQC2 BH4 are representative of Total Metals and not representative of dissolved metals. The elevated levels are a result of sediment in the sample.

[1] Low reliability trigger value; should only be used as indicative interim working level.

[2] Environmental Concern Level (ECL) for most toxic form of Arsenic (As), As (III), of 2.3 µg/L was applied for As (Total). NOTE the low reliability marine guideline trigger value for the less toxic form of As, As (V), is 4.5 µg/L. The ECL or the low reliability marine guideline trigger value should only be used as indicative interim working levels.

[3] Environmental Concern Level (ECL); should only be used as indicative interim working level.

Project: 9-11 Gibbons Street, Redfern
Client: St George Community Housing
CES Project Number: CES180204-SGC
Table 11: Waste Classification

Parameters	Unit	PQL	Waste Classification Criteria CT1 *	Restricted Solid Waste CT2 *	Sample ID	BH1_0.3-0.6	BH1_1.2-1.5	BH1_1.2-1.5	BH2_0.3-0.6	BH2_2.0-2.3	BH1_0.4-0.8	BH1_0.4-0.8	QAQC1_BH1_0.4-0.8	BH1_1.2-1.5	BH4_0.3-0.8	BH4_1.2-1.5	BH4_1.2-1.5	BH6_0.3-0.8	BH6_0.3-0.8	BH6_1.2-1.5
					Depth (mbgl)	0.3-0.6	1.2-1.5	1.2-1.5	0.3-0.6	2.0-2.3	0.4-0.8	0.4-0.8	0.4-0.8	1.2-1.5	0.3-0.8	1.2-1.5	1.2-1.5	0.3-0.8	0.3-0.8	1.2-1.5
					Date Sampled	27/02/2018	27/02/2018	27/02/2018	27/02/2018	27/02/2018	28/02/2018	28/02/2018	28/02/2018	28/02/2018	03/01/2018	03/01/2018	01/03/2018	02/03/2018	02/03/2018	02/03/2018
					Date Extracted	Fill	Natural	Natural	Fill	Natural	Fill	Fill	Fill	Natural	Fill	Natural	Natural	Fill	Fill	Natural
					Soil Unit	186116	186116	186116	186116	186116	186212	186212	186212	186212	186295	186295	186376	186376	186376	186376-B
					Lab report	Primary	Primary	Lab Duplicate	Primary	Primary	Primary	Lab Duplicate	Filed Duplicate	Primary	Primary	Primary	Lab Duplicate	Primary	Lab Duplicate	Primary
*** Refer to Table 3 for TCLP test results of shaded samples for additional waste classification.**																				
TRH C6 - C9	mg/kg	25	650	2600		<25	<25		<25	<25	<25		<25	<25	<25			<25	<25	<25
TRH C6 - C10	mg/kg	25				<25	<25		<25	<25	<25		<25	<25	<25			<25	<25	<25
FRACTION 1	mg/kg	25				<25	<25		<25	<25	<25		<25	<25	<25			<25	<25	<25
Benzene	mg/kg	0.2	10	40		<0.2	<0.2		<0.2	<0.2	<0.2		<0.2	<0.2	<0.2			<0.2	<0.2	<0.2
Toluene	mg/kg	0.5	288	1152		<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5			<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	1	600	2400		<1	<1		<1	<1	<1		<1	<1	<1			<1	<1	<1
m+p-xylene	mg/kg	2	1000	4000		<2	<2		<2	<2	<2		<2	<2	<2			<2	<2	<2
o-Xylene	mg/kg	1	1000	4000		<1	<1		<1	<1	<1		<1	<1	<1			<1	<1	<1
Xylenes (total)	mg/kg		1000	4000		<1	<1		<1	<1	<1		<1	<1	<1			<1	<1	<1
Naphthalene	mg/kg	1				<1	<1		<1	<1	<1		<1	<1	<1			85	160	<1
Total Phenolics	mg/kg	5	288	1152																
TRH C10 - C14	mg/kg	50				<50	<50		<50	<50	<50		<50	<50	<50			150	66	<50
TRH C15 - C28	mg/kg	100				<100	<100		280	<100	<100		<100	<100	<100			1000	390	<100
TRH C29 - C36	mg/kg	100				<100	<100		160	<100	<100		<100	<100	<100			360	150	<100
TRH total C10 - C36	mg/kg	50	10000**	40000																
TRH >C10-C16	mg/kg	50				<50	<50		<50	<50	<50		<50	<50	<50			270	110	<50
FRACTION 2	mg/kg	50				<50	<50		<50	<50	<50		<50	<50	<50			190	<50	<50
TRH >C16-C34	mg/kg	100				<100	<100		400	<100	<100		<100	<100	<100			1200	470	<100
TRH >C34-C40	mg/kg	100				<100	<100		<100	<100	<100		<100	<100	<100			140	<100	<100
Total +ve TRH (>C10-C40)	mg/kg					<50	<50		400	<50	<50		<50	<50	<50			1600	580	<50
Naphthalene	mg/kg	0.1				<0.1	<0.1		0.3	<0.1	<0.1		<0.1	<0.1	<0.1			200	28	0.6
Acenaphthylene	mg/kg	0.1				<0.1	<0.1		2.3	<0.1	0.1		<0.1	<0.1	<0.1			58	7.9	0.2
Acenaphthene	mg/kg	0.1				<0.1	<0.1		0.2	<0.1	<0.1		<0.1	<0.1	<0.1			18	1.8	<0.1
Fluorene	mg/kg	0.1				<0.1	<0.1		0.8	<0.1	<0.1		<0.1	<0.1	<0.1			94	10	<0.1
Phenanthrene	mg/kg	0.1				0.1	<0.1		10	0.1	0.7		<0.1	0.2	0.5			360	45	0.4
Anthracene	mg/kg	0.1				<0.1	<0.1		2.6	<0.1	0.2		<0.1	<0.1	0.2			92	11	0.2
Fluoranthene	mg/kg	0.1				0.3	<0.1		18	0.3	1.5		0.2	0.4	0.9			250	29	1.1
Pyrene	mg/kg	0.1				0.3	<0.1		20	0.4	1.7		0.2	0.3	0.8			250	29	1.2
Benzo(a)anthracene	mg/kg	0.1				0.2	<0.1		9.7	0.2	0.8		0.1	0.2	0.4			110	12	0.9
Chrysene	mg/kg	0.1				0.1	<0.1		6.9	0.2	1		0.1	0.2	0.5			98	11	0.8
Benzo(b+k)fluoranthene	mg/kg	0.2				0.3	<0.2		11	0.3	3.6		0.4	0.6	0.7			130	15	1
Benzo(a)pyrene	mg/kg	0.05	0.8	10		0.2	<0.05		7.5	0.2	3.1		0.1	0.2	0.4			98	11	1
Indeno(1,2,3-c,d)pyrene	mg/kg	0.3				<0.1	<0.1		3.3	<0.1	0.8		<0.1	<0.1	0.3			37	4	0.6
Dibenz(a,h)anthracene	mg/kg	0.1				<0.1	<0.1		1.3	<0.1	0.2		<0.1	<0.1	<0.1			12	1.1	0.2
Benzo(g,h,i)perylene	mg/kg	0.1				<0.1	<0.1		4.1	0.1	0.9		<0.1	<0.1	0.2			47	5.3	0.8
Benzo(a)pyrene TEQ	mg/kg	0.5				<0.5	<0.5		11	<0.5	1.8		<0.5	<0.5	0.6			140	15	1.4
Total +ve	mg/kg		200**	800		1.4	<0.05		98	1.9	13		1.2	2	4.7			1900	220	9
Individual aroclors (PCB)	mg/kg	0.1		50		<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	0.1			<1	<1	
Arsenic	mg/kg	4	100	400		5	<4		7	<4	41	33	7	9	52			6	4	4
Cadmium	mg/kg	0.4	20	80		<0.4	<0.4		<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.5			<0.4	<0.4	<0.4
Chromium	mg/kg	1	100	400		11	<1		9	13	5	8	4	4	6			11	8	10
Copper	mg/kg	1	-	-		40	<1		53	21	24	33	8	10	18			150	120	110
Lead	mg/kg	1	100	400		440	2		220	43	100	130	31	12	190			330	300	120
Mercury	mg/kg	0.1	4	16		1	<0.1		0.9	0.2	0.9	1	0.2	0.2	0.9			0.5	0.5	1
Nickel	mg/kg	1	40	160		6	<1		6	3	4	5	1	2	4			4	4	22
Zinc	mg/kg	1	-	-		200	17		120	32	170	180	28	28	410			150	150	140
Asbestos ID in soil																				
Trace Analysis																				
Exchangeable Ca	meq/100g	0.1					1.1	0.7								3.4	3.2			
Exchangeable K	meq/100g	0.1					<0.1	<0.1								0.3	0.3			
Exchangeable Mg	meq/100g	0.1					0.13	<0.1								0.35	0.33			
Exchangeable Na	meq/100g	0.1					<0.1	<0.1								<0.1	<0.1			
Cation Exchange Capacity	meq/100g	1					1.3	<1								4.1	3.8			
HCB	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
alpha-BHC	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
gamma-BHC	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
beta-BHC	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Heptachlor	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
delta-BHC	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Aldrin	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Heptachlor Epoxide	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
gamma-Chlordane	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
alpha-chlordane	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Chlordane	mg/kg	0.1																		
Endosulfan I	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
pp-DDE	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Dieldrin	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Aldrin and Dieldrin	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1						
Endrin	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
pp-DDD	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Endosulfan II	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Endosulfan	mg/kg	0.1									<0.1		<0.1	<0.1						
pp-DDT	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
DDT (Total)	mg/kg	0.1									<0.1		<0.1	<0.1						
DDT+DDE+DDD	mg/kg	0.1									<0.1		<0.1	<0.1						
Endrin Aldehyde	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Endosulfan Sulphate	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Methoxychlor	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Azinphos-methyl (Guthion)	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Bromophos-ethyl	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Chlorpyriphos	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Chlorpyriphos-methyl	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Diazinon	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Dichlorvos	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Dimethoate	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Ethion	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Fenitrothion	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Malathion	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Parathion	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Ronnel	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1			<0.1	<0.1	
Dichlorodifluoromethane	mg/kg	1							<1		<1									
Chloromethane	mg/kg	1							<1		<1									
Vinyl Chloride	mg/kg	1							<1		<1									
Bromomethane	mg/kg	1							<1		<1									
Chloroethane	mg/kg	1							<1		<1									
Trichlorofluoromethane	mg/kg	1							<1		<1									
1,1-Dichloroethene	mg/kg	1							<1		<1									
trans-1,2-dichloroethene	mg/kg	1							<1		<1									
1,1-dichloroethane	mg/kg	1							<1		<1									
cis-1,2-dichloroethene	mg/kg	1							<1		<1									
bromochloromethane	mg/kg	1							<1		<1									
chloroform	mg/kg	1							<1		<1									
2,2-dichloropropane	mg/kg	1							<1		<1									
1,2-dichloroethane	mg/kg	1							<1		<1									
1,1,1-trichloroethane	mg/kg	1							<1		<1									
1,1-dichloropropene	mg/kg	1							<1		<1									
carbon tetrachloride	mg/kg	1							<1		<1									
dibromomethane	mg/kg	1							<1		<1									
1,2-dichloropropane	mg/kg	1							<1		<1									
trichloroethene	mg/kg	1							<1		<1									
bromodichloromethane	mg/kg	1							<1		<1									
trans-1,3-dichloropropene	mg/kg	1							<1		<1									
cis-1,3-dichloropropene	mg/kg	1							<1		<1									
1,1,2-trichloroethane	mg/kg	1							<1		<1									
1,3-dichloropropane	mg/kg	1							<1		<1									
dibromochloromethane	mg/kg	1							<1		<1									
1,2-dibromoethane	mg/kg	1							<1		<1									
tetrachloroethene	mg/kg	1							<1		<1									
1,1,1,2-tetrachloroethane	mg/kg	1							<1		<1									
chlorobenzene	mg/kg	1							<1		<1									
bromoform	mg/kg	1							<1		<1									
1,1,2,2-tetrachloroethane	mg/kg	1							<1		<1									
1,2,3-trichloropropane	mg/kg	1							<1		<1									
bromobenzene	mg/kg	1							<1		<1									
2-chlorotoluene	mg/kg	1							<1		<1									
4-chlorotoluene	mg/kg	1							<1		<1									
1,3-dichlorobenzene	mg/kg	1							<1		<1									
1,4-dichlorobenzene	mg/kg	1							<1		<1									
1,2-dichlorobenzene	mg/kg	1							<1		<1									
1,2-dibromo-3-chloropropane	mg/kg	1							<1		<1									
1,2,4-trichlorobenzene	mg/kg	1							<1		<1									
hexachlorobutadiene	mg/kg	1							<1		<1									
1,2,3-trichlorobenzene	mg/kg	1							<1		<1									
Sample mass tested	g					1185.5			1428.9		1426.8				1007.93			909.85		
Sample Description	-					Brown coarse-grained soil & rocks			Brown coarse-grained soil & rocks		Grey sandy soil & rocks				Brown fine-grained soil & rocks			Brown coarse- grained soil & rocks		
Asbestos ID in soil (as per AS4964)	-					No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected			No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected		No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected				No asbestos detected at reporting limit of 0.1g/kg: Organic fibre detected			No asbestos detected at reporting limit of 0.1g/kg: Organic fibre detected		
Trace Analysis	-					No asbestos detected			No asbestos detected		No asbestos detected				No asbestos detected			No asbestos detected		
Total Asbestos#1	g/kg	<0.1				<0.1			<0.1		<0.1				<0.1			<0.1		
Asbestos ID in soil <0.1g/kg*	-	N/A				No visible asbestos detected			No visible asbestos detected		No visible asbestos detected				No visible asbestos detected			No visible asbestos detected		
ACM >7mm Estimation*	g	-				-			-		-				-			-		
FA and AF Estimation*	g	-				-			-		-				-			-		
ACM >7mm Estimation*	%(w/w)	<0.01				<0.01			<0.01		<0.01				<0.01			<0.01		
FA and AF Estimation*#2	%(w/w)	<0.001				<0.001			<0.001		<0.001				<0.001			<0.001		

Project: 9-11 Gibbons Street, Redfern
Client: St George Community Housing
CES Project Number: CES180204-SGC
Table 11: Waste Classification

				Sample ID	BH5_0.3-0.9	BH5_1.2-1.5	BH7_0.3-0.9	BH7_1.2-1.5	BH8_0.3-0.9	BH8_1.2-1.5	BH9_0.3-0.9	BH9_1.2-1.5	BH8_1.2-1.5	BH8_1.2-1.5	BH10_0.3-0.9	BH10_0.3-0.9	BH10_1.2-1.5	BH10_1.2-1.5
				Depth (mbgl)	0.3-0.9	1.2-1.5	0.3-0.9	1.2-1.5	0.3-0.9	1.2-1.5	0.3-0.9	1.2-1.5	1.2-1.5	1.2-1.5	0.3-0.9	0.3-0.9	1.2-1.5	1.2-1.5
				Date Sampled	02/03/2018	02/03/2018	02/03/2018	02/03/2018	02/03/2018	02/03/2018	02/03/2018	02/03/2018	02/03/2018	02/03/2018	06/03/2018	06/03/2018	06/03/2018	06/03/2018
				Date Extracted	Fill	Natutal	Fill	Natutal	Fill	Natural	Fill	Natural	Natural	Natural	Fill	Fill	Natural	Natural
				Soil Unit	186376	186376	186376	186376-B	186376	186376	186376	186376	186376-A	186376-A	186297	186297	186297	186297
				Lab report	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Lab Duplicate	Primary	Lab Duplicate	Primary	Lab Duplicate
Parameters	Unit	PQL	Waste Classification Criteria CT1 *	Restricted Solid Waste CT2 *														
*** Refer to Table 3 for TCLP test results**																		
TRH C6 - C9	mg/kg	25	650	2600	<25		<25		<25		<25		<25	<25	<25	<25	<25	
TRH C6 - C10	mg/kg	25			<25		<25		<25		<25		<25	<25	<25	<25	<25	
FRACTION 1	mg/kg	25			<25		<25		<25		<25		<25	<25	<25	<25	<25	
Benzene	mg/kg	0.2	10	40	<0.2		<0.2		<0.2		<0.2		<0.2	<0.2	<0.2	<0.2	<0.2	
Toluene	mg/kg	0.5	288	1152	<0.5		<0.5		<0.5		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	
Ethylbenzene	mg/kg	1	600	2400	<1		<1		<1		<1		<1	<1	<1	<1	<1	
m+p-xylene	mg/kg	2	1000	4000	<2		<2		<2		<2		<2	<2	<2	<2	<2	
o-Xylene	mg/kg	1	1000	4000	<1		<1		<1		<1		<1	<1	<1	<1	<1	
Xylenes (total)	mg/kg		1000	4000	<1		<1		<1		<1		<1	<1	<1	<1	<1	
Naphthalene	mg/kg	1			<1		<1		5		<1		<1	<1	<1	<1	<1	
Total Phenolics	mg/kg	5	288	1152														
TRH C10 - C14	mg/kg	50			<50		<50		<50		<50		<50	<50	<50	<50	<50	
TRH C15 - C28	mg/kg	100			<100		450		240		<100		<100	<100	970	1200	<100	
TRH C29 - C36	mg/kg	100			<100		260		160		<100		<100	<100	800	1100	<100	
TRH total C10 - C36	mg/kg	50	10000**	40000														
TRH >C10-C16	mg/kg	50			<50		<50		<50		<50		<50	<50	<50	<50	<50	
FRACTION 2	mg/kg	50			<50		<50		<50		<50		<50	<50	<50	<50	<50	
TRH >C16-C34	mg/kg	100			<100		640		360		<100		<100	<100	1600	2000	<100	
TRH >C34-C40	mg/kg	100			<100		200		120		<100		<100	<100	390	570	<100	
Total +ve TRH (>C10-C40)	mg/kg				<50		830		480		<50		<50	<50	2000	2600	<50	
Naphthalene	mg/kg	0.1			0.2		0.8	<0.1	4		0.4		0.3	0.2	2.3	2.1	<0.1	
Acenaphthylene	mg/kg	0.1			0.2		2.8	<0.1	2		0.7		0.4	0.2	2.8	3.6	<0.1	
Acenaphthene	mg/kg	0.1			<0.1		0.5	<0.1	<0.1		0.1		<0.1	<0.1	<1	<1	<0.1	
Fluorene	mg/kg	0.1			0.1		3.2	<0.1	0.3		0.5		0.2	0.2	2.9	2.3	<0.1	
Phenanthrene	mg/kg	0.1			1.1		22	<0.1	5.2		4.3		2	1.2	28	25	<0.1	
Anthracene	mg/kg	0.1			0.3		6.4	<0.1	1.8		1.3		0.8	0.4	12	10	<0.1	
Fluoranthene	mg/kg	0.1			1.2		24	<0.1	14		6.2		3.1	1.8	61	70	<0.1	
Pyrene	mg/kg	0.1			1.1		22	<0.1	15		6.3		3	1.9	61	80	<0.1	
Benzo(a)anthracene	mg/kg	0.1			0.6		12	<0.1	8		3.3		1.7	1	28	35	<0.1	
Chrysene	mg/kg	0.1			0.5		8.6	<0.1	6.7		2.6		1.4	0.8	32	39	<0.1	
Benzo(b+k)fluoranthene	mg/kg	0.2			0.8		15	<0.2	10		4.5		2.5	1	53	63	<0.2	
Benzo(a)pyrene	mg/kg	0.05	0.8	10	0.5		10	<0.05	7		3		1.6	0.98	37	44	<0.05	
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1			0.2		4.1	<0.1	2.8		1.3		0.8	0.4	35	42	<0.1	
Dibenz(a,h)anthracene	mg/kg	0.1			<0.1		1.4	<0.1	1		0.5		0.3	0.1	6.3	7.4	<0.1	
Benzo(g,h,i)perylene	mg/kg	0.1			0.2		4.9	<0.1	3.5		1.5		1	0.5	35	43	<0.1	
Benzo(a)pyrene TEQ	mg/kg	0.5			0.7		15	<0.5	10		4.4		2.6	1.4	56	66	<0.5	
Total +ve	mg/kg	-	200**	800	7		140	<0.05	81		36		19	11	600	670	<0.05	
Individual aroclors (PCB)	mg/kg	0.1		50	<0.1		<0.5		<0.5		<0.1		<0.1	<0.1	<1	<1	<0.1	
Arsenic	mg/kg	4	100	400	10		5	8	7		8		<4	<4	<4	<4	<4	
Cadmium	mg/kg	0.4	20	80	<0.4		<0.4	<0.4	<0.4		<0.4		<0.4	<0.4	<0.4	<0.4	<0.4	
Chromium	mg/kg	1	100	400	12		13	4	10		12		3	3	6	5	<1	
Copper	mg/kg	1	-	-	750		90	8	73		84		8	10	47	48	<1	
Lead	mg/kg	1	100	400	220		170	39	660		240		39	42	89	100	1	
Mercury	mg/kg	0.1	4	16	1.5		0.5	0.2	0.5		1.1		0.3	0.4	0.3	0.4	<0.1	
Nickel	mg/kg	1	40	160	5		8	6	17		8		3	3	6	5	<1	
Zinc	mg/kg	1			340		330	27	160		240		47	48	110	130	9	
Asbestos ID in soil																		
Trace Analysis																		
Exchangeable Ca	meq/100g	0.1																
Exchangeable K	meq/100g	0.1																
Exchangeable Mg	meq/100g	0.1																
Exchangeable Na	meq/100g	0.1																
Cation Exchange Capacity	meq/100g	1																
HCB	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
alpha-BHC	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
gamma-BHC	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
beta-BHC	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Heptachlor	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
delta-BHC	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Aldrin	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Heptachlor Epoxide	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
gamma-Chlordane	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
alpha-chlordane	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Chlordane	mg/kg	0.1																
Endosulfan I	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
pp-DDE	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Dieldrin	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Aldrin and Dieldrin	mg/kg	0.1																
Endrin	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
pp-DDD	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Endosulfan II	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Endosulfan	mg/kg	0.1																
pp-DDT	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
DDT (Total)	mg/kg	0.1																
DDT+DDE+DDD	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Endrin Aldehyde	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Endosulfan Sulphate	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Methoxychlor	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Azinphos-methyl (Guthion)	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Bromophos-ethyl	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Chlorpyriphos	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Chlorpyriphos-methyl	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Diazinon	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Dichlorvos	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Dimethoate	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Ethion	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Fenitrothion	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Malathion	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Parathion	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Ronnel	mg/kg	0.1			<0.1		<0.1		<0.1		<0.1		<0.1	<0.1	<1	<1	<0.1	
Dichlorodifluoromethane	mg/kg	1			<1		<1											
Chloromethane	mg/kg	1			<1		<1											
Vinyl Chloride	mg/kg	1			<1		<1											
Bromomethane	mg/kg	1			<1		<1											
Chloroethane	mg/kg	1			<1		<1											
Trichlorofluoromethane	mg/kg	1			<1		<1											
1,1-Dichloroethene	mg/kg	1			<1		<1											
trans-1,2-dichloroethene	mg/kg	1			<1		<1											
1,1-dichloroethane	mg/kg	1			<1		<1											
cis-1,2-dichloroethene	mg/kg	1			<1		<1											
bromochloromethane	mg/kg	1			<1		<1											
chloroform	mg/kg	1			<1		<1											
2,2-dichloropropane	mg/kg	1			<1		<1											
1,2-dichloroethane	mg/kg	1			<1		<1											
1,1,1-trichloroethane	mg/kg	1			<1		<1											
1,1-dichloropropene	mg/kg	1			<1		<1											
carbon tetrachloride	mg/kg	1			<1		<1											
dibromomethane	mg/kg	1			<1		<1											
1,2-dichloropropane	mg/kg	1			<1		<1											
trichloroethene	mg/kg	1			<1		<1											
bromodichloromethane	mg/kg	1			<1		<1											
trans-1,3-dichloropropene	mg/kg	1			<1		<1											
cis-1,3-dichloropropene	mg/kg	1			<1		<1											
1,1,2-trichloroethane	mg/kg	1			<1		<1											
1,3-dichloropropane	mg/kg	1			<1		<1											
dibromochloromethane	mg/kg	1			<1		<1											
1,2-dibromoethane	mg/kg	1			<1		<1											
tetrachloroethene	mg/kg	1			<1		<1											
1,1,1,2-tetrachloroethane	mg/kg	1			<1		<1											
chlorobenzene	mg/kg	1			<1		<1											
bromoform	mg/kg	1			<1		<1											
1,1,2,2-tetrachloroethane	mg/kg	1			<1		<1											
1,2,3-trichloropropane	mg/kg	1			<1		<1											
bromobenzene	mg/kg	1			<1		<1											
2-chlorotoluene	mg/kg	1			<1		<1											
4-chlorotoluene	mg/kg	1			<1		<1											
1,3-dichlorobenzene	mg/kg	1			<1		<1											
1,4-dichlorobenzene	mg/kg	1			<1		<1											
1,2-dichlorobenzene	mg/kg	1			<1		<1											
1,2-dibromo-3-chloropropane	mg/kg	1			<1		<1											
1,2,4-trichlorobenzene	mg/kg	1			<1		<1											
hexachlorobutadiene	mg/kg	1			<1		<1											
1,2,3-trichlorobenzene	mg/kg	1			<1		<1											
Sample mass tested	g				1122.91		1185.08		1290.67		704.73				1588.3			
Sample Description	-				Brown coarse- grained soil & rocks		Brown coarse- grained soil & rocks		Brown coarse- grained soil & rocks		Brown coarse- grained soil & rocks				Brown sandy soil & rocks			
Asbestos ID in soil (as per AS4964)	-				No asbestos detected at reporting limit of 0.1g/kg Organic fibre detected		No asbestos detected at reporting limit of 0.1g/kg Organic fibre detected		No asbestos detected at reporting limit of 0.1g/kg Organic fibre detected		No asbestos detected at reporting limit of 0.1g/kg Organic fibre detected				No asbestos detected at reporting limit of 0.1g/kg Organic fibre detected			
Trace Analysis	-				No asbestos detected		No asbestos detected		No asbestos detected		No asbestos detected				No asbestos detected			
Total Asbestos#1	g/kg	<0.1			<0.1		<0.1		<0.1		<0.1				<0.1			
Asbestos ID in soil <0.1g/kg*	-	N/A			No visible asbestos detected		No visible asbestos detected		No visible asbestos detected		No visible asbestos detected				No visible asbestos detected			
ACM >7mm Estimation*	g	-			-		-		-		-				-			
FA and AF Estimation*	g	-			-		-		-		-				-			
ACM >7mm Estimation*	%(w/w)	<0.01			<0.01		<0.01		<0.01		<0.01				<0.01			
FA and AF Estimation*#2	%(w/w)	<0.001			<0.001		<0.001		<0.001		<0.001				<0.001			

Project: 9-11 Gibbons Street, Redfern
Client: St George Community Housing
CES Project Number: CES180204-SGC
Table 11: Waste Classification

Parameters	Unit	PQL	Waste Classification Criteria CT1 *	Restricted Solid Waste CT2 *	Sample ID	BH11_0.3-0.7	BH11_0.3-0.7	BH11_1.3-1.6	BH11_1.3-1.6	BH1_0.4-0.8	QAQC1	QAQC2	BH2_1.2-1.5
					Depth (mbgl)	0.3-0.7	0.3-0.7	1.2-1.5	1.2-1.5	0.4-0.8	0.4-0.8	0.4-0.8	1.2-1.5
					Date Sampled	06/03/2018	06/03/2018	06/03/2018	06/03/2018	28/02/2018	28/02/2018	28/02/2018	28/02/2018
					Date Extracted	Fill	Fill	Natural	Natural	Fill	Fill	Fill	Natural
					Soil Unit	180297	180297	180297-A	180297-A	180608	180608	180608	180608
					Lab report	Primary	Lab Duplicate	Primary	Lab Duplicate	Primary	Field Duplicate of BH1_0.4-0.8	Field Triplicate of BH1_0.4-0.8	
*** Refer to Table 3 for TCLP test results**													
TRH C6 - C9	mg/kg	25	650	2600	<25							<10	
TRH C6 - C10	mg/kg	25			<25							<10	
FRACTION 1	mg/kg	25			<25							<10	
Benzene	mg/kg	0.2	10	40	<0.2							<0.2	
Toluene	mg/kg	0.5	288	1152	<0.5							<0.5	
Ethylbenzene	mg/kg	1	600	2400	<1							<0.5	
m+p-xylene	mg/kg	2	1000	4000	<2							<0.5	
o-Xylene	mg/kg	1	1000	4000	<1							<0.5	
Xylenes (total)	mg/kg		1000	4000	<1							<0.5	
Naphthalene	mg/kg	1			<1							<1	
Total Phenolics	mg/kg	5	288	1152									
TRH C10 - C14	mg/kg	50			<50							<50	
TRH C15 - C28	mg/kg	100			390							<100	
TRH C29 - C36	mg/kg	100			410							<100	
TRH total C10 - C36	mg/kg	50	10000**	40000								<50	
TRH >C10-C16	mg/kg	50			<50							<50	
FRACTION 2	mg/kg	50			<50							<50	
TRH >C16-C34	mg/kg	100			690							<100	
TRH >C34-C40	mg/kg	100			190							<100	
Total +ve TRH (>C10-C40)	mg/kg				880							<50	
Naphthalene	mg/kg	0.1			0.4		<0.1					<0.5	
Acenaphthylene	mg/kg	0.1			1.7		<0.1					<0.5	
Acenaphthene	mg/kg	0.1			<0.1		<0.1					<0.5	
Fluorene	mg/kg	0.1			0.2		<0.1					<0.5	
Phenanthrene	mg/kg	0.1			7.8		<0.1					<0.5	
Anthracene	mg/kg	0.1			2.4		<0.1					<0.5	
Fluoranthene	mg/kg	0.1			16		<0.1					<0.5	
Pyrene	mg/kg	0.1			17		<0.1					<0.5	
Benzo(a)anthracene	mg/kg	0.1			8.7		<0.1					<0.5	
Chrysene	mg/kg	0.1			8		<0.1					<0.5	
Benzo(b+k)fluoranthene	mg/kg	0.2			15		<0.2						
Benzo(a)pyrene	mg/kg	0.05	0.8	10	2.7		<0.05					<0.5	
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1			6		<0.1					<0.5	
Dibenz(a,h)anthracene	mg/kg	0.1			0.5		<0.1					<0.5	
Benzo(g,h,i)perylene	mg/kg	0.1			8.8		<0.1					<0.5	
Benzo(a)pyreme TEQ	mg/kg	0.5			6.3		<0.5					1.2	
Total +ve	mg/kg	1	200**	800	95		<0.05						
Individual aroclors (PCB)	mg/kg	0.1		50	<0.5							<0.1	
Arsenic	mg/kg	4	100	400	490		8.20	7.70				<5	
Cadmium	mg/kg	0.4	20	80	0.7		<0.4	<0.4				<1	
Chromium	mg/kg	1	100	400	12		11	11				3	
Copper	mg/kg	1	-	-	60		2	2				6	
Lead	mg/kg	1	100	400	280		14	12				23	
Mercury	mg/kg	0.1	4	16	0.9		<0.1	<0.1				0.1	
Nickel	mg/kg	1	40	160	8		1	2				2	
Zinc	mg/kg	1			500		46	48				19	
Asbestos ID in soil													
Trace Analysis													
Exchangeable Ca	meq/100g	0.1											
Exchangeable K	meq/100g	0.1											
Exchangeable Mg	meq/100g	0.1											
Exchangeable Na	meq/100g	0.1											
Cation Exchange Capacity	meq/100g	1											
HCB	mg/kg	0.1			<0.1								
alpha-BHC	mg/kg	0.1			<0.1								
gamma-BHC	mg/kg	0.1			<0.1								
beta-BHC	mg/kg	0.1			<0.1								
Heptachlor	mg/kg	0.1			<0.1								
delta-BHC	mg/kg	0.1			<0.1								
Aldrin	mg/kg	0.1			<0.1								
Heptachlor Epoxide	mg/kg	0.1			<0.1								
gamma- Chlordane	mg/kg	0.1			<0.1								
alpha-chlordane	mg/kg	0.1			<0.1								
Chlordane	mg/kg	0.1											
Endosulfan I	mg/kg	0.1			<0.1								
pp-DDE	mg/kg	0.1			<0.1								
Dieldrin	mg/kg	0.1			<0.1								
Aldrin and Dieldrin	mg/kg	0.1											
Endrin	mg/kg	0.1			<0.1								
pp-DDD	mg/kg	0.1			<0.1								
Endosulfan II	mg/kg	0.1			<0.1								
Endosulfan	mg/kg	0.1											
pp-DDT	mg/kg	0.1			<0.1								
DDT (Total)	mg/kg	0.1											
DDT+DDE+DDD	mg/kg	0.1			<0.1								
Endrin Aldehyde	mg/kg	0.1			<0.1								
Endosulfan Sulphate	mg/kg	0.1			<0.1								
Methoxychlor	mg/kg	0.1			<0.1								
Azinphos-methyl (Guthion)	mg/kg	0.1			<0.1								
Bromophos-ethyl	mg/kg	0.1			<0.1								
Chlorpyriphos	mg/kg	0.1			<0.1								
Chlorpyriphos-methyl	mg/kg	0.1			<0.1								
Diazinon	mg/kg	0.1			<0.1								
Dichlorvos	mg/kg	0.1			<0.1								
Dimethoate	mg/kg	0.1			<0.1								
Ethion	mg/kg	0.1			<0.1								
Fenitrothion	mg/kg	0.1			<0.1								
Malathion	mg/kg	0.1			<0.1								
Parathion	mg/kg	0.1			<0.1								
Ronnel	mg/kg	0.1			<0.1								
Dichlorodifluoromethane	mg/kg	1			<1	<1	<1						
Chloromethane	mg/kg	1			<1	<1	<1						
Vinyl Chloride	mg/kg	1			<1	<1	<1						
Bromomethane	mg/kg	1			<1	<1	<1						
Chloroethane	mg/kg	1			<1	<1	<1						
Trichlorofluoromethane	mg/kg	1			<1	<1	<1						
1,1-Dichloroethene	mg/kg	1			<1	<1	<1						
trans-1,2-dichloroethene	mg/kg	1			<1	<1	<1						
1,1-dichloroethane	mg/kg	1			<1	<1	<1						
cis-1,2-dichloroethene	mg/kg	1			<1	<1	<1						
bromochloromethane	mg/kg	1			<1	<1	<1						
chloroform	mg/kg	1			<1	<1	<1						
2,2-dichloropropane	mg/kg	1			<1	<1	<1						
1,2-dichloroethane	mg/kg	1			<1	<1	<1						
1,1,1-trichloroethane	mg/kg	1			<1	<1	<1						
1,1-dichloropropene	mg/kg	1			<1	<1	<1						
carbon tetrachloride	mg/kg	1			<1	<1	<1						
dibromomethane	mg/kg	1			<1	<1	<1						
1,2-dichloropropane	mg/kg	1			<1	<1	<1						
trichloroethene	mg/kg	1			<1	<1	<1						
bromodichloromethane	mg/kg	1			<1	<1	<1						
trans-1,3-dichloropropene	mg/kg	1			<1	<1	<1						
cis-1,3-dichloropropene	mg/kg	1			<1	<1	<1						
1,1,2-trichloroethane	mg/kg	1			<1	<1	<1						
1,3-dichloropropane	mg/kg	1			<1	<1	<1						
dibromochloromethane	mg/kg	1			<1	<1	<1						
1,2-dibromoethane	mg/kg	1			<1	<1	<1						
tetrachloroethene	mg/kg	1			<1	<1	<1						
1,1,1,2-tetrachloroethane	mg/kg	1			<1	<1	<1						
chlorobenzene	mg/kg	1			<1	<1	<1						
bromoform	mg/kg	1			<1	<1	<1						
1,1,2,2-tetrachloroethane	mg/kg	1			<1	<1	<1						
1,2,3-trichloropropane	mg/kg	1			<1	<1	<1						
bromobenzene	mg/kg	1			<1	<1	<1						
2-chlorotoluene	mg/kg	1			<1	<1	<1						
4-chlorotoluene	mg/kg	1			<1	<1	<1						
1,3-dichlorobenzene	mg/kg	1			<1	<1	<1						
1,4-dichlorobenzene	mg/kg	1			<1	<1	<1						
1,2-dichlorobenzene	mg/kg	1			<1	<1	<1						
1,2-dibromo-3-chloropropane	mg/kg	1			<1	<1	<1						
1,2,4-trichlorobenzene	mg/kg	1			<1	<1	<1						
hexachlorobutadiene	mg/kg	1			<1	<1	<1						
1,2,3-trichlorobenzene	mg/kg	1			<1	<1	<1						
Sample mass tested	g				1041.99								
Sample Description	-				Brown sandy soil & rocks								
Asbestos ID in soil (as per AS4964)	-				No asbestos detected at reporting limit of 0.1g/kg Organic fibre detected								
Trace Analysis	-				No asbestos detected								
Total AsbestosFI	g/kg	<0.1			<0.1								
Asbestos ID in soil <0.1g/kg*	-	NA			No visible asbestos detected								
ACM >7mm Estimation*	g	--			--								
FA and AF Estimation*	g	--			--								
ACM >7mm Estimation*	%(w/w)	<0.01			<0.01								
FA and AF Estimation*#2	%(w/w)	<0.001			<0.001								

Project: 9-11 Gibbons Street, Redfern
Client: St George Community Housing
CES Project Number: CES180204-SGC
Table 12: TCLP Results

						Investigation	186116-A		186116-A		186212-A		186295-A		186597-A		186597-A	
						Sample	BH3_0.3-0.6_metal		BH2_0.3-0.6_PAH&lead		BH1_0.4-0.8_PAH&lead		BH4_0.3-0.8_metal		BH10_0.3-0.9_PAHs		BH11_0.3-0.7_PAH&,metals	
						Depth	0.3-0.6		0.3-0.6		0.4-0.8		0.3-0.8		0.3-0.9		0.3-0.7	
						Date of Sample	27/02/2018		27/02/2018		28/02/2018		1/03/2018		6/03/2018		6/03/2018	
						Material Unit	Fill		Fill		Fill		Fill		Fill		Fill	
Parameter	Units	PQL	General Solid Waste leachable concentration (TCLP1) (mg/L)	General Solid Waste Specific Contaminant Concentration (mg/kg)	Restricted Solid Waste leachable concentration (TCLP2) (mg/L)	Restricted Solid Waste Specific Contaminant Concentration (mg/kg)	TCLP Concentration (mg/L)	CT Concentration (mg/kg)	TCLP Concentration (mg/L)	CT Concentration (mg/kg)	TCLP Concentration (mg/L)	CT Concentration (mg/kg)	TCLP Concentration (mg/L)	CT Concentration (mg/kg)	TCLP Concentration (mg/L)	CT Concentration (mg/kg)	TCLP Concentration (mg/L)	CT Concentration (mg/kg)
Naphthalene in TCLP	mg/L	0.001							<0.001	0.3	<0.001	<0.1			<0.001	2.3	<0.001	0.4
Acenaphthylene in TCLP	mg/L	0.001							<0.001	2.3	<0.001	0.1			<0.001	2.8	<0.001	1.7
Acenaphthene in TCLP	mg/L	0.001							<0.001	0.2	<0.001	<0.1			<0.001	<1	<0.001	<0.1
Fluorene in TCLP	mg/L	0.001							<0.001	0.8	<0.001	<0.1			<0.001	2.9	<0.001	0.2
Phenanthrene in TCLP	mg/L	0.001							<0.001	10	<0.001	0.7			0.007	28	<0.001	7.8
Anthracene in TCLP	mg/L	0.001							<0.001	2.6	<0.001	0.2			0.002	12	<0.001	2.4
Fluoranthene in TCLP	mg/L	0.001							<0.001	18	<0.001	1.5			0.006	61	<0.001	16
Pyrene in TCLP	mg/L	0.001							<0.001	20	<0.001	1.7			0.005	61	<0.001	17
Benzo(a)anthracene in TCLP	mg/L	0.001							<0.001	9.7	<0.001	0.8			<0.001	28	<0.001	8.7
Chrysene in TCLP	mg/L	0.001							<0.001	6.9	<0.001	1			<0.001	32	<0.001	8
Benzo(bjk)fluoranthene in TCLP	mg/L	0.002							<0.002	11	<0.002	3.6			<0.002	53	<0.002	15
Benzo(a)pyrene in TCLP	mg/L	0.001	0.04	10	0.16	23			<0.001	7.5	<0.001	1.1			<0.001	37	<0.001	2.7
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	0.001							<0.001	3.3	<0.001	0.8			<0.001	35	<0.001	6
Dibenzo(a,h)anthracene in TCLP	mg/L	0.001							<0.001	1.3	<0.001	0.2			<0.001	6.3	<0.001	0.5
Benzo(g,h,i)perylene in TCLP	mg/L	0.001							<0.001	4.1	<0.001	0.9			<0.001	35	<0.001	8.8
Total +ve PAH's	mg/L		N/A	200	N/A	800			NIL (+)VE	98	NIL (+)VE	13			0.02	400	NIL (+)VE	95
Surrogate p-Terphenyl-d14	%								114		104							
pH of soil for fluid# determ.	pH units	0.1					8.8		8.8		8.4		8.6		9.8		9.4	
pH of soil TCLP (after HCl)	pH units	0.1					1.8		1.9		1.9		1.9		2		1.8	
Extraction fluid used	-	1					1		1		1		1		1		1	
pH of final Leachate	pH units	0.1					5.1		5.6		5.1		5		5.2		5.4	
Arsenic in TCLP	mg/L	0.05	5	500	20	2000	<0.05	5					0.3	52			2.8	490
Cadmium in TCLP	mg/L	0.01	1	100	4	400	<0.01	<0.4					<0.01	0.5			<0.01	0.7
Chromium in TCLP	mg/L	0.01	5	1900	20	7600	0.02	11					<0.01	6			<0.01	12
Copper in TCLP	mg/L	0.01					0.01	40					<0.01	18			0.05	60
Lead in TCLP	mg/L	0.03	5	1500	20	6000	0.3	440	0.1	220	0.04	100	0.04	190			0.33	280
Mercury in TCLP	mg/L	0.0005	0.2	50	0.8	200	<0.0005	1					<0.0005	0.9			<0.0005	0.9
Nickel in TCLP	mg/L	0.02	2	1050	8	4200	<0.02	6					<0.02	4			0.03	8
Zinc in TCLP	mg/L	0.02					0.7	200					2.5	410			4.8	500
(PFHxS)+ (PFOS)	µg/kg	0.01																
	µg/kg	0.01																
Perfluorooctanoic acid (PFOA)	µg/kg	0.01																
6:2 FTS	µg/kg	0.01																
8:2 FTS	µg/kg	0.01																

Project: 9-11 Gibbons Street, Redfern

Client: St George Community Housing

CES Project Number: CES180204-SGC

Table 12: TCLP Results

						Investigation	186376-B		186376-B		186376-B		186376-B		186376-B	
						Sample	BH6_0.3-0.8_Meatals & PAHs		BH5_0.3-0.9_Metals		BH7_0.3-0.9_Metals& PAHs		BH8_0.3-0.9_Metals& PAHs&PFAS		BH9_0.3-0.9_Metals& PAHs	
						Depth	0.3-0.8		0.3-0.9		0.3-0.9		0.3-0.9		0.3-0.9	
						Date of Sample	2/03/2018		2/03/2018		2/03/2018		2/03/2018		2/03/2018	
						Material Unit	Fill		Fill		Fill		Fill		Fill	
Parameter	Units	PQL	General Soild Waste leachable concentration (TCLP1) (mg/L)	General Solid Waste Specific Contaminant Concentration (mg/kg)	Restricted Solid Waste leachable concentration (TCLP2) (mg/L)	Restricted Solid Waste Specific Contaminant Concentration (mg/kg)	TCLP Concentration (mg/L)	CT Concentration (mg/kg)	TCLP Concentration (mg/L)	CT Concentration (mg/kg)	TCLP Concentration (mg/L)	CT Concentration (mg/kg)	TCLP Concentration (mg/L)	CT Concentration (mg/kg)	TCLP Concentration (mg/L)	CT Concentration (mg/kg)
Naphthalene in TCLP	mg/L	0.001					1.1	200			0.021	0.8	0.001	4	0.001	0.4
Acenaphthylene in TCLP	mg/L	0.001					0.11	58			0.002	2.8	<0.001	2	<0.001	0.7
Acenaphthene in TCLP	mg/L	0.001					0.028	18			<0.001	0.5	<0.001	<0.1	<0.001	0.1
Fluorene in TCLP	mg/L	0.001					0.086	94			0.003	3.2	<0.001	0.3	<0.001	0.5
Phenanthrene in TCLP	mg/L	0.001					0.12	360			0.007	22	0.001	5.2	<0.001	4.3
Anthracene in TCLP	mg/L	0.001					0.02	92			0.001	6.4	<0.001	1.8	<0.001	1.3
Fluoranthene in TCLP	mg/L	0.001					0.017	250			0.001	24	<0.001	14	<0.001	6.2
Pyrene in TCLP	mg/L	0.001					0.014	250			<0.001	22	<0.001	15	<0.001	6.3
Benzo(a)anthracene in TCLP	mg/L	0.001					0.002	110			<0.001	12	<0.001	8	<0.001	3.3
Chrysene in TCLP	mg/L	0.001					0.002	98			<0.001	8.6	<0.001	6.7	<0.001	2.6
Benzo(bjk)fluoranthene in TCLP	mg/L	0.002					<0.002	130			<0.002	15	<0.002	10	<0.002	4.5
Benzo(a)pyrene in TCLP	mg/L	0.001	0.04	10	0.16	23	0.001	98			<0.001	10	<0.001	7	<0.001	3
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	0.001					<0.001	37			<0.001	4.1	<0.001	2.8	<0.001	1.3
Dibenzo(a,h)anthracene in TCLP	mg/L	0.001					<0.001	12			<0.001	1.4	<0.001	1	<0.001	0.5
Benzo(g,h,i)perylene in TCLP	mg/L	0.001					<0.001	47			<0.001	4.9	<0.001	3.5	<0.001	1.5
Total +ve PAH's	mg/L		N/A	200	N/A	800	1.5	1900			0.036	140	0.002	81	0.001	36
Surrogate p-Terphenyl-d14	%															
pH of soil for fluid# determ.	pH units	0.1					9.2		9.1		8.9		8.7		9.3	
pH of soil TCLP (after HCl)	pH units	0.1					2		1.9		1.8		1.8		1.8	
Extraction fluid used	-	1					1		1		1		1		1	
pH of final Leachate	pH units	0.1					5.6		5.9		5.1		5.1		5.1	
Arsenic in TCLP	mg/L	0.05	5	500	20	2000	<0.05	6	<0.05	10	<0.05	5	<0.05	7	<0.05	8
Cadmium in TCLP	mg/L	0.01	1	100	4	400	<0.01	<0.4	<0.01	<0.4	<0.01	<0.4	<0.01	<0.4	<0.01	<0.4
Chromium in TCLP	mg/L	0.01	5	1900	20	7600	<0.01	11	<0.01	12	<0.01	13	<0.01	10	<0.01	12
Copper in TCLP	mg/L	0.01					0.1	150	0.04	750	0.04	90	0.04	73	0.01	84
Lead in TCLP	mg/L	0.03	5	1500	20	6000	0.5	330	0.2	220	0.04	170	0.34	660	0.04	240
Mercury in TCLP	mg/L	0.0005	0.2	50	0.8	200	<0.0005	0.5	<0.0005	1.5	<0.0005	0.5	<0.0005	0.5	<0.0005	1.1
Nickel in TCLP	mg/L	0.02	2	1050	8	4200	<0.02	4	<0.02	5	<0.02	8	<0.02	17	<0.02	8
Zinc in TCLP	mg/L	0.02					0.5	150	0.6	340	0.9	330	1.1	160	1	240
(PFHxS)+ (PFOS)	µg/kg	0.01											<0.01	<0.1		
	µg/kg	0.01											<0.01	0.2		
Perfluorooctanoic acid (PFOA)	µg/kg	0.01											<0.01	<0.1		
6:2 FTS	µg/kg	0.01											<0.01	<0.1		
8:2 FTS	µg/kg	0.01											<0.01	<0.1		

Table A - Soil Analytical Results
Project Number: 54877
Project Name: Redfern Data Gap Assessment

	Metals & Metalloids								TPHs (NEPC 1999)					TPHs (NEPC 1999) - Silica Gel				TRHs (NEPC 2013)							Hs (NEPC 2013) - Silica G			BTEX					
	Arsenic (Total)	Cadmium	Chromium (Total)	Copper	Lead	Mercury (Inorganic)	Nickel	Zinc	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Total)	C10-C14 Fraction (SG)	C15-C28 Fraction (SG)	C29-C36 Fraction (SG)	C10 - C36 Fraction (Total) (SG)	>C10-C16 Fraction	>C16-C34 Fraction	>C34-C40 Fraction	>C10-C40 Fraction (Total)	>C10-C16 less Naphthalene (F2)	C6-C10 Fraction	C6-C10 less BTEX (F1)	>C10-C16 Fraction (SG)	>C16-C34 Fraction (SG)	>C34-C40 Fraction (SG)	Benzene	Ethylbenzene	Toluene	Xylene (o)	Xylene (m & p)	Xylene (Total)
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	2.00	0.40	1.00	1.00	1.00	0.10	1.00	1.00	20.00	20.00	50.00	50.00	50.00	20.00	50.00	50.00	50.00	50.00	100.00	100.00		50.00	20.00	20.00	50.00	100.00	100.00	0.10	0.10	0.10	0.10	0.20	0.30
NEPM 2013 EIL - Urban Residential (site specific)	100		190	100	1100		25	320																									
NEPM 2013 ESL Urban Residential and Public Open Space, Coarse Soil																			300	2800		120		180		300	2800	50	70	85			105
NEPM 2013 Mgnt Limits - Residential, Parkland and Public Open Space, Coarse																		1000	2500	10000			700		1000	2500	10000						
NEPM 2013 Soil HIL B	500	150	500	30000	1200	120	1200	60000																									
NEPM 2013 Soil HSL A & HSL B for Vapour Intrusion - Sand 0 to <1m																						110		45				0.5	55	160			40
Field_ID	**Sample_Depth_Range**	**Sampled_Date-Time**																																
BH101 0.3-0.4	0.3-0.4	11/05/2018	8.1	0.4	13	240	390	0.6	11	710	<20	36	480	280	796	-	-	-	-	<50	610	190	-	<50	<20	<20	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3
BH101 1.2-1.4	1.2-1.4	11/05/2018	<2	<0.4	<5	<5	9.7	<0.1	<5	110	<20	<20	<50	<50	<50	-	-	-	-	<50	<100	<100	-	<50	<20	<20	-	-	-	-	-	-	-	-	-
BH102 0.35-0.55	0.35-0.55	11/05/2018	10	<0.4	8.1	180	400	0.4	10	180	<20	<20	200	110	310	-	-	-	-	<50	240	<100	-	<50	<20	<20	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3
BH103 0.3-0.5	0.3-0.5	11/05/2018	4	<0.4	7	130	110	0.2	5.8	91	<100	~~3200~~	~~14,000~~	~~3900~~	~~21,100~~	170	400	<50	570	~~2700~~	~~14,000~~	~~2300~~	-	2000	<100	<100	250	360	<100	<0.5	0.7	<0.5	0.6	<1	<1.5
BH103 1.8-2.0	1.8-2	11/05/2018	2.2	<0.4	9.8	<5	8.4	<0.1	<5	<5	<20	<20	<50	<50	<50	-	-	-	-	<50	<100	<100	-	<50	<20	<20	-	-	-	-	-	-	-	-	-
BH104 0.65-0.75	0.65-0.75	11/05/2018	5.2	0.4	8.7	110	490	2.7	6	580	<20	<20	97	77	174	-	-	-	-	<50	130	<100	-	<50	<20	<20	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3
BH105 0.3-0.5	0.3-0.5	11/05/2018	9.5	<0.4	15	65	330	1.6	17	230	<20	29	220	140	389	-	-	-	-	<50	280	110	-	<50	<20	<20	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3
BH107 0.3-0.5	0.3-0.5	11/05/2018	3.9	<0.4	9	280	200	1.2	11	170	<20	48	370	250	668	-	-	-	-	<50	500	170	-	<50	<20	<20	-	-	-	0.2	<0.1	<0.1	<0.1	<0.2	<0.3
BH107 0.8-1.0	0.8-1	11/05/2018	3.3	<0.4	9.1	40	140	1.2	16	260	<20	<20	250	160	410	-	-	-	-	<50	320	110	-	<50	<20	<20	-	-	-	0.3	<0.1	0.1	<0.1	<0.2	<0.3
QC01	BH107 0.8-1.0	11/05/2018	<2	<0.4	5.2	9.7	64	0.3	15	290	<20	<20	<50	<50	<50	-	-	-	-	<50	<100	<100	-	<50	<20	<20	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3
QC01A	BH107 0.8-1.0	11/05/2018	<4	<0.4	2	6	49	<0.1	3	21	<25	<50	<100	<100	-	-	-	-	-	<50	<100	<100	<50	<50	<25	<25	-	-	-	<0.2	<1	<0.5	<1	<2	<1

Table A - Soil Analytical Results
Project Number: 54877
Project Name: Redfern Data Gap Assessment

			Polycyclic Aromatic Hydrocarbons																							Chlorinated Benzenes	Polychlorinated Biphenyls								
			Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(a)pyrene TEQ (lower bound)*	Benzo(a)pyrene TEQ (medium bound)*	Benzo(a)pyrene TEQ (upper bound)*	Benzo(b,j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzo(b,j+k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Carcinogenic PAHs as B(a)P TEQ	Phenanthrene	Pyrene	PAHs (Total)	Total Positive PAHs	Hexachlorobenzene	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	PCBs (Total)
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			0.10	0.10	0.10	0.10	0.05	0.50	0.50	0.50	0.50	0.10	0.50		0.10	0.10	0.10	0.10	0.10	0.10		0.10	0.10	0.50		0.05	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NEPM 2013 EIL - Urban Residential (site specific)																				170														
NEPM 2013 ESL Urban Residential and Public Open Space, Coar							0.7																											
NEPM 2013 Mgnt Limits - Residential, Parkland and Public Oper																																		
NEPM 2013 Soil HIL B																					4			400		15								1
NEPM 2013 Soil HSL A & HSL B for Vapour Intrusion - Sand 0 to																				3														
Field_ID	**Sample_Depth_Range**	**Sampled_Date-Time**																																
BH101 0.3-0.4	0.3-0.4	11/05/2018	<0.5	1.7	2.3	11	11	17	17	17	5.9	7.2	5	-	9.6	2.9	27	0.7	7.2	<0.5	16.98	6.1	29	126.6	-	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH101 1.2-1.4	1.2-1.4	11/05/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-
BH102 0.35-0.55	0.35-0.55	11/05/2018	<0.5	0.9	1.8	4.2	4.1	7	7	7	3	2.8	2.7	-	3.5	1.6	9.5	0.8	2.7	<0.5	7.023	5.2	9	51.8	-	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH103 0.3-0.5	0.3-0.5	11/05/2018	46	120	250	240	200	310	310	310	130	110	130	-	240	43	700	260	88	510 - 720	305.3	1200	700	4967	-	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH103 1.8-2.0	1.8-2	11/05/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-
BH104 0.65-0.75	0.65-0.75	11/05/2018	<0.5	<0.5	<0.5	0.7	0.7	0.9	1.2	1.5	0.6	<0.5	<0.5	-	0.7	<0.5	1.6	<0.5	0.6	<0.5	1.175	0.8	1.6	7.3	-	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH105 0.3-0.5	0.3-0.5	11/05/2018	<0.5	<0.5	0.7	2.6	2.5	3.3	3.5	3.8	1.4	1.9	2	-	2.4	<0.5	4.5	<0.5	1.3	<0.5	3.523	2.7	4.9	26.9	-	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH107 0.3-0.5	0.3-0.5	11/05/2018	<0.5	0.6	0.7	4.6	5.5	8.8	8.8	8.8	3.7	5.1	3.5	-	4.3	1.6	6	<0.5	3.8	<0.5	8.754	2.5	6.7	48.6	-	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH107 0.8-1.0	0.8-1	11/05/2018	<0.5	<0.5	0.9	3.8	3.3	5.3	5.3	5.3	2.4	2.5	2.5	-	3.2	0.9	6	<0.5	1.8	<0.5	5.307	3	6.3	36.6	-	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
QC01	BH107 0.8-1.0	11/05/2018	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21	<0.5	<0.5	<0.5	-	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
QC01A	BH107 0.8-1.0	11/05/2018	0.1	0.2	1	4	3.2	4.6	4.6	4.6	-	1.6	-	4.9	3	0.3	7.4	<0.1	1.6	<0.1	4.106	2.6	8.2	-	38	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Table A - Soil Analytical Results
Project Number: 54877
Project Name: Redfern Data Gap Assessment

			Asbestos										Organochlorine Pesticides																										Other
			Approx. Sample Mass	Asbestos from ACM in Soil	Asbestos from FA & AF in Soil	Mass ACM	Mass Asbestos in ACM	Mass FA	Mass Asbestos in FA	Mass AF	Mass Asbestos in AF	Mass Asbestos in FA & AF	4,4-DDE	Aldrin	Aldrin + Dieldrin (Sum of Total)	alpha-BHC	alpha-Chlordane	beta-BHC	Chlordane	Dieldrin	DDD	DDT	DDT+DDE+DDD (Sum of Total)	delta-BHC	Endosulfan alpha	Endosulfan beta	gamma-Chlordane	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	Heptachlor	Heptachlor Epoxide	Lindane	Methoxychlor	Toxaphene	% Moisture 103oC
			g	%w/w	%w/w	g	g	g	g	g	g	g	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%
EQL													0.05	0.05	0.05	0.05		0.05	0.10	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	1.00	1.00
NEPM 2013 EIL - Urban Residential (site specific)																						180																
NEPM 2013 ESL Urban Residential and Public Open Space, Coar																																						
NEPM 2013 Mgnt Limits - Residential, Parkland and Public Oper																																						
NEPM 2013 Soil HIL B															10				90				600						20			10			500	30		
NEPM 2013 Soil HSL A & HSL B for Vapour Intrusion - Sand 0 to																																						
Field_ID	**Sample_Depth_Range**	**Sampled_Date-Time**																																				
BH101 0.3-0.4	0.3-0.4	11/05/2018	253	0	0	0	0	0	0	0	0	0	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1	9.5
BH101 1.2-1.4	1.2-1.4	11/05/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.1
BH102 0.35-0.55	0.35-0.55	11/05/2018	327	0	0	0	0	0	0	0	0	0	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1	12
BH103 0.3-0.5	0.3-0.5	11/05/2018	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1	8.3
BH103 1.8-2.0	1.8-2	11/05/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13
BH104 0.65-0.75	0.65-0.75	11/05/2018	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1	6.7
BH105 0.3-0.5	0.3-0.5	11/05/2018	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1	10
BH107 0.3-0.5	0.3-0.5	11/05/2018	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1	11
BH107 0.8-1.0	0.8-1	11/05/2018	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1	9.1
QC01	BH107 0.8-1.0	11/05/2018	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1	4.9
QC01A	BH107 0.8-1.0	11/05/2018	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	-	7.9

Table B - Groundwater Analytical Results
Project Number: 54877
Project Name: Redfern Data Gap Assessment

	Metals & Metalloids								Chlorinated Alkanes																			Chlorinated Alkenes										Trihalomethanes			
	Arsenic (Total) (Filtered)	Cadmium (Filtered)	Chromium (Total) (Filtered)	Copper (Filtered)	Lead (Filtered)	Mercury (Inorganic) (Filtered)	Nickel (Filtered)	Zinc (Filtered)	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,2,3-trichloropropane	1,2-dibromo-3-chloropropane	1,2-dichloroethane	1,2-dichloropropane	1,3-dichloropropane	2,2-dichloropropane	Bromochloromethane	Carbon tetrachloride	Chloroethane	Chloromethane	Dichlorodifluoromethane	Dichloromethane	Trichlorofluoromethane	1,1-dichloroethene	1,1-dichloropropene	2-chlorotoluene	3-chloropropene	4-chlorotoluene	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Tetrachloroethene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Trichloroethene	Vinyl Chloride	Bromodichloromethane	Chloroform	Dibromochloromethane	Tribromomethane
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NEPM 2013 GIL - Marine Waters		0.0007		0.0013	0.0044	0.0001	0.007	0.015				1.9																														
Recreational (10x Health Based Drinking Water Criteria)	0.1	0.02		20	0.1	0.01	0.2									0.03					0.03				0.04		0.3					0.5			0.2	0.003	2.5	2.5	2.5	2.5
NEPM 2013 Groundwater HSL C for Vapour Intrusion - Sand																																									
Sample ID	**Well ID**	**Date**																																								
BH1	BH1	18/05/2018	<0.001	<0.0002	<0.001	0.019	0.001	<0.0001	0.025	0.12	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001
BH106	BH106	18/05/2018	<0.001	<0.0002	<0.001	0.03	0.002	<0.0001	0.006	0.14	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001
BH107	BH107	18/05/2018	<0.001	<0.0002	<0.001	0.06	0.004	<0.0001	0.006	0.06	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001
BH3	BH3	18/05/2018	<0.001	0.0002	<0.001	0.058	0.005	<0.0001	0.006	0.16	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001
BH4	BH4	18/05/2018	<0.001	<0.0002	<0.001	0.001	<0.001	<0.0001	0.002	0.024	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.002	<0.002
QC01	BH4	18/05/2018	<0.001	<0.0002	0.002	<0.001	<0.001	<0.0001	0.003	0.023	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001
QC01A	BH4	18/05/2018	<0.001	<0.0001	<0.001	0.013	0.002	<0.00005	0.004	0.039	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.01	-	<0.01	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	0.001	<0.001	<0.001

Table B - Groundwater Analytical Results
Project Number: 54877
Project Name: Redfern Data Gap Assessment

	TPHs (NEPC 1999)					TRHs (NEPC 2013)						BTEX						Polycyclic Aromatic Hydrocarbons																	
	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Total)	>C10-C16 Fraction	>C16-C34 Fraction	>C34-C40 Fraction	>C10-C16 less Naphthalene (F2)	C6-C10 Fraction	C6-C10 less BTEX (F1)	Benzene	Ethylbenzene	Toluene	Xylene (o)	Xylene (m & p)	Xylene (Total)	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(a)pyrene TEQ (WHO)	Benzo(b,j)fluoranthene	Benzo(b,k)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	PAHs (Total)
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL	0.01	0.05	0.10	0.10	0.10	0.05	0.10	0.10	0.05	0.01	0.01	0.001	0.001	0.001	0.001	0.002	0.003	0.00	0.00	0.00	0.00	0.00		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NEPM 2013 GIL - Marine Waters												0.5																					0.05			
Recreational (10x Health Based Drinking Water Criteria)												0.01	3	8			6					0.0001														
NEPM 2013 Groundwater HSL C for Vapour Intrusion - Sand									1		1	0.8	NL	NL			NL																NL			
Sample ID	**Well ID**	**Date**																																		
BH1	BH1	18/05/2018	<0.02	<0.05	0.1	<0.1	0.1	0.14	<0.1	<0.1	0.14	<0.02	<0.02	<0.001	<0.001	<0.001	<0.001	<0.002	<0.003	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	-	<0.00001	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
BH106	BH106	18/05/2018	<0.02	<0.05	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.05	<0.02	<0.02	<0.001	<0.001	<0.001	<0.001	<0.002	<0.003	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	-	<0.00001	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
BH107	BH107	18/05/2018	-	-	-	-	-	-	-	-	-	<0.02	-	<0.001	<0.001	<0.001	<0.001	<0.002	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH3	BH3	18/05/2018	<0.02	<0.05	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.05	<0.02	<0.02	<0.001	<0.001	<0.001	<0.001	<0.002	<0.003	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	-	<0.00001	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
BH4	BH4	18/05/2018	<0.04	<0.05	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.05	<0.04	<0.04	<0.002	<0.002	<0.002	<0.002	<0.004	<0.006	<0.00001	<0.00001	<0.00001	0.00003	0.00003	-	0.00002	-	0.00004	0.00003	0.00005	<0.00001	0.00009	<0.00001	0.00003	0.01 - 0.0000	0.00004	0.00011	0.00048
QC01	BH4	18/05/2018	<0.02	<0.05	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.05	0.04	0.04	<0.001	<0.001	<0.001	<0.001	<0.002	<0.003	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	-	<0.00001	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
QC01A	BH4	18/05/2018	0.01	<0.05	<0.1	<0.1	-	<0.05	<0.1	<0.1	<0.05	0.025	0.025	<0.001	<0.001	<0.001	<0.001	<0.002	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	-	<0.0002	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0

Table B - Groundwater Analytical Results
Project Number: 54877
Project Name: Redfern Data Gap Assessment

	Monocyclic Aromatic Hydrocarbons										Miscellaneous Hydrocarbons							Chlorinated Benzenes						Solvents		
	1,2,4-trimethyl benzene	1,3,5-trimethyl benzene	4-isopropyl toluene	Bromobenzene	Isopropylbenzene	n-butyl benzene	n-propyl benzene	sec-butyl benzene	Styrene	Tert-butyl benzene	1,2-dibromoethane	2-Butanone (MEK)	4-Methyl-2-pentanone (MIBK)	Bromomethane	Cyclohexane	Dibromomethane	Iodomethane	1,2,3-trichlorobenzene	1,2,4-trichlorobenzene	1,2-Dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	Chlorobenzene	2-Propanone (Acetone)	Carbon disulfide	Hexachlorobutadiene
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	mg/L
EQL	0.00	0.00		0.00	0.00				0.00		0.00	0.00	0.00	0.00		0.00	0.00			0.00	0.00	0.00	0.00	1.00	0.00	
NEPM 2013 GIL - Marine Waters																			0.02							
Recreational (10x Health Based Drinking Water Criteria)									0.3		0.01			0.01						15		0.4	3			
NEPM 2013 Groundwater HSL C for Vapour Intrusion - Sand																										
Sample ID	**Well ID**	**Date**																									
BH1	BH1	18/05/2018	<0.001	<0.001	-	<0.001	<0.001	-	-	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<1	<0.001	-
BH106	BH106	18/05/2018	<0.001	<0.001	-	<0.001	<0.001	-	-	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<1	<0.001	-
BH107	BH107	18/05/2018	<0.001	<0.001	-	<0.001	<0.001	-	-	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<1	<0.001	-
BH3	BH3	18/05/2018	<0.001	<0.001	-	<0.001	<0.001	-	-	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<1	<0.001	-
BH4	BH4	18/05/2018	<0.002	<0.002	-	<0.002	<0.002	-	-	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<2	<0.002	-
QC01	BH4	18/05/2018	0.009	0.004	-	<0.001	<0.001	-	-	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<1	<0.001	-
QC01A	BH4	18/05/2018	0.006	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.01	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001

Table C - Soil Vapour Analytical Results
Project Number: 54877
Project Name: Redfern Data Gap Assessment

				Organic Alcohols	Chlorinated Alkanes														Chlorinated Alkenes										Trihalomethanes				TRHs (NEPC 2013		BTEX				Polycyclic Aromatic Hydrocarbons	
				Isopropyl alcohol	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,2,3-trichloropropane	1,2-dibromo-3-chloropropane	1,2-dichloroethane	1,2-dichloropropane	1,3-dichloropropane	2,2-dichloropropane	Bromochloromethane	Carbon tetrachloride	Trichlorofluoromethane	1,1-dichloroethene	1,1-dichloropropene	2-chlorotoluene	4-chlorotoluene	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Tetrachloroethene	trans-1,3-dichloropropene	Trichloroethene	Vinyl Chloride	Bromodichloromethane	Chloroform	Dibromochloromethane	Tribromomethane	>C10-C16 Fraction	>C6-C10 Fraction	Benzene	Ethylbenzene	Toluene	Xylene (Total)	Naphthalene	1,2,4-trimethyl benzene
				mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3
EQL				1.67	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	1.67	1.67	0.08	0.08	0.08	0.25	0.08	0.08
NEPM 2013 HIL Residential B Soil Vapour						60																	0.08		2		0.02	0.03											
NEPM 2013 Soil Vapour HSL A & HSL B - Sand 0 to <1m																																		1	330	1300	220	0.8	
Field_ID	**LocCode**	**WellCode**	**Sampled_Date-Time**																																				
DUP1	SV06 (FRONT)	SV06	14/05/2018	<1.667	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<1.667	<1.667	<0.08335	<0.08335	<0.08335	<0.2501	<0.08335	<0.08335
SV02	SV02 (FRONT)	SV02	14/05/2018	<1.667	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<1.667	<1.667	<0.08335	<0.08335	<0.08335	<0.2501	<0.08335	<0.08335
SV05	SV05 (FRONT)	SV05	14/05/2018	<1.667	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<1.667	<1.667	<0.08335	<0.08335	<0.08335	<0.2501	<0.08335	<0.08335
SV06	SV06 (FRONT)	SV06	14/05/2018	<1.667	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<1.667	<1.667	<0.08335	<0.08335	<0.08335	<0.2501	<0.08335	<0.08335
SV07	SV07 (FRONT)	SV07	14/05/2018	<1.667	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<1.667	<1.667	<0.08335	<0.08335	<0.08335	<0.2501	<0.08335	<0.08335
SV09	SV09 (FRONT)	SV09	14/05/2018	<1.667	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<1.667	<1.667	0.4834	<0.08335	<0.08335	<0.2501	<0.08335	<0.08335
Statistical Summary																																							
Number of Results				6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Number of Detects				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Minimum Concentration				<1.667	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<1.667	<1.667	<0.08335	<0.08335	<0.08335	<0.2501	<0.08335	<0.08335
Minimum Detect				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.4834	ND	ND	ND	ND	ND
Maximum Concentration				<1.667	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<1.667	<1.667	0.4834	<0.08335	<0.08335	<0.2501	<0.08335	<0.08335
Maximum Detect				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.4834	ND	ND	ND	ND	ND
Average Concentration				0.83	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.83	0.83	0.12	0.042	0.042	0.13	0.042	0.042
Median Concentration				0.8335	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.8335	0.8335	0.041675	0.041675	0.041675	0.12505	0.041675	0.041675
Standard Deviation				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.18	0	0	0	0	0
Number of Guideline Exceedances				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0

Table C - Soil Vapour Analytical Results
Project Number: 54877
Project Name: Redfern Data Gap Assessment

				Monocyclic Aromatic Hydrocarbons								cellaneous Hydrocarb		Chlorinated Benzenes						Miscellaneous Industrial Chemicals
				1,3,5-trimethyl benzene	4-isopropyl toluene	isopropylbenzene	n-butyl benzene	n-propyl benzene	sec-butyl benzene	Styrene	Tert-butyl benzene	1,2-dibromoethane	Dibromomethane	1,2,3-trichlorobenzene	1,2,4-trichlorobenzene	1,2-Dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	Chlorobenzene	Hexachlorobutadiene
				mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3
EQL				0.08	0.08	0.08	0.08	0.08	0.08	0.83	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
NEPM 2013 HIL Residential B Soil Vapour																				
NEPM 2013 Soil Vapour HSL A & HSL B - Sand 0 to <1m																				
Field_ID	**LocCode**	**WellCode**	**Sampled_Date-Time**																	
DUP1	SV06 (FRONT)	SV06	14/05/2018	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.8335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335
SV02	SV02 (FRONT)	SV02	14/05/2018	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.8335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335
SV05	SV05 (FRONT)	SV05	14/05/2018	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.8335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335
SV06	SV06 (FRONT)	SV06	14/05/2018	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.8335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335
SV07	SV07 (FRONT)	SV07	14/05/2018	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.8335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335
SV09	SV09 (FRONT)	SV09	14/05/2018	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.8335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335
Statistical Summary																				
Number of Results				6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Number of Detects				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration				<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.8335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335
Minimum Detect				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration				<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.8335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335	<0.08335
Maximum Detect				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration				0.042	0.042	0.042	0.042	0.042	0.042	0.42	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042
Median Concentration				0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.41675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675	0.041675
Standard Deviation				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix C NEPC 2013 Tables

Table 1A(1) Health investigation levels for soil contaminants

Chemical	Health-based investigation levels (mg/kg)			
	Residential[1] A	Residential[1] B	Recreational[1] C	Commercial/ industrial[1] D
Metals and Inorganics				
Arsenic[2]	100	500	300	3 000
Beryllium	60	90	90	500
Boron	4500	40 000	20 000	300 000
Cadmium	20	150	90	900
Chromium (VI)	100	500	300	3600
Cobalt	100	600	300	4000
Copper	6000	30 000	17 000	240 000
Lead[3]	300	1200	600	1 500
Manganese	3800	14 000	19 000	60 000
Mercury (inorganic)[5]	40	120	80	730
Methyl mercury[4]	10	30	13	180
Nickel	400	1200	1200	6 000
Selenium	200	1400	700	10 000
Zinc	7400	60 000	30 000	400 000
Cyanide (free)	250	300	240	1 500
Polycyclic Aromatic Hydrocarbons (PAHs)				
Carcinogenic PAHs (as BaP TEQ)[6]	3	4	3	40
Total PAHs[7]	300	400	300	4000
Phenols				
Phenol	3000	45 000	40 000	240 000
Pentachlorophenol	100	130	120	660
Cresols	400	4 700	4 000	25 000
Organochlorine Pesticides				
DDT+DDE+DDD	240	600	400	3600
Aldrin and dieldrin	6	10	10	45
Chlordane	50	90	70	530
Endosulfan	270	400	340	2000
Endrin	10	20	20	100
Heptachlor	6	10	10	50
HCB	10	15	10	80
Methoxychlor	300	500	400	2500
Mirex	10	20	20	100
Toxaphene	20	30	30	160
Herbicides				
2,4,5-T	600	900	800	5000
2,4-D	900	1600	1300	9000
MCPA	600	900	800	5000

Chemical	Health-based investigation levels (mg/kg)			
	Residential[1] A	Residential[1] B	Recreational[1] C	Commercial/ industrial[1] D
MCPB	600	900	800	5000
Mecoprop	600	900	800	5000
Picloram	4500	6600	5700	35000
Other Pesticides				
Atrazine	320	470	400	2500
Chlorpyrifos	160	340	250	2000
Bifenthrin	600	840	730	4500
Other Organics				
PCBs[8]	1	1	1	7
PBDE Flame Retardants (Br1–Br9)	1	2	2	10

Notes:

(1) Generic land uses are described in detail in Schedule B7 Section 3

HIL A – Residential with garden/accessible soil (home grown produce <10% fruit and vegetable intake (no poultry), also includes childcare centres, preschools and primary schools.

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

HIL C – Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. This does not include undeveloped public open space where the potential for exposure is lower and where a site-specific assessment may be more appropriate.

HIL D – Commercial/industrial, includes premises such as shops, offices, factories and industrial sites.

(2) Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability may be important and should be considered where appropriate (refer Schedule B7).

(3) Lead: HIL is based on blood lead models (IEUBK for HILs A, B and C and adult lead model for HIL D where 50% oral bioavailability has been considered. Site-specific bioavailability may be important and should be considered where appropriate.

(4) Methyl mercury: assessment of methyl mercury should only occur where there is evidence of its potential source. It may be associated with inorganic mercury and anaerobic microorganism activity in aquatic environments. In addition the reliability and quality of sampling/analysis should be considered.

(5) Elemental mercury: HIL does not address elemental mercury. A site-specific assessment should be considered if elemental mercury is present, or suspected to be present,

(6) Carcinogenic PAHs: HIL is based on the 8 carcinogenic PAHs and their TEFs (potency relative to B(a)P) adopted by CCME 2008 (refer Schedule B7). The B(a)P TEQ is calculated by multiplying the concentration of each carcinogenic PAH in the sample by its B(a)P TEF, given below, and summing these products.

PAH species	TEF	PAH species	TEF
Benzo(a)anthracene	0.1	Benzo(g,h,i)perylene	0.01
Benzo(a)pyrene	1	Chrysene	0.01
Benzo(b+j)fluoranthene	0.1	Dibenz(a,h)anthracene	1
Benzo(k)fluoranthene	0.1	Indeno(1,2,3-c,d)pyrene	0.1

Where the B(a)P occurs in bitumen fragments it is relatively immobile and does not represent a significant health risk.

(7) Total PAHs: HIL is based on the sum of the 16 PAHs most commonly reported for contaminated sites (WHO 1998). The application of the total PAH HIL should consider the presence of carcinogenic PAHs and naphthalene (the most volatile PAH). Carcinogenic PAHs reported in the total PAHs should meet the B(a)P TEQ HIL. Naphthalene reported in the total PAHs should meet the relevant HSL.

(8) PCBs: HIL relates to non-dioxin-like PCBs only. Where a PCB source is known, or suspected, to be present at a site, a site-specific assessment of exposure to all PCBs (including dioxin-like PCBs) should be undertaken.

Table 1A(2) Interim soil vapour health investigation levels for volatile organic chlorinated compounds

Chemical	Interim soil vapour HIL (mg/m^3)			
	Residential[1] A	Residential[1] B	Recreational[1] C	Commercial / Industrial[1] D
TCE	0.02	0.02	0.4	0.08
1,1,1-TCA	60	60	1200	230
PCE	2	2	40	8
cis-1,2-dichloroethene	0.08	0.08	2	0.3
Vinyl chloride	0.03	0.03	0.5	0.1

Notes:

1. Land use settings are equivalent to those described in Table 1A(1) Footnote 1 and Schedule B7, though secondary school buildings should be assessed using residential 'A/B' for vapour intrusion purposes.
2. Interim HILs for VOCCs are conservative soil vapour concentrations that can be adopted for the purpose of screening sites where further investigation is required on a site-specific basis. They are based on the potential for vapour intrusion using an indoor air-to-soil vapour attenuation factor of 0.1 and an outdoor air-to-soil vapour attenuation factor of 0.05.
3. Application of the interim HILs is based on a measurement of shallow (to 1 m depth) soil vapour (or deeper where the values are to be applied to a future building with a basement) or sub-slab soil vapour.
4. The applicability of the interim HILs needs to be further considered when used for other building types such as homes with a crawl-space and no slab, which may require site-specific assessment.
5. Use of the interim HILs requires comparison with data that has been collected using appropriate methods and meets appropriate data quality requirements.
6. Oral and dermal exposure should be considered on a site-specific basis where direct contact exposure is likely to occur.

Table 1A(3) Soil HSLs for vapour intrusion (mg/kg)

	HSL A & HSL B Low – high density residential				HSL C recreational / open space				HSL D Commercial / Industrial				
CHEMICAL	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4m**	**4 m+**	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m+**	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m+**	**Soil saturation concentration (Csat)**
SAND													
Toluene	160	220	310	540	NL	NL	NL	NL	NL	NL	NL	NL	560
Ethylbenzene	55	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	64
Xylenes	40	60	95	170	NL	NL	NL	NL	230	NL	NL	NL	300
Naphthalene	3	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	9
Benzene	0.5	0.5	0.5	0.5	NL	NL	NL	NL	3	3	3	3	360
F1[9]	45	70	110	200	NL	NL	NL	NL	260	370	630	NL	950
F2[10]	110	240	440	NL	NL	NL	NL	NL	NL	NL	NL	NL	560
SILT													
Toluene	390	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	640
Ethylbenzene	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	69
Xylenes	95	210	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	330

	HSL A & HSL B Low – high density residential				HSL C recreational / open space				HSL D Commercial / Industrial				
Naphthalene	4	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	10
Benzene	0.6	0.7	1	2	NL	NL	NL	NL	4	4	6	10	440
F1[9]	40	65	100	190	NL	NL	NL	NL	250	360	590	NL	910
F2[10]	230	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	570
CLAY													
Toluene	480	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	630
Ethylbenzene	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	68
Xylenes	110	310	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	330
Naphthalene	5	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	10
Benzene	0.7	1	2	3	NL	NL	NL	NL	4	6	9	20	430
F1[9]	50	90	150	290	NL	NL	NL	NL	310	480	NL	NL	850
F2[10]	280	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	560

Notes:

(1) Land use settings are equivalent to those described in Table 1A(1) Footnote 1 and Schedule B7. HSLs for vapour intrusion for high density residential assume residential occupation of the ground floor. If communal car parks or commercial properties occupy the ground floor, HSL D should be used,

(2) The key limitations of the HSLs should be referred to prior to application and are presented in Friebel and Nadebaum (2011b and 2011d).

(3) Detailed assumptions in the derivation of the HSLs and information on how to apply the HSLs are presented in Friebel and Nadebaum (2011a and 2011b).

(4) Soil HSLs for vapour inhalation incorporate an adjustment factor of 10 applied to the vapour phase partitioning to reflect the differences observed between theoretical estimates of soil vapour partitioning and field measurements. Refer Friebel & Nadebaum (2011a) for further information.

(5) The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.

(6) The HSLs for TPH C_6-C_{10} in sandy soil are based on a finite source that depletes in less than seven years, and therefore consideration has been given to use of sub-chronic toxicity values. The >C_8-C_{10} aliphatic toxicity has been adjusted to represent sub-chronic exposure, resulting in higher HSLs than if based on chronic toxicity. For further information refer to Section 8.2 and Appendix J in Friebel and Nadebaum (2011a).

(7) The figures in the above table may be multiplied by a factor to account for biodegradation of vapour. A factor of 10 may apply for source depths from 2 m to <4 m or a factor of 100 for source depths of 4 m and deeper. To apply the attenuation factor for vapour degradation, a number of conditions must be satisfied. Firstly the maximum length of the shorter side of the concrete slab and surrounding pavement cannot exceed 15 m, as this would prevent oxygen penetrating to the centre of the slab. Secondly, measurement of oxygen in the subsurface is required to determine the potential for biodegradation. Oxygen must be confirmed to be present at >5% to use these factors.

(8) For soil texture classification undertaken in accord with AS 1726, the classifications of sand, silt and clay may be applied as coarse, fine with liquid limit <50% and fine with liquid limit>50% respectively, as the underlying properties to develop the HSLs may reasonably be selected to be similar. Where there is uncertainty, either a conservative approach may be adopted or laboratory analysis should be carried out.

(9) To obtain F1 subtract the sum of BTEX concentrations from the C_6-C_{10} fraction.

(10) To obtain F2 subtract naphthalene from the >C_{10}-C_{16} fraction.

Table 1A(4) Groundwater HSLs for vapour intrusion (mg/L)

	HSL A & HSL B Low – high density residential			HSL C recreational / open space			HSL D Commercial / industrial			
CHEMICAL	**2 m to <4 m**	**4 m to <8 m**	**8 m+**	**2 m to <4 m**	**4 m to <8 m**	**8 m+**	**2 m to <4 m**	**4 m to <8 m**	**8 m+**	**Solubility limit**
SAND										
Toluene	NL	NL	NL	NL	NL	NL	NL	NL	NL	61
Ethylbenzene	NL	NL	NL	NL	NL	NL	NL	NL	NL	3.9
Xylenes	NL	NL	NL	NL	NL	NL	NL	NL	NL	21
Naphthalene	NL	NL	NL	NL	NL	NL	NL	NL	NL	0.17
Benzene	0.8	0.8	0.9	NL	NL	NL	5	5	5	59
F1[7]	1	1	1	NL	NL	NL	6	6	7	9.0
F2[8]	1	1	1	NL	NL	NL	NL	NL	NL	3.0
SILT										
Toluene	NL	NL	NL	NL	NL	NL	NL	NL	NL	61
Ethylbenzene	NL	NL	NL	NL	NL	NL	NL	NL	NL	3.9
Xylenes	NL	NL	NL	NL	NL	NL	NL	NL	NL	21
Naphthalene	NL	NL	NL	NL	NL	NL	NL	NL	NL	0.17

	HSL A & HSL B Low – high density residential			HSL C recreational / open space			HSL D Commercial / industrial			
Benzene	4	5	5	NL	NL	NL	30	30	30	59
F1[7]	6	6	6	NL	NL	NL	NL	NL	NL	9.0
F2[8]	NL	NL	NL	NL	NL	NL	NL	NL	NL	3.0
CLAY										
Toluene	NL	NL	NL	NL	NL	NL	NL	NL	NL	61
Ethylbenzene	NL	NL	NL	NL	NL	NL	NL	NL	NL	3.9
Xylenes	NL	NL	NL	NL	NL	NL	NL	NL	NL	21
Naphthalene	NL	NL	NL	NL	NL	NL	NL	NL	NL	0.17
Benzene	5	5	5	NL	NL	NL	30	30	35	59
F1[7]	NL	NL	NL	NL	NL	NL	NL	NL	NL	9.0
F2[8]	NL	NL	NL	NL	NL	NL	NL	NL	NL	3.0

Notes:

(1) Land use settings are equivalent to those described in Table 1A(1) Footnote 1 and Schedule B7. HSLs for vapour intrusion for high density residential assume residential occupation of the ground floor. If communal car parks or commercial properties occupy the ground floor, HSL D should be used,

(2) The key limitations of the HSLs are presented in Friebel and Nadebaum (2011d) and should be referred to prior to application.

(3) Detailed assumptions in the derivation of the HSLs and information on the application of the HSLs are presented in Friebel and Nadebaum (2011a and 2011b).

(4) The solubility limit is defined as the groundwater concentration at which the water cannot dissolve any more of an individual chemical based on a petroleum mixture. The soil vapour that is in equilibrium with the groundwater will be at its maximum. If the derived groundwater HSL exceeds the water solubility limit, a soil vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.

(5) The figures in the above table may be multiplied by a factor to account for biodegradation of vapour. A factor of 10 may apply for source depths from 2 m to <4 m or a factor of 100 for source depths of 4 m and deeper. To apply the attenuation factor for vapour degradation, a number of conditions must be satisfied. Firstly, the maximum length of the shorter side of the concrete slab and surrounding pavement cannot exceed 15 m, as this would prevent oxygen penetrating to the centre of the slab. Secondly, measurement of oxygen in the subsurface is required to determine the potential for biodegradation. Oxygen must be confirmed to be present at >5% to use these factors.

(6) For soil texture classification undertaken in accord with AS 1726, the classifications of sand, silt and clay may be applied as coarse, fine with liquid limit <50% and fine with liquid limit >50% respectively, as the underlying properties to develop the HSLs may reasonably be selected to be similar. Where there is uncertainty, either a conservative approach may be adopted or laboratory analysis should be carried out.

(7) To obtain F1 subtract the sum of BTEX concentrations from the C_6-C_{10} fraction.

(8) To obtain F2 subtract naphthalene from the >C_{10}-C_{16} fraction.

Table 1A(5) Soil vapour HSLs for vapour intrusion (mg/m³)

	HSL A & HSL B Low – high density residential					HSL C recreational / open space					HSL D Commercial / Industrial				
CHEMICAL	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m to <8 m**	**8 m+**	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m to <8 m**	**8 m+**	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m to <8 m**	**8 m+**
SAND															
Toluene	1300	3800	7300	15 000	29 000	NL	NL	NL	NL	NL	4800	16 000	39 000	84 000	NL
Ethylbenzene	330	1100	2200	4300	8700	NL	NL	NL	NL	NL	1300	4600	11 000	25 000	53 000
Xylenes	220	750	1500	3000	6100	NL	NL	NL	NL	NL	840	3,200	8000	18 000	37 000
Naphthalene	0.8	3	6	10	25	410	NL	NL	NL	NL	3	15	35	75	150
Benzene	1	3	6	10	20	360	2400	4700	9500	19 000	4	10	30	65	130
F1[8]	180	640	1,300	2600	5300	86 000	NL	NL	NL	NL	680	2800	7000	15 000	32 000
F2[9]	130	560	1200	2400	4800	NL	NL	NL	NL	NL	500	2400	NL	NL	NL
SILT															
Toluene	1400	14 000	32 000	69 000	140 000	NL	NL	NL	NL	NL	5700	63 000	NL	NL	NL
Ethylbenzene	380	4200	9700	21 000	43 000	NL	NL	NL	NL	NL	1500	19 000	54 000	NL	NL
Xylenes	260	2900	6800	15 000	30 000	NL	NL	NL	NL	NL	1000	13 000	38 000	NL	NL
Naphthalene	0.9	10	25	60	120	NL	NL	NL	NL	NL	4	50	150	350	750
Benzene	1	10	25	55	110	1800	12 000	24 000	48 000	97 000	4	50	140	320	670
F1[8]	210	2600	6000	13 000	26 000	NL	NL	NL	NL	NL	850	11 000	33 000	77 000	160 000

	HSL A & HSL B Low – high density residential					HSL C recreational / open space					HSL D Commercial / Industrial				
F2[9]	160	2300	5400	NL	NL	NL	NL	NL	NL	NL	670	NL	NL	NL	NL
CLAY															
Toluene	1600	23 000	53 000	110 000	NL	NL	NL	NL	NL	NL	6500	100 000	NL	NL	NL
Ethylbenzene	420	6800	16 000	35 000	NL	NL	NL	NL	NL	NL	1800	31 000	NL	NL	NL
Xylenes	280	4800	11 000	24 000	50 000	NL	NL	NL	NL	NL	1200	21 000	NL	NL	NL
Naphthalene	1	20	45	95	200	NL	NL	NL	NL	NL	4	85	240	560	1200
Benzene	1	15	40	90	180	3000	20 000	40 000	81 000	160 000	5	80	230	530	1100
F1[8]	230	4200	9900	21 000	44 000	NL	NL	NL	NL	NL	1000	19 000	55 000	130 000	270 000
F2[9]	180	3,800	NL	NL	NL	NL	NL	NL	NL	NL	800	NL	NL	NL	NL

1. Land use settings are equivalent to those described in Table 1A(1) Footnote 1 and Schedule B7. HSLs for vapour intrusion for high density residential assume residential occupation of the ground floor. If communal car parks or commercial properties occupy the ground floor, HSL D should be used,
2. The key limitations of the HSLs should be referred to prior to application and are presented in Friebel and Nadebaum (2011b and 2011d).
3. Detailed assumptions in the derivation of the HSLs and information on how to apply the HSLs are presented in Friebel and Nadebaum (2011a and 2011b).
4. The maximum possible soil vapour concentrations have been calculated based on vapour pressures of the pure chemicals. Where soil vapour HSLs exceed these values a soil-specific source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.
5. Soil vapour HSLs should be compared with measurements taken as laterally close as possible to the soil or groundwater sources of vapour (i.e. within or above vapour sources). Consideration is required of where the sample is taken, the current condition of the site and the likely future condition of the site. Shallow gas measurements in open space (1ess than 1 m below ground surface) may be subject to influences of weather conditions and moisture.
6. The figures in the above table may be multiplied by a factor to account for biodegradation of vapour. A factor of 10 may apply for source depths from 2 m to <4 m or a factor of 100 for source depths of 4 m and deeper. To apply the attenuation factor for vapour degradation, a number of conditions must be satisfied. Firstly, the maximum length of the shorter side of the concrete slab and surrounding pavement cannot exceed 15 m, as this would prevent oxygen penetrating to the centre of the slab. Secondly, measurement of oxygen in the subsurface is required to determine the potential for biodegradation. Oxygen must be confirmed to be present at >5% to use these factors.
7. For soil texture classification undertaken in accord with AS 1726, the classifications of sand, silt and clay may be applied as coarse, fine with liquid limit <50% and fine with liquid limit >50% respectively as the underlying properties to develop the HSLs may reasonably be selected to be similar. Where there is uncertainty, either a conservative approach may be adopted or laboratory analysis should be carried out.
8. To obtain F1 subtract the sum of BTEX concentrations from the C_6-C_{10} fraction.

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