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Phase I & Limited Scope Phase II ESA

1-3 Burrows Road, St Peters

Revision A – 30-Sep-2015
Prepared for – Goodman Property Services (Aust) Pty Ltd – ABN: 40 088 981 793

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Phase I & Limited Scope Phase II ESA

1-3 Burrows Road, St Peters

Client: Goodman Property Services (Aust) Pty Ltd

ABN: 40 088 981 793

Prepared by

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30-Sep-2015

Job No.: 60438840

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Quality Information

Document Phase I & Limited Scope Phase II ESA

Ref 60438840

Date 30-Sep-2015

Prepared by Alex Latham

Reviewed by Brad Eismen

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
A	30-Sep-2015	Draft for comment	Alex Latham Associate Director	

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Glossary

General Terms			
BTEXN	Benzene, toluene, ethylbenzene, xylenes and naphthalene		
CoPC	Contaminants of Potential Concern		
CSM	Conceptual Site Model		
DQI	Data Quality Indicators		
DQO	Data Quality Objectives		
EPA	Environment Protection Authority (part of OEH)		
GAC	Groundwater Assessment Criteria		
GME	Groundwater Monitoring Event		
HIL	Health Investigation Level		
HSL	Health Screening Level		
LOR	Limit of Reporting		
LNAPL	Light Non-Aqueous Phase Liquid		
m bgs	Metres below ground surface		
m btoc	Metres Below Top of Casing		
NATA	National Association of Testing Authorities		
NEPC	National Environment Protection Council		
NEPM	National Environment Protection Measure		
OCP	Organochlorine Pesticides		
OPP	Organophosphorus Pesticides		
PAH	Polycyclic Aromatic Hydrocarbons		
PCB	Polychlorinated Biphenyls		
PID	Photoionisation detector		
QA/QC	Quality Assurance/Quality Control		
RPD	Relative Percent Difference		
SAC	Soil Assessment Criteria		
SWL	Standing Water Level		
TPH	Total Petroleum Hydrocarbons		
TRH	Total Recoverable Hydrocarbons		
UPSS	Underground Petroleum Storage System		
UST	Underground Storage Tank		
VHC	Volatile Halogenated Compound (or Chlorinated Hydrocarbons [CHC])		
VOC	Volatile Organic Compound		
Units			
m	metre	mg/L	milligrams/litre
mg/kg	milligrams/kilogram	µg/L	micrograms/litre

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Executive Summary

AECOM Australia Pty Ltd (AECOM) was engaged by Goodman Property Services (Aust) Pty Ltd (GPS) to complete a Phase I and limited scope Phase II Environmental Site Assessment (ESA) of Burrows Industrial Estate, 1-3 Burrows Road, St Peters, NSW (the Site).

The Site comprises Lots 11 and 12 in Deposited Plan 606737 and is approximately 4.1 hectares (Ha). Part of the Site may be resumed for road construction purposes and as a consequence, the developable area is approximately 3.6 Ha. GPS have advised that the Site may be redeveloped for continued use as a warehouse-type industrial estate. The redevelopment is understood to comprise concrete 'slab-on-ground' construction supported by piers installed into geotechnically suitable materials, concrete paved roadways and car parks and some small areas of landscaping.

The Site has been assessed generally following the guidelines endorsed by the NSW EPA. The assessment included a review of Site history and background data (Phase I ESA) followed by intrusive investigation, sampling and analysis (Phase II ESA).

The Phase I ESA data indicated that Site was extensively filled with materials and has been utilised since the 1940s for the production of packaging (hessian bags and then plastic containers and other plastic products) and then as a warehouse type estate. Historical use included above and below ground storage of petroleum hydrocarbons, inks, gases, adhesives and vehicle workshop(s). The Site has undergone many stages of building alterations, removals and additions.

The limited scope Phase II ESA was completed in readily accessible areas across the Site. Twenty two soil boreholes were completed and five groundwater monitoring wells were installed and sampled. Fill materials were identified at each borehole completed and the current data indicates that it extends, on average, to approximately 3.3 m depth. Groundwater is present in the fill materials and current data indicates it is present between 1.1 and 3.1 m depth. The soil sampling density completed is approximately half the minimum rate recommended in the NSW EPA (1995) Sampling Design Guidelines, but given the encountered conditions, is considered sufficient to provide an indication of Site suitability for continued commercial/industrial land use.

The fill materials have been identified to be contaminated with lead, Benzo(a)Pyrene (B(a)P), long chain-length total recoverable hydrocarbons (TRH) and asbestos. The volume of fill material is estimated to be in the order of 120 000 m^3. Contamination at concentrations exceeding the adopted assessment criteria has not been identified in natural soils underlying the fill however, acid sulfate soil conditions are likely to be present.

Groundwater has high concentrations of zinc, nickel and copper and to a lesser extent, cadmium and lead. Given the high concentrations of lead in fill, it does not appear to be significantly leaching into groundwater. Similarly, B(a)P has not been detected in groundwater. Volatile compounds have not been identified in groundwater to date. Additional assessment data would be required to assess if the Site is the source of the metals impacts and to evaluate the groundwater flow direction.

Based on the available data, the following conclusions are made:

- With respect to the proposed redevelopment, AECOM considers that the Site can be made suitable for commercial/industrial land use however, implementation of control/management mechanisms will be required.
- A review of historical Site plans held by Council to evaluate the location of former processes/activities followed by a targeted assessment should be completed, to confirm if the Site can be made suitable for commercial/industrial land use with implementation of control/management mechanisms.
- The control mechanisms would include the preparation and adherence to a Construction-phase Site Management Plan (CSMP) and after redevelopment, a Long Term Site Management Plan (LTSMP).
- Additional assessment data may be required during the demolition-construction phase.

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1.0 Introduction

1.1 Preamble

AECOM Australia Pty Ltd (AECOM) was engaged by Goodman Property Services (Aust) Pty Ltd (GPS) to complete a Phase I and limited scope Phase II Environmental Site Assessment (ESA) of Burrows Industrial Estate, 1-3 Burrows Road, St Peters, NSW (the Site).

It is understood that:

- Tallina Pty Ltd, part of the Goodman Group, owns the Site. GPS is contemplating demolition of existing buildings and construction of free-standing warehouses.
- The developable portion of the Site is approximately 3.6 hectares.

The Site location is shown on Figure 1 and the layout and sampling location plan is shown in Figure 2 (Appendix A). Tables of results are provided in Appendix B.

1.2 Objectives

The project objectives were to:

- Obtain an understanding of soil and groundwater contamination conditions at the Site.
- Support a Development Application (DA) submission.

1.3 Scope of Work

To achieve the objective, the following works were completed:

- Review of historical and background information relating to the Site, including:
    - Previous contamination assessment reports.
    - Council Section 149 planning certificate.
    - Historical certificates of title and aerial photographs.
    - NSW EPA register of regulated contaminated sites.
    - Soil, geology and hydrogeological data.
- Site inspection to assess current Site operations and to locate boreholes.
- Drilling of 22 soil boreholes (BH01 to BH22) to a maximum depth of 5.3 metres below ground surface (m bgs). Soil samples were collected from the boreholes.
- Collection of four surface soil samples (SS01 to SS04).
- Installation and development of five groundwater monitoring wells (MW01, MW16, MW17, MW19 and MW21).
- Surveying of the top of the monitoring well casings and all borehole locations to Australian Height Datum (AHD) and Map Grid Australia (MGA).
- Gauging, purging and sampling of the groundwater monitoring wells.
- Laboratory analysis of soil and groundwater samples using methods endorsed by the National Association of Testing Authority (NATA) to evaluate concentrations of Contaminants of Potential Concern (CoPC). The CoPC included:
    - Total recoverable hydrocarbons (TRH).
    - Benzene, toluene, ethylbenzene, xylene and naphthalene (BTEXN).
    - Suite of eight metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc).
    - Polycyclic aromatic hydrocarbons (PAH) and phenols.

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- Organochlorine and Organophosphorus Pesticides (OCP, OPP).
- Polychlorinated biphenyls (PCB).
- Asbestos.
- Volatile halogenated compounds (VHC).

- Data evaluation and reporting.

1.4 Data Quality Objectives

To ensure that data of adequate type and reliability were collected and assessed, the seven step Data Quality Objective (DQO) approach, endorsed in NSW DEC (2006), was adopted. The DQOs have set quality assurance and quality control parameters for the field and laboratory programs, to ensure data of appropriate reliability have been used to assess the environmental condition of the Site.

The DQOs for this project are presented in Appendix C. Attainment of the DQOs has been assessed by reference to the data quality indicators (DQIs), also presented in Appendix C.

1.5 Guidelines

AECOM completed works with reference to the following guidelines:

- National Environment Protection Measure (NEPM), *Assessment of Site Contamination (ASC) (National Environment Protection Council [NEPC]*, *1999* as amended (2013) (the ASC NEPM).
- CRC CARE (2011). *Technical Report No.10 - Health Screening Levels* (HSLs*) for Petroleum Hydrocarbons in Soil and Groundwater*. Friebel, E. and Nadebaum, P. Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE).
- NSW DEC (2006). *Guidelines for the NSW Site Auditor Scheme (2nd Edition)*. Department of Environment and Conservation NSW.
- NSW DEC (2007). *Guidelines for the Assessment and Management of Groundwater Contamination*.
- NSW EPA (1995). *Sampling Design Guidelines*.
- NSW OEH (2011). *Guidelines for Consultants Reporting on Contaminated Sites*. NSW Government Office of Environment & Heritage (OEH).

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2.0 Site Details

2.1 Identification

Site identification details are summarised on Table 1.

Table 1 Site Identification

Item	Description
Address[1]	1-3 Burrows Road, St Peters
Legal Description[1]	Lot 11 and 12, DP 606737
Site Area[2]	Lot 11: 3.27 hectares (Ha) and Lot 12: 8165 m^2 (0.816 Ha) Developable portion: 3.6 Ha (approximately)
Site Owner[1, 3]	Tallina Pty Ltd
Local Government[1]	City of Sydney
Zoning[1]	IN1 General Industrial
Elevation (m AHD)[2]	2 to 4 (based on survey data)

Notes: 1 = Section 149 Certificate. 2 = survey data. 3 = Certificate of Title

2.2 Current Land Use

The Site is currently used as a warehouse-type industrial estate. Site tenants during the AECOM fieldwork program included:

Table 2 Site Tenants

Unit(s)	Tenants / Comment(s)
1	Vacant building
2	AST Services: storage and distribution of electric motor cars
3	Jets (Qantas Freight): freight transport and distribution
4	Coca Cola Amatil: freight storage (drink products), transport and distribution
5-6	Staging Rentals: manufacture and/or storage of 'props' for theatre productions/stage shows
7	PCA Express: freight storage (including quarantine products), transport and distribution
8-11	Sealed Air Australia: freight storage, transport and distribution

The Site was mostly sealed in concrete and bitumen hardstand surfaces.

Small garden or lawn areas were present along the main access driveway from Burrows Road and near Unit 8. A small area of unpaved ground was present between Unit 9 and the north western Site boundary. Multiple fragments of asbestos containing material (ACM) were observed in this area.

2.3 Surrounding Land Use

Land use surrounding the Site included:

- North and east: Alexandria Landfill facility (former brick-pit).
- South: Burrows Road followed by commercial/industrial properties, then Alexandra Canal. The Canal is located approximately 75 m to the south.
- West: Canal Road followed by commercial/industrial properties.

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3.0 Background Information/Phase I ESA

The following sections summarise the Site history and background data reviewed by AECOM.

3.1 Section 149 Certificate

AECOM reviewed the Planning Certificate issued under Section 149 of the Environmental Planning and Assessment Act, 1979. The Certificate was dated 20 August 2015 and is summarised below:

- The Site is identified as Lots 11 and 12 in DP 606737 and is owned by Tallina Pty Ltd.
- The Site is zoned IN1 General Industrial under the Sydney Local Environmental Plan 2012.
- There are no matters listed for the Site under the Contaminated Land Management Act, 1997.

A copy of the Certificate is included in **Appendix D**.

3.2 Previous Reports

3.2.1 Mahaffey Associates Pty Ltd 1994

AECOM reviewed a report dated 10 May 1994 (Report No. GR270, *Geotechnical Assessment of Possible Site Contamination at No. 1-3 Burrows Road, Alexandria*) prepared for Goodman Hardie Pty Ltd, as summarised below:

- The Site was noted to be located in an area reclaimed by the infilling of Sheas Creek and construction of Alexandra Canal. Fill materials were expected to be present at the Site to approximately 1 m bgs.
- Historical Site activities were noted to comprise a hessian bag manufacturer (Abrahams Pty Ltd) and warehousing by Australian Liquor Distributors Pty Ltd.
- In 1994, the Site was occupied by:
    - Premier VIP Stores Pty Ltd (Units 1 and 2). Warehousing and dispatch type-operation. The report noted there were no chemical manufacturing or chemical storage activities.
    - Croxley Collins Pty Ltd (Unit 3). The report noted there was a recharging location for battery operated equipment.
    - St Regis Bates Pty Ltd (Units 4 to 7). The report noted that operations included the manufacture of multi-layered heavy paper packaging and inks were used for printing.
    - Rheem Australia Pty Ltd (Units 8 to 11). The report noted there were a variety of manufacturing activities related to the production of strengthened plastic fabrics, packaging liners and finished packaging. A 9000 litre underground storage tank (UST) for the storage of solvents was present, as were two Liquified Petroleum Gas (LPG) tanks.
- The report concluded that the Site "*has not suffered significant contamination as a result of past developments*" and "*existing activities are not likely to involve a significant environmental risk*".

3.2.2 Hibbs & Associates Pty Ltd 2005

AECOM reviewed a report dated April 2005 (Reference No. S3933/130, *Hazardous Materials Survey, Burrows Industrial Estate, 1-3 Burrows Road, Alexandria*) prepared for Macquarie Goodman Property Services Pty Ltd, as summarised below:

- No friable asbestos containing materials were identified on the Site.
- Bonded asbestos materials were identified to include asbestos cement sheets lining the external soffits of Units 1 and 9a, lining a gas cabinet near the machinery area in Unit 7 and possible vinyl asbestos tiles in Unit 3.

3.2.3 AECOM 2011

AECOM completed an Underground Petroleum Storage System (UPSS) inspection and compliance report in 2011 (reference 60218857_Burrows IE_20111118). The report is included in Appendix D and identified the following:

- At least five USTs have been present. Three USTs were decommissioned by removal in 1997 and two USTs may have been abandoned in-situ in approximately 1990. Based on WorkCover data, the USTs appeared to be:
    - 2 x 18 000 L (petrol): located in the south western portion of the Site, near Unit 1.
    - 1 x 20 000 L (petrol): located on the northern side of Unit 8, near the present day LPG tank.
    - 1 x 9000 L (solvent): located adjacent to Units 4 and 6.
    - 2 x 20 000 L (petrol): located adjacent to Units 4 and 6.
- No active USTs were identified by AECOM in 2011.
- WorkCover NSW Dangerous Goods records were obtained for the Site and these are included in the AECOM 2011 report. The Dangerous Goods records also noted the following:
    - Rheem Australia (occupier) and A. Abrahams & Sons (trading name) (1972 and 1975): two bunded storage areas of brick wall and concrete floors for the storage of solvent-based inks and waste solvents/inks. An above ground tank for 4 700 L of copper naphthenate, (a wood preservative) located opposite Units 4 and 6.
    - Rheem Australia (1994): roofed package store, with toluene (800 L), black ink (300 L), reducer (100 L) and butyl rubber adhesive (4000 L). Two 7500 L above ground storage tanks (ASTs), for propane and butane and a 2000 L AST for LPG. A drum store for 15 000 L of 'Instapak Component A'.

The inferred locations of the USTs are provided on Figure 1 in the AECOM 2011 report (Appendix D).

3.2.4 PSM Consult Pty Ltd 2015

Pells Sullivan Meynink (PSM) completed a geotechnical investigation of the Site in September 2015 (Reference: PSM2808-005R. *Burrows Industrial Estate, 1-3 Burrows Road, Alexandria, Geotechnical Investigation*). Review of the report indicated the following:

- The 1:100 000 Sydney Geological map indicates the Site is underlain by Quaternary alluvium (peat, sandy peat and mud).
- Fieldwork was undertaken on 13 August 2015 and included the completion of six Cone Penetrometer Tests (CPTs) by truck mounted testing rig and three bulk samples were collected by hand auger. CPTs were completed to 12 to 14 m bgs. Bulk samples were collected from approximately 0.2 to 0.5 m bgs.
- Bulk samples were logged to comprise clayey sand.
- Based on CPT data, PSM inferred that subsurface Units at the Site included (depths are approximate):
    - Pavement: 0 to 0.2 m bgs.
    - Fill: 0.2 to 1 m bgs. Gravelly sand and clayey sand, medium to very dense.
    - Upper Sand: 1 to 3 m bgs. Silty sand, loose to dense. PSM inferred that groundwater was present between 1.4 and 2.5 m bgs.
    - Upper Clay: 3 to 5.8 m bgs. Clay to silty clay, soft to firm.
    - Lower Sand: 5.8 to 8.7 m bgs. Sand to silty sand, dense to very dense.
    - Lower Clay: 8.7 to 10.7 m bgs. Clay to silty clay, stiff to very stiff.
    - Bedrock: 10.8 m bgs, inferred from CPT refusal.

3.3 Expected Subsurface Conditions

A review of readily available data In relation to expected soil geology and hydrogeological conditions is provided in the following sections.

3.3.1 Geology

According the *Sydney 1:100,000 Geological Series Sheet 9130* (DMR, 1983), Site conditions are mapped to comprise Quaternary sediments consisting peat, sandy peat and mud. The Site is mapped to be situated adjacent to Ashfield Shale of the Wianamatta Group.

3.3.2 Soils

According to the *Sydney 1:100,000 Soil Landscape Series Sheet 9130* (DECCW, 2009), Site soil conditions are mapped to comprise 'Disturbed Terrain', which may comprise:

- Level to hummocky terrain extensively disturbed by human activity, including quarries, tips, areas of landfill.
- Original soils have been removed, greatly disturbed or buried and landfill including soil, rock, building and waste materials may have been added.

Based on the review of the City of Sydney Acid Sulfate Soil (ASS) Risk Map Sheet (refer Appendix D), Class 3 ASS are mapped to be present. Under the classification scheme, Class 3 means that any work greater than 1 m bgs or any works that would lower the water table by greater than 1 m bgs would require development consent.

AECOM notes that ASS are unlikely to manifest in fill materials however, would likely be present in the Quaternary sediments. Investigation and testing would be required to confirm the presence of ASS.

3.3.3 Hydrogeology

AECOM notes that the Site is located in Zone 2 of the Botany Groundwater Management Zones (refer Appendix D). Groundwater use for domestic purposes (e.g. drinking water, watering gardens, washing, bathing etc.) is banned in Zone 2.

A search of the NSW Office of Water database of registered groundwater bores was undertaken by AECOM in July 2014 for an approximate 1 km radius of the Site, as summarised in the following table:

Table 3 Bore Search Summary

Bore	Total Depth	SWL	Distance & Direction from Site	Use	Other
GW072643	12		200 m NE	Test bore	2 m of fill materials, Alexandria Landfill
GW100053	7	1	1 km NE	Recreation	Sydney Park
GW109821	35	14.5	600 m N	Monitoring	2.2 m of fill, Alexandria Landfill
GW109822	10.45	3	100 m NE	Monitoring	2.6 m of fill, Alexandria Landfill
GW109823	29	12.5	100 m NE	Monitoring	3 m of fill, Alexandria Landfill
GW109824	20.7	4.5	250 m NW	Monitoring	4.5 m of fill, Alexandria Landfill
GW109825	22	14.9	600 m NNW	Monitoring	4.5 m of fill, Alexandria Landfill
GW111320	5.2	2.5	1 km NE	Monitoring	Sims property
GW111321	5	2.6	1 km NE	Monitoring	Sims property

Notes: depths are in metres. SWL = standing water level

The bore search data indicates that groundwater is expected to be present at the Site, from approximately 2 m bgs. Groundwater is expected to flow towards Alexandra Canal however, the following is noted:

- Due to proximity of Alexandra Canal, the depth to groundwater may be tidally influenced.
- The presence of the former brick-pit excavation (Alexandria Landfill) may cause a localised reversal in groundwater flow direction.

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3.4 Certificates of Title

AECOM completed a review of historical certificates of title to gain an understanding of former site owners and potential land use (refer Appendix D). In summary, the documentation indicated the following ownership history:

Table 4 Ownership History

Year(s)	Owner	Possible Use
2000 to date	Tallina Pty Ltd	Warehouse estate
1988 to 2000	Goodman Hardie Pty Ltd	Warehouse estate
1951 to 1980 (Lot 12)	The Austral Brick Company Pty Ltd	Clay-shale extraction and associated activities
1924 to 1951 (Lot 12)	The central Brick and Tile Company Pty Ltd	As above
1972 to 1979	Rheem Australia Pty Ltd	Production of packaging materials
1949 to 1972	A. Abrahams & Sons Pty Ltd	Manufacturing of hessian bags
1915 to 1948	Council of Municipality of Alexandria	Unknown
Pre 1915	Various owners (e.g. administrators of Estate of James Collins, Gerald William Cooper, Frederick William Lynch [brickyard manager] and Walter George West [brickyard manager]	Brickyards

Review of documentation included in the certificate of title search indicated:

- The presence of a fuel bowser (off-site) near the south western corner of the Site.
- Unit 9 building was noted to be under construction in 1980.
- A brick and galvanised iron factory building was present along the Sites' north western boundary in 1980.

According to the Encyclopaedia of Australian Science (refer Appendix D), A Abrahams & Sons Pty Ltd was a company that produced sacks and bags and then flexible packaging.

3.5 Websites

AECOM completed reviews of various websites, to gain an understanding of the Site setting and expected conditions. These reviews are summarised below.

3.5.1 NSW EPA

Review of the NSW EPA website was undertaken to evaluate if the Site or nearby properties were listed under Section 58 of the Contaminated Land Management Act, 1997. The subject Site was not listed.

Listed properties in the Site vicinity include:

- The bed of Alexandra Canal, contaminated with chlorinated hydrocarbons, pesticides and metals.
- Former Cadbury Schweppes site (45-49 O'Riordan Street, Alexandria), located approximately `1.4 km from the subject Site and therefore unlikely to affect it.
- Australia Post (10-24 Ralph Street, Alexandria),located approximately 1.3 km from the subject Site and therefore unlikely to affect it.
- Former Tidyburn facility (53 Barwon Park Road/15 Campbell Road, St Peters). Based on review of sixmaps (http://maps.six.nsw.gov.au/#), this appears to be part of the Sydney Landfill facility, located approximately 600 m to the north of the Site. The EPA has declared this as a Remediation Site and considers that soil is contaminated with PAH, TRH and BTEX and groundwater is contaminated with naphthalene and TRH.

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The EPA website was also reviewed for Licences issued under the Protection of the Environment Operations Act. No current licenses for the Site were identified however, Sealed Air Australia Pty Limited formerly held a license for 'hazardous, Industrial or Group A Waste generation or Storage'. Properties near the Site with licenses included:

- 33 Burrows Road St Peters, SITA Alexandria Pty Ltd: for the non thermal treatment of general waste and waste storage.
- 25 Burrows Road St Peters, Council of the City of Sydney: for a materials recycling depot, waste storage and recovery of general waste.

EPA search records are presented in Appendix D.

3.5.2 UXO

Review of the Department of Defence unexploded ordnance (UXO) website on 22 September 2015 indicated that the Site was not listed (refer Appendix D).

3.5.3 Council

AECOM reviewed readily available information posted on the archive section of the City of Sydney website, as summarised below.

Maps

A town planning map from 1950 shows the A. Abrahams & Sons Pty Ltd facility, noted to be a bag and sack manufacturer. The property at 5/5A Canal Road is noted to be a metal merchant.

Photographs

Two photographs show the A. Abrahams & Sons Pty Ltd facility circa 1977 to 1980. The Site frontages to Burrows and Canal Roads generally appear similar to the current layout.

Development & Building Applications

It is noted that the Development and Building Applications (DA's and BA's) may not have necessarily been approved by Council. Review of the data indicated the following:

Table 5 City of Sydney Archives

Item	Date/s	Comments
304(A62)/49	Start: 28 Nov' 1949 End: 29 Jun' 1950	Corner (Cnr) Canal St & Burrows Rd, Alexandria. A. Abrahams & Sons. Amenity Building.
16/50	Start: 14 Dec' 1949 End: 20 May 1953	Cnr Burrows Rd & Canal Rd Alexandria. Alterations & additions to connect two existing buildings to provide additional space for the manufacture of bags. A Abrahams & Sons P/L. Interim Development Application.
216/50	Start: 23 Mar' 1950 End: 14 Apr' 1950	Cnr Burrows Road & Canal Road, Alexandria. Alterations to Building (No.7) & use of portion for the sewing of bags & to house cleaning machines. A. Abrahams & Sons Pty. Ltd. Interim Development Application.
563/51	Start: 06 Jun' 1951 End: 27 Oct' 1952	Canal Rd Burrows Rd, Alexandria. Erection of public weighbridge & housing. A. Abrahams & Son Pty. Ltd.
4719/53	Start: 10 Nov' 1953 End: 13 Jan' 1954	Premises, Canal Rd., Alexandria, occupied by A. Abrahams & Sons P/L. Use of building No. 9 (Fronting Burrows Rd.) by Terazzo & Co. P/L for the purpose of vehicle maintenance and as a workshop
131/54	Start: 28 Jan' 1954 End: 26 May 1955	Cnr Burrows & Canal Rds, Alexandria - office block & septic tank [A Abrahams & Sons Pty Ltd]
5593/56	Start: 07 Nov' 1956 End: 20 Feb' 1957	Property, Burrows Rd. & Canal Rd., Alexandria. A. Abrahams & Sons Pty. Ltd. Subdivision.
1025/57	Start: 01 May 1957 End: 21 May 1958	Cnr. Canal Rd & Burrows Rd, Alexandria (A. Abrahams & Sons) Additions to existing factory. (Building No.4)
457/58	Start: 07 Jul' 1958 End: 01 Dec' 1961	Cnr Canal & Burrows Rd Alexandria. Construction of a Modern Service Station. (A. Abrahams & Sons)

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Item	Date/s	Comments
708/60	Start: not specified End: 14 Jul' 1969	Cnr Canal Rd & Burrows Rd, Alexandria. Erection of a factory for use in the manufacture of containers. A Abrahams & Sons P/L.
796/60	Start: 01 Apr' 1960 End: 16 May 1961	Cnr Burrows & Canal Rds, Alexandria - new building (factory) [A Abrahams & Sons]
0594/61	Start: 17 Mar' 1961 End: 29 May 1964	Cnr. Canal Road & Burrows Road, Alexandria. Office Extension. A. Abrahams & Sons Pty. Ltd.
1943/61	Start: 13 Sep' 1961 End: 26 Feb' 1962	Cnr Canal & Burrows Rds., Alexandria. (A. Abrahams & Sons) Factory additions
0001/62	Start: 21 Dec' 1961 End: 02 May 1962	Burrows Rd Alexandria. (Abrahams). Proposed erection of a sub-station. A. Abrahams & Sons P/L
121/62	Start: 12 Dec' 1967 End: 29 May 1968	Premises, Canal Rd & Burrows Rd, Alexandria. A. Abrahams & Sons Pty Ltd. To erect a single-storey building for use as a substation.
2805/63	Start: 04 Dec' 1963 End: 06 Mar' 1970	Cnr Canal & Burrows Rds Alexandria. Plastic Factory. Abrahams & Sons P/L.
6824/67	Start: 12 Dec' 1967 End: 29 May 1968	Premises, N.W. Cnr. Canal Rd. & Burrows Rd.,Alexandria. A Abrahams & Sons Pty Ltd. D.A.(Erection of extension)
80/C/072	Start: 17 Mar' 1961 End: 14 Jun' 1974	Premises Canal Rd, Burrows Rd Alexandria. A Abrahams & Sons Pty Ltd. To erect a single storey addition to a single storey office building. For Council's comment
241/74	Start: 26 Jun' 1974 End: 20 Jan' 1975	Cnr Canal & Burrows Rds, Alexandria. Ink & solvent store (Plastics Dept) A. Abrahams & Sons
35/77	Start: 16 Feb' 1977 End: 14 Jan' 1982	Cnr Canal & Burrows Rd Alexandria. Creation of Factory Units. (Rheem Aust Ltd)
37/79	Start: 20 Jan' 1979 End: 22 Nov' 1979	Cnr Burrows & Canal Rds, Alexandria. Fume exhaust stack & cold air exhaust stack. Rheem Aust Ltd.
44 83 2459	Start: 21 Dec' 1983 End: 04 Oct' 1984	1-3 Burrows Rd. Alexandria. Erect building & use as inflammable liquids store. Rheem Australia Ltd.
45 83 5516	Start: 30 Nov' 1983 End: 27 Mar' 1986	Factory unit 8, No 1 Burrows Rd Alexandria. New Structure. Rheem Aust.
45 86 0070	Start: 07 Jan' 1986 End: 03 Mar' 1987	1 Burrows Rd Alexandria. Erect a hot room, factory unit 9 Eastern wall. Rheem Australia Ltd.

In summary, Council records indicate a long history of Building and/or Development Applications for the Site. Based on the DA and BA information, historical Site activities are inferred to have included:

- Manufacturing of bags and then plastic containers.
- Workshop and vehicle maintenance workshop(s).
- Below-ground storage of petroleum hydrocarbons and solvent-based inks. AECOM notes that one DA/BA was for the erection of a service station however, the WorkCover records did not contain any information related to this. It is assumed that the petrol station was not constructed.
- Above-ground storage of solvent-based inks and waste inks, toluene, adhesive and copper naphthenate.

3.6 Aerial Photographs

The following information was derived from reviewing historical aerial photographs for the Site and surrounding area. Copies of aerial photographs are included as Figures 3 to 11.

Table 6 Aerial Photographs

Year	Comments
1930 (Figure 3)	**Site**: no obvious development noted at the Site however, surface of the site appears to be disturbed land. An access track from Woodley Street (near northern part of Alexandra Landfill) runs into the Site, to the area of 'disturbed' ground **Surrounds**: Alexandra landfill (brick-pit excavation) is present to the north of the Site however, photograph does not include detail for area to the north west of the Site. Burrows and Canal Roads are present and there is minimal commercial/industrial development.
1943 (Figure 4)	**Site**: the Site appears undeveloped however, the access track observed in the 1930 photograph still appears to be present. There may be a fence along the Canal Road boundary area of the Site. The Site surface appears 'mottled' and 'hummocky', suggestive of filling activities. **Surrounds**: two large brick-pit excavations are present, to the north and to the north west of the Site. Cluster of buildings noted at 5/5A Canal Road. A plume of smoke is visible emanating from a chimney at 5/5A Canal Road. Expansion of industrial activities along Burrows and Canal Roads.
1951 (Figure 5)	**Site**: Eight buildings, parallel to each other and on a SE to NW alignment are present, fronting Burrows Road and four buildings are present along the north western boundary area. A dark area on the plan, possible excavation pit, is present in the approximate location of Lot 12. **Surrounds**: Expansion of industrial activities along Burrows and Canal Roads. Expansion of brick-pit excavations, towards the Site. Cluster of buildings noted at 5/5A Canal Road, possibly representing the metal smelter.
1961 (Figure 6)	**Site**: eight buildings fronting Burrows Road are still present. There appears to have been additions to the buildings at the north western boundary area. Unit 1 appears to be present. The north eastern portion of Lot 11 appears to remain undeveloped. The dark area noted in Lot 12 in the 1943 photograph is not visible and appears to be 'filled' ground. **Surrounds**: Expansion of brick-pit excavations, towards the Site. Cluster of buildings noted at 5/5A Canal Road, possibly representing the metal smelter.
1978 (Figure 7)	**Site**: eight buildings fronting Burrows road have been replaced by a large ware-house type building. Buildings along the north western boundary area are present and appear to have been extended to the south (i.e. current Units 8 and 9). A large shed-like building is present in the western portion of Lot 12 and the remainder of Lot 12 appears to be used as a storage yard (details difficult to discern). **Surrounds**: Expansion of brick-pit excavations and/or landfill operations, towards the Site. Cluster of buildings noted at 5/5A Canal Road.
1986 (Figure 8)	**Site**: layout generally as per current. Access Road from Burrows Road is present and the large building fronting Burrows Road has been modified (i.e. part removed). Buildings along the north western boundary area have been removed and replaced by asphalt paved car park. Units 8 and 9 buildings are present. Lot 12 has been redeveloped, with one large warehouse-style building present. **Surrounds**: disturbed land associated with the brickpit/landfill appears to extend to the Sites' western and northern boundaries.
1991	**Site**: generally as per 1986 photograph. **Surrounds**: generally as per 1986 photograph.
1999 (Figure 9)	**Site**: generally as per 1986 photograph. **Surrounds**: generally as per 1986 photograph.
2004 (Figure 10)	**Site**: generally as per 1986 photograph however, it is noted that the roof on Units 2 to 8 appear to have been modified, possibly changed from corrugated asbestos cement to metal. **Surrounds**: generally as per 1986 photograph.
2014 (Figure 11)	**Site**: as per current layout. **Surrounds**: no obvious buildings noted at 5/5A Canal Road, except for one shed structure.

In summary, the aerial photographs indicate:

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- The Site was first developed in the mid to late 1940s. Prior to this, the Site appears to have been filled with materials associated with construction of Alexandra Canal and/or waste materials associated with the brickpits/landfills and/or wastes of unknown origin.
- The Site has undergone extensions to the original buildings and additions of new buildings.
- The original buildings have mostly been removed and replaced.
- Quarrying and landfilling operations have been undertaken on the adjacent property, as well as operation of a metal merchant / smelter at 5/5A Canal Road.
- A high potential for contamination to exist.

3.7 Site Inspection

Inspections of the Site were completed by AECOM prior to and during completion of intrusive investigation activities. Detailed inspection of the internal areas of Unit 1 (no access) and Units 5 to 11 were not completed, to minimise disruption to tenants and/or due to quarantine restrictions and because the sampling locations targeted areas external to buildings. It is also noted that Units 10/11 are located in the undevelopable portion of the Site and were therefore, 'out of project scope'. Observations are summarised below and selected photographs are included in Appendix E:

- A high point exists near the central portion of the Site, near Units 5 and 9. The Site surface slopes down to the south and to the north of this high point.
- No visible signs of the presence of USTs were observed, consistent with the AECOM 2011 observations.
- The Site surface was mostly paved. The asphalt paved car park was (considered to be) in an average to poor condition. Concrete floor slabs in Units 2 to 4 were generally in good condition.
- A fire pump housing unit was present between Units 1 and 2. The pumps appeared to be electric-powered and no signs of fuel storage were observed.
- Some minor production of plastics (moulds) was observed in Unit 8 and 9 as well as some storage of pre-packaged chemical containers. Storage activities appeared to be well maintained.
- Unit 4 was utilised for the storage of packaged drink products.
- Units 5 and 6 were used for the storage and manufacture of 'set-designs'. Manufacturing was observed to include the sawing, cutting and painting of wood products. Based on the presence of the concrete floor slab, the potential for contamination to the subsurface of these activities is considered to be low.
- Unit 7 appeared to be used for storage of packaged goods on shelving. Observation made from the main access doorway indicated a well maintained facility.
- Numerous fragments of ACM were observed on the ground surface between Unit 9 and the Site's north western boundary. In addition, observed anthropogenic materials included nodules of slag, pieces of glass, ash/coke and metal waste. Fragments of probable ACM and slag were also observed on the ground surface on the northern side of Unit 9.
- Pieces of slag were observed in fill materials beneath the concrete slab for the car-park area of Unit 7.
- A small plant room was present on the southern side of Unit 8. Access was not obtained however, it appeared that compressors were present on a concrete slab. No exhaust pipes or vent pipes were observed.
- A flammable liquids store sign was present on the external northern wall of Unit 8 and a fenced compound was present adjacent to this. The compound was empty but based on the presence of residual steel pipework on the external wall of the building, appeared to formerly store gas cylinders and/or ASTs. Borehole BH19 was completed outside the store area. Two brick bund areas with concrete bases were also present with no storage activities. The bunds appeared to be in reasonable condition with no obvious indications of leaks or spills.
- A large mound of material was present off-site, near the Site's north western boundary area.

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4.0 Investigation Rationale and Methodology

4.1 Contaminants of Potential Concern

Based on the data reviewed, Contaminants of Potential Concern (CoPC) at the Site are considered to include:

- Suite of eight metals: can be present in fill materials of unknown origin and quality and in foundry/casting sands and can be associated with workshop and mechanical repair and maintenance activities. Some metals (e.g. arsenic) have been used for insect (termite) control. Common metal contaminants include arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc.
- Benzene, toluene, ethylbenzene xylenes and naphthalene (BTEXN): typically associated with petrol and to a lesser extent, diesel. Can occur in fill materials of unknown origin and quality and can be associated with workshop and maintenance/repair activities. Naphthalene may be associated with the former copper naphthenate storage.
- Total Recoverable Hydrocarbons (TRH): occur in petrol and diesel fuels, oils, solvents and can be present in fill materials of unknown origin and quality.
- Polycyclic aromatic hydrocarbons (PAH): can be present in petrol and diesel fuel, oil, waste oil, creosote, tar, bitumen/asphalt and in incompletely combusted materials, such as ash and slag. Can be present in fill materials of unknown origin and quality.
- Phenols: typically associated with waste oils.
- Organochlorine pesticides (OCP): typically related to insect control (termiticides). Typically applied immediately beneath building slabs and/or around timber structures in contact with the ground. Can be present in fill materials of unknown origin and quality. The use of OCP was banned in the 1980s.
- Organophosphorus pesticides (OPP): typically related to insect (e.g. termite) control. OPP are less persistent in the environment than OCP.
- Polychlorinated biphenyls (PCB): historically present in electrical equipment such as transformers and capacitors. Can be present in fill materials of unknown origin and quality.
- Asbestos: can be present in fill materials of unknown origin and quality and with the deterioration/damage/weathering of asbestos building structures.
- Volatile halogenated compounds (VHC): related to solvents such as degreasers, lubricants, and thinners. VHC are commonly present in groundwater in the Botany Sands.

4.2 Investigation Locations

The developable portion of the Site is approximately 3.6 Ha. The NSW EPA (1995) Sampling Design Guidelines recommend approximately 46 sample locations as a minimum number of sampling points for the characterisation of a 3.6 Ha Site.

A total of 22 soil boreholes and four surface samples were completed, mainly on a broad grid in readily accessible areas external to the buildings. Six boreholes (BH01, BH04, BH16, BH17, BH20 and BH21) were positioned in proximity to the inferred locations of the former USTs.

AECOM considers that the investigation density completed is sufficient to assess if significant contamination-related constraints to Site redevelopment are present however, additional works may be required to enable a better understanding of contamination-related risks.

Sample locations are shown on Figure 2 in Appendix A and the rationale is presented in Table 7:

Table 7 Sample location rationale

Location(s)	Rationale
BH01/MW01	Vicinity of former USTs.
BH02, BH03	Vicinity of former buildings and general Site coverage.
BH04	Vicinity of former USTs.

Location(s)	Rationale
BH05 to BH15	Vicinity of former buildings and general Site coverage.
BH16/MW16, BH17/MW17	Vicinity of former USTs.
BH18	General Site coverage.
BH19	General Site coverage and vicinity former Flammable liquids store area.
BH20	Vicinity of former USTs.
BH21/MW21	Vicinity of former USTs and general Site coverage.
BH22	General Site coverage.
SS01 to SS04	Assess for asbestos in surface soils adjacent to Site boundary.

Positions of boreholes were also influenced by Site operational concerns and the presence of underground utilities. Three attempts were made at borehole BH07 and as a result, soil sample identifiers include BH07, BH07A and BH07B. All three locations were located within a one metre radius and the data is considered representative of one borehole location.

4.3 Soil Assessment Methodology

The soil assessment was completed in August 2015 and the methodology is summarised below:

Table 8 Soil Assessment Methodology

Activity	Details
Service Clearance	Prior to the drilling, borehole locations were checked for underground services by a Telstra accredited service locator using radio-detection and with reference to utility plans obtained through the Dial-Before-You-Dig service.
Surface Samples	Surface samples were collected by stainless steel hand-trowel and placed into snap-lock plastic bags.
Drilling Method & Soil Sample Collection	Boreholes were initially drilled by hand auger to approximately 1 m bgs to reduce the risk of contact with underground services. A Geoprobe™ drill rig was used to complete the boreholes by continuous push tube methodology. The push tube boreholes were typically completed at least 1 m into natural soils. Two boreholes (BH06 and BH15) encountered refusal in fill material. There was poor sample recovery in borehole BH17, likely due to blocky fill material obstructing the PET tube. In multiple instances, solid flight auger drilling was required to penetrate blocky fill materials and/or buried concrete slabs. Soil samples from the surface to 1m bgs were collected directly from the hand auger cutting head and then were collected directly from the push tube cores. Relatively undisturbed soil samples (i.e. push tubes) are denoted as a 'black bar' on the borelogs, while samples collected from the hand auger and/or solid flight auger are denoted by an 'x' (refer Borelogs, **Appendix F**). At locations where monitoring wells were installed, the soil boreholes were re-drilled/reamed with hollow stem augers, to enable placement of the monitoring well materials.
Soil logging	Soil logging was in general accordance with the Unified Soil Classification System. A sample register is included as **Table T1** in **Appendix B**.
Soil Sample Collection For Analysis	The soil samples were collected into laboratory-prepared 250 mL glass jars with Teflon-lined lids, which were filled to minimise headspace and placed in an insulated cooler containing crushed ice. All soil samples were collected by gloved hand. A new pair of nitrile gloves was worn for each sample collection event.

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Activity	Details
Field Screening	Soil sub-samples were placed in snap-lock plastic bags and the headspace screened in the field for volatile organic compounds (VOCs) using a calibrated Photoionisation Detector (PID) equipped with a 10.6 eV lamp. The PID screening results are provided on **Table T1** and the borehole logs. Calibration details are provided in **Appendix C**.
Decontamination	Sampling equipment was decontaminated between boreholes by brushing away extraneous materials, washing with phosphate free detergent, followed by a rinse with potable water.
Quality Control (QC) samples	QC samples included the collection and analysis of field duplicate samples (refer to **Appendix C**).
Spoil Disposal	Excess soil cuttings from the boreholes were placed into 205 litre drums and appropriately disposed off-site.

4.4 Groundwater Assessment Methodology

The groundwater assessment methodology is summarised below:

Table 9 Groundwater Assessment Methodology

Activity	Details
Well Construction and Installation	Monitoring wells were constructed from Class 18 uPVC 50 mm outside diameter machine threaded riser and slotted (0.5 mm) casing. After completion of the push tube borehole and logging of encountered conditions, including measurement of the water level in the borehole, the borehole was re-drilled with hollow flight augers. The monitoring well materials were then assembled and placed into the annulus of the hollow flight auger. Graded filter sand was added to approximately 0.5 m above the top of the screened interval and a minimum 0.5 m layer of hydrated bentonite seal was added above the filter sand. The hollow flight augers were carefully removed as the sand and bentonite were added to the construction. The wells were typically installed with 3 m long screens, targeting the first encountered groundwater strike. The wells were finished with steel road box covers. Well construction details are provided in **Appendix F**.
Well Development	The wells were developed as soon as practicable after installation using low-flow pumping, to promote connectivity with the aquifer. Geochemical parameters (temperature, electrical conductivity, redox potential, dissolved oxygen and pH) were measured by a calibrated water quality meter (WQM) during development. Development continued until the geochemical parameters stabilised and the water became clear. Typically, between 8 and 11 L of water were removed from each well during development, refer **Table T2** in **Appendix B**. Field worksheets and calibration records for the WQM are provided in **Appendix C**.
Survey	Monitoring well locations and the elevation of the top of the casings were recorded by appropriately qualified surveyors (refer **Appendix C)**. The survey also captured all the borehole locations.
Well gauging	The standing water level (SWL) in all monitoring wells was measured using an electronic water/oil interface meter, which was also suitable for detecting light non-aqueous phase liquid (LNAPL). The measurements were taken on the same day and in as close succession as possible to minimise temporal variation. Gauging was completed prior to purging and the data is presented on **Table T2** in **Appendix B**.
Well purging	Monitoring wells were purged using low flow sampling equipment. Geochemical parameters were measured by a calibrated WQM and the SWLs were measured by the interface probe during purging. Purging continued until the geochemical parameters and SWL stabilised. The stabilised geochemical parameters are provided on **Table T3** in **Appendix B**. Field worksheets and calibration records for the WQM are provided in **Appendix C**.

Activity	Details
Groundwater sampling	Monitoring wells were sampled using low flow sampling equipment. The groundwater samples were collected after the geochemical parameters had stabilised to within approximately 10% in three successive readings.
Decontamination	Decontamination of the interface meter probe and sampling pump was undertaken using a phosphate free detergent solution followed by a double rinse with laboratory supplied deionised water. Dedicated sampling tubing was used to reduce the risk of cross contamination. One rinsate sample (QC201) was collected from the interface meter probe head following decontamination procedures. One field prepared trip blank (TB) was utilised during sample holding and transport, to assess for potential cross-contamination.
Purge Water Disposal	Purged water was stored in a 205 litre drum and appropriately disposed off-site.

4.5 Laboratory Analysis

ALS Environmental (ALS) was used as the primary laboratory and Envirolab Services Pty Ltd (Envirolab) was used as the secondary (or 'check') laboratory.

Soil samples were selected for analysis based on:

- The presence of odours and/or unusual colouration in the soil samples and/or elevated PID readings.
- The presence of fill materials.
- The depth to encountered groundwater during drilling.
- Current Site use and/or features (e.g. decommissioned UST).
- The presence of fragments of probable ACM.

Groundwater samples were analysed for TRH, BTEXN, PAH, metals and VHC.

Table T1 in Appendix B provides a summary of the soil and groundwater samples analysed (including quality control samples) and the rationale for sample selections for analysis. The laboratory certificates are provided in **Appendix G**.

5.0 Quality Assurance and Quality Control

5.1 QA/QC Data Validation

The QA/QC program implemented for the investigation was completed in accordance with the seven-step DQO process, as described in Appendix C. The achievement of the project DQOs was demonstrated by reference to the DQIs.

5.2 Data Useability

The data validation procedure employed in the assessment of the field and laboratory QA/QC data indicated that the reported analytical results are representative of the soil and groundwater conditions at the sample locations and that the overall quality of the analytical data produced is acceptably reliable for the purpose of this investigation.

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6.0 Assessment Criteria

6.1 Soil

The following guidelines were adopted for evaluation of the soil analysis results:

- NEPC, 1999. *National Environment Protection (Assessment of Site Contamination) Measure (as amended 2013)* (ASC NEPM 2013); and
- CRC CARE (2011). *Health Screening Levels for petroleum hydrocarbons in soil and groundwater.* Technical report series No. 10. Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE). Friebel, E. and Nadebaum, P., 2011.

Application of these guidelines is summarised below.

6.1.1 Health Investigation Levels (HILs)

The HILs described in the ASC NEPM 2013 are scientifically based, generic assessment criteria designed to be used in the first stage of an assessment of potential risks to human health from chronic exposure to contaminants. They are intentionally conservative and are based on a reasonable worst-case scenario for four generic land use settings, as summarised below:

Table 10 Health Investigation Level Summary

HIL	Land Use
HIL-A	Residential with garden/accessible soil (home grown produce <10% fruit and vegetable intake, (no poultry), also includes children's day care 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 flats.
HIL-C	Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools. and footpaths.
HIL-D	Commercial/industrial such as shops, offices, factories and industrial sites.

6.1.2 Health Screening Levels (HSLs)

The HSLs presented in the ASC NEPM 2013 and CRC CARE 2011 were developed to be protective of human health by determining the reasonable maximum concentration from site sources for a range of situations commonly encountered on contaminated sites. The HSLs apply to the same land use settings as for the HILs, although the values for residential A and B are combined, and include additional consideration of soil texture and depth to source to determine the appropriate soil, groundwater and soil vapour criteria for the exposure scenario. The HSLs are summarised on the following table:

Table 11 Health Screening Level Summary

HSL	Land Use	Soil Depths	Soil Types (all land uses)
HSL-A	See **Table 10**	0 m to <1 m 1 m to <2 m 2m to <4m 4m +	**Sand** (sand, sandy clay, sandy clay loam, sandy loam, loamy sand, loam, sandy silt and silty sand) **Silt** (silt, silty clay and silty clay loam) **Clay** (clay, clay loam and silt loam)
HSL-B			
HSL-C			
HSL-D			
Shallow Trench Worker	Utility / intrusive maintenance workers involved in shallow trenches (to a maximum depth of 1m)	0m to <2m 2m to <4m 4m +	

6.1.3 Aesthetics & Ecological Investigation Levels (EILs)

Neither the ASC NEPM 2013 nor CRC CARE 2011 provide numeric aesthetic guidelines however, the ASC NEPM states that *site assessment requires balanced consideration of the quantity, type and distribution of foreign material or odours in relation to the specific land use and its sensitivity*.

As the Site is a commercial/industrial facility and with no visibly obvious indications of stressed/dying vegetation, the EILs for soils have not been considered in this assessment.

6.1.4 Ecological Screening Levels (ESLs) & Management Limits

The Ecological Screening Levels (ESLs) presented in the ASC NEPM are based on a review of Canadian 'risk-based' guidance for petroleum hydrocarbons in coarse and fine grained soils. AECOM notes that the ASC NEPM derived values are moderate to low reliability and that:

- ESLs apply from the surface to 2 m depth, corresponding to the root zone and habitation zone of many species.
- ESLs only apply to coarse and fine grained soils. Where soil texture is not known, a conservative approach should be adopted (i.e. assume coarse soils). AECOM notes that Fill materials may comprise both coarse and fine grained soils and non-soil material.
- Consideration should be given to the risk of material being excavated and causing an exposure risk.

The Management Limits presented in the ASC NEPM reflect the nature and properties of petroleum hydrocarbons, such as:

- The formation of observable LNAPL.
- Fire and explosion hazards.
- Effects on buried infrastructure (e.g. penetration of, or damage to, in-ground services).

Application of the Management Limits requires consideration of site-specific factors such as the depth to building basements and services and depth to groundwater. The ASC NEPM notes that the Management Limits may have less relevance at operating industrial sites, which have no or limited sensitive receptors in the area of potential impact.

6.1.5 Adopted Soil Assessment Criteria (SAC)

The following have been adopted as the soil assessment criteria.

Table 12 Soil Assessment Criteria

Guideline	Level Adopted	CoPC
ASC NEPM (2013)	HIL-D	PAH, Metals, OCP, OPP, PCB, phenols
	Vapour Intrusion: HSL-D, Sand. Depth depends on sample collection depth	TRH, BTEXN
CRC CARE (2011)	Direct Contact: HSL-D Direct Contact: Intrusive Maintenance Worker	
Not applicable	Absence/Presence	Asbestos

The following rationale was applied in the selection of these SAC:

- Commercial/industrial standards (HIL-D and HSL-D for industrial land use) were adopted as they are most applicable criteria for the current and proposed land use.
- For HSLs, sand was selected as the soil type, based on a conservative measure (i.e. significant volumes of highly variable fill material) and based on logged field conditions of the natural soil underlying the fill. Depth was based on sample collection depth.
- Assumes no ecological receptors on-Site, adopted SAC are protective of human health only.

The selected SAC are provided with the soil analysis results on **Table T4** (**Appendix B**). The ESLs and Management Limits for petroleum hydrocarbons are presented on **Table T5**.

The ASC NEPM does provide SAC for asbestos in soil however, the adopted sampling technique does not allow in the collection of sufficient soil sample volume for sample preparation (i.e. bulk sample for sieving). As a consequence, an initial screening criterion of Presence or Absence of asbestos in soil has been adopted.

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Table T4 includes the NSW EPA (2014) Waste Classification Criteria for General Solid Waste. The Waste Classification criteria are presented on Table T6, including the sample results for the Toxicity Characteristic Leachate Procedure (TCLP) tests undertaken.

6.2 Groundwater

The following guidelines were adopted for evaluation of the groundwater analysis results:

- ASC NEPM 2013 *Groundwater HSLs for vapour intrusion*.
- CRC CARE 2011 *Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater*.
- Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand (2000) *National Water Quality Management Strategy - Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC 2000).
- NHMRC 2013 *Australian Drinking Water Quality Guidelines*.

Application of these guidelines is summarised below.

6.2.1 Human Health

HSLs

For the assessment of petroleum hydrocarbon contamination, the HSLs presented in the ASC NEPM 2013 and CRC CARE 2011 are applicable for assessing vapour intrusion risks from contaminated groundwater . The HSLs are based on five specific land uses/receptors; three soil types and three depth ranges for groundwater, as summarised on Table 13.

Table 13 Health Screening Level Summary

HSL	Land Use	Depth to Groundwater	Soil Types (all land uses)
HSL_A	See **Table 10**	2 m to <4 m 4 m to <8 m 8 m +	**Sand** (sand, sandy clay, sandy clay loam, sandy loam, loamy sand, loam, sandy silt and silty sand) **Silt** (silt, silty clay and silty clay loam) **Clay** (clay, clay loam and silt loam)
HSL_B			
HSL_C			
HSL_D			
Shallow Trench Worker	Utility / intrusive maintenance workers involved in shallow trenches to a maximum depth of 1m)		

Drinking Water Quality Guidelines

For the assessment of drinking water, the ASC NEPM 2013 refer to the use of the *Australian Drinking Water Quality Guidelines* which were published in 2011 and updated in 2013 (NHMRC, 2013). These guidelines have been developed for health and aesthetic quality levels for supplying good quality drinking water. The Australian Drinking Water Guidelines (ADWG) do not present guideline values for TRH in drinking water.

6.2.2 Ecological

The ASC NEPM provides Groundwater Investigation Levels (GILs) for Fresh and Marine Waters, which are based on the ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC 2000).

ANZECC (2000) provide 'trigger' values for chemicals within the water, which represent the best current estimates of the concentration of chemicals that should have no significant adverse effects on the aquatic ecosystem. ANZECC (2000) indicates that an exceedance of a trigger value does not necessarily imply that there is an inherent risk, rather that further assessment and monitoring may be required prior to implementing appropriate management actions. AECOM notes that:

- according to ANZECC (2000), low reliability trigger values are interim levels only because "*low reliability trigger values were derived, in the absence of a data set of sufficient quantity, using larger assessment factors to account for greater uncertainty*", and, "*low reliability values should not be used as default guidelines*".
- Whilst ANZECC (2000) provide an interim, low reliability trigger level of 7 µg/L for crude oil in water, there is no trigger level for TRH. Current laboratory limits of reporting (LOR) cannot quantify TRH to this concentration and as a consequence, no ecological assessment criteria were adopted for TRH.
- The ASC NEPM has not adopted the low reliability trigger levels as GILs.

6.2.3 Adopted Groundwater Assessment Criteria (GAC)

The following have been adopted as the groundwater assessment criteria (GAC):

Table 14 Groundwater Assessment Criteria

Receptor	Guideline	Level Adopted	CoPC
Human Health	ASC NEPM	Vapour Intrusion: HSL-D, 2m to <4m, sand	BTEXN, TRH F1
Ecological	ASC NEPM	Marine Water GIL	BTEXN, metals

The following rationale was applied in the selection of the GAC:

- HSL-D was adopted for human health as they are most applicable to the Site.
- Sand was selected as the soil type and depth to groundwater as 2 m to <4 m based on field observations.
- Marine Water GILs were selected as AECOM considers that groundwater at the Site is likely to initially discharge to Alexandra Canal.

Given that the Site is located in an area which bans utilising groundwater for domestic use, it is considered that groundwater at the Site is unlikely to be extracted and used for drinking purposes. The Drinking Water Guidelines are included on Table T7 for reference purposes.

The adopted GAC are compared to the groundwater analytical results on **Table T7** (**Appendix B**).

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7.0 Results

7.1 Soil

7.1.1 Fill Materials

Fill materials were logged at all boreholes completed and its depth was between 0.5 (BH15, refusal in fill) and 4.5 m bgs (BH16). Based on the logged conditions at the boreholes completed, it is inferred that fill material extends to an average depth of 3.3 m across the site. Given the Site developable area is in the order of 3.6 Ha (36 000 m^2), the volume of fill material is estimated to be in the order of 120 000 m^3.

Fill materials were variable in composition although typically comprised mixtures of sand, silt and clay with inclusions of concrete, glass, ash, slag, terracotta, porcelain, timber and metal waste and fragments of probable ACM. Material logged as 'Ironstone' gravel was also present and it is considered that this likely represents foundry/casting sands. Selected photographs showing the mixed fill material retrieved during sampling are shown in Appendix F.

A summary of the boreholes completed, logged fill depth and presence of ash, slag and foundry/casting sands is provided below:

Table 15 Summary of Fill Materials

Location	Total Depth (m)	Fill Depth (m)	Ash	Slag	Foundry/casting sand	Other
BH01	3.9	2.8	No	No	Yes	
BH02	3.9	2.9	No	Yes	No	
BH03	3.9	3	Yes	No	No	
BH04	3.9	2.3	No	Yes	Yes	Metal waste
BH05	3.9	2.3	No	Yes	No	Metal waste
BH06	1.1	>1.1				Refusal in Fill
BH07*	3	2.3	No	Yes	Yes	Metal waste, ACM fragment
BH08	5.1	2.7	No	Yes	Yes	Metal waste
BH09	5.3	4.2	Yes	Yes	Yes	
BH10	5.1	3.9	Yes	Yes	Yes	
BH11	3.9	3.3	Yes	Yes	Yes	
BH12	4	3.7	Yes	Yes	Yes	Metal waste
BH13	3.9	2.8	No	Yes	Yes	Metal waste
BH14	5.1	3.8	Yes	Yes	Yes	
BH15	0.5	>0.5				Refusal in Fill
BH16	5.1	4.5	Yes	Yes	Yes	Metal waste
BH17	5.1	Not clear	Yes	Yes	Yes	Poor sample recovery. Metal waste
BH18	3.9	3.2	No	Yes	Yes	Metal waste
BH19	3.9	3.2	No	Yes	Yes	Metal waste
BH20	3.9	3.4	No	Yes	Yes	
BH21	3.9	3	No	Yes	No	ACM fragment. Metal waste
BH22	5.1	4.5	No	Yes	Yes	ACM fragment

Note: * includes BH07, BH07A and BH07B.

Two boreholes (BH06 and BH15) encountered refusal on concrete within the fill material and therefore assessment of conditions below these “refusals” has not been completed. AECOM notes that a monitoring well was proposed for BH15 but this was not installed.

Based on the logged conditions, Figure 12 in Appendix A provides inferred cross sections of the Sites subsurface.

7.1.2 Natural Soil and Bedrock

Natural soils were logged to comprise sandy clay, clay, silty clay, silty sand and sandy silt. In locations where organic fibres were logged to be present in natural soil, this represents the presence of decomposing vegetation matter (i.e. peat and/or peat-like material).

Bedrock was not encountered in the boreholes completed.

7.1.3 Soil Odours and VOC screening

No unusual odours in soil were observed at the boreholes completed. Hydrogen sulphide (H_2S) odour was noted at depth in the majority of boreholes completed past the fill materials. The H_2S odour, sometimes logged as ‘organic odour’, was typically present in the natural soil profile, suggesting the presence of ASS. It is noted that H_2S can be associated with landfill facilities.

Soil odours and VOC screening data are presented on the following table:

Table 16 Soil Odour & VOC Measurements

Location	Odour	PID (ppm)
BH01	Slight H_2S in sandy clay	Not measured
BH02	Slight to moderate H_2S in clay and sandy clay	14.1
BH03	Moderate H_2S in sandy clay	19.5 and 21.3
BH04	Mild hydrocarbon (HC) odour in fill at 0.5m H_2S in clay and sandy clay	0.5 0.2
BH05	Strong H_2S in sandy silt and silty sand	0.4 to 0.7
BH06	Shallow refusal	0.2
BH07*	H_2S in silty clay and sandy silt	0.3 and 0.4
BH08	Strong H_2S in silty sand and silty clay	0.5 to 4.1
BH09	Moderate to strong H_2S in clayey sand and sandy clay	139.8 and 390.1
BH10	Slight H_2S in sandy clay	25.3
BH11	H_2S and HC in sandy silt	0.5
BH12	H_2S in silty sand	0.3
BH13	H_2S in sandy silt and silty sand	0.3 to 6.6
BH14	Moderate H_2S in sandy clay	150.1
BH15	Shallow refusal	0.1
BH16	Slight H_2S and possible HC at base of fill	2.1
BH17	Slight HC in Fill at 2.7m. Natural soil not recovered in push tube	15.2
BH18	No odours noted	0.2
BH19	Slight H_2S at base of fill, top of natural sand	1.2
BH20	No odours noted	0.4
BH21	Chemical odour noted from 1 m (odour type not specified)	0.3
BH22	Moderate H_2S in sandy clay	26.7

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The maximum measured concentration of VOC in the PID screened soil-subsamples was 390 parts per million (ppm) at borehole BH09 at 4.6 m bgs. Concentrations of TRH, BTEXN, phenols and VHC were below the laboratory limit of reporting (LOR) in this sample, indicating that the H_2S odour and/or high moisture content in the soil sub-samples may have been affecting the PID.

7.2 Groundwater

7.2.1 Groundwater Elevation

Groundwater gauging data are presented on **Table T2** and summarised below:

- The measured SWL in the groundwater monitoring wells was between 1.096 (MW01) and 3.16 metres below top of casing (m btoc) (MW16).
- The groundwater elevation was between 0.975 (MW17) and 1.024 m AHD (MW01).

Review of the SWL and survey data was inconclusive with respect to evaluating the groundwater flow direction. Groundwater elevation data is presented on **Figure 13**. Based on the site setting, groundwater is inferred to flow towards Alexandra Canal, in a southerly to south westerly direction. Additional data points would be required to confirm the groundwater flow direction(s).

7.2.2 Geochemical Parameters

The stabilised groundwater geochemical parameters collected during the final purge volume are presented on **Table T3** in Appendix B and are summarised below:

- Dissolved oxygen measurements were between 0.02 and 0.92 mg/L, generally indicating low oxygenated conditions.
- Electrical conductivity measurements were between 800 and 2000 µS/cm, generally indicating fresh to brackish conditions.
- pH measurements were between 6.6 and 6.9, indicating mildly acidic to near-neutral conditions.
- Redox potential measurements were between 140 and 270 mV, generally indicating a low redox potential.

7.2.3 Groundwater Observations

No LNAPL, unusual odours or colour were noted in the monitoring wells sampled (refer **Table T3**).

7.3 Analysis Results

The soil sample analysis results are presented on Tables T4 to T6 and the groundwater sample analysis results are presented on Table T7 (Appendix B). For ease of reporting, the tables of results include CoPC for which there are current NSW EPA endorsed assessment criteria. The laboratory analysis reports are presented in Appendix G and contain all analysis results.

7.3.1 Soil

TRH, BTEXN

Thirty seven soil samples were laboratory analysed. Concentrations of BTEXN and TRH were below the adopted HSL D for vapour intrusion in the samples analysed.

Concentrations of TRH >C16-C34 (F3) exceeded the CRC Care HSL D for Direct Contact in three samples, representing two borehole locations (BH17 and BH21). The concentrations of F3 in these samples were below the CRC Care criteria for direct contact by an intrusive maintenance worker.

PAH

Thirty nine soil samples were laboratory analysed and the results indicated:

- Concentrations of total PAH were variable and below the adopted SAC in the samples analysed.
- Concentrations of naphthalene were below the CRC Care direct contact criteria.

- Concentrations of benzo(a)pyrene (B(a)P) were variable and four results were above the ASC NEPM HIL D. The detected concentration of B(a)P at borehole BH21_07-0.8 exceeded the ASC NEPM HIL D by more than 250%.

Two soil samples were re-analysed by the Toxicity Characteristic Leachate Procedure (TCLP) test method. The B(a)P did not appear to be leaching under acidic conditions (refer Table T6).

Metals

Fifty five soil samples were laboratory analysed to evaluate concentrations of the suite of eight metals. Concentrations of metals in the soil samples analysed were variable and below the adopted SAC with the exception of lead.

Concentrations of lead exceeded the ASC NEPM HIL D (1500 mg/kg) in 23 samples. Of these 23 samples, eight exceeded the ASC NEPM HIL D by more than 250% (i.e. exceeded 3750 mg/kg). All samples that contained concentrations of lead above the HIL D were obtained from fill material.

Results of TCLP tests for metals (refer Table T6) indicated that fill materials spanned the waste categories provided in the NSW EPA (2014) Waste Classification Guidelines, including:

- General Solid Waste (GSW).
- Restricted Solid Waste (RSW).
- Hazardous Waste (HW).

OCP, OPP, PCB

Twelve soil samples were laboratory analysed. Concentrations of OCP, OPP and PCB were below the laboratory LOR and therefore below the adopted SAC in the samples analysed.

Phenols

Four soil samples were laboratory analysed. Concentrations of phenolic compounds were below the laboratory LOR and therefore below the adopted SAC in the samples analysed.

VHC

Four soil samples were laboratory analysed. Concentrations of VHC were below the laboratory LOR in the samples analysed.

Asbestos

Eighteen samples were laboratory analysed for the presence/absence of asbestos. Asbestos was identified in nine samples, as summarised below:

Table 17 Asbestos results

Sample	Matrix	Laboratory Comment/Result
BH01_0.3-0.4	Fill	one loose bundle of friable asbestos fibres approximately 3 x 1 x 0.5mm
BH03_1.0-1.2	Fill	several friable asbestos fibre bundles approximately 5 x 2 x 2mm
BH07A_0.5-0.6	Fill	one loose bundle of friable asbestos fibres approximately 4 x 1 x 0.5mm.
BH21_0.7-0.8	Fill	Several pieces of heavily degraded and friable asbestos fibre board approximately 60 x 30 x 3mm with soil debris containing several loose bundles of friable asbestos fibres approximately 2 x 1 x 0.5mm.
BH22_0.3-0.4	Fill	Two pieces of bonded asbestos cement sheeting approximately 45 x 35 x 5mm plus several pieces of friable asbestos cement sheeting approximately 4 x 4 x 1mm
BH22_0.45	Fragment	One piece of bonded asbestos cement sheeting approximately 90 x 60 x 5 mm
SS01	Fill	Two pieces of friable asbestos fibre board approximately 4 x 3 x 2 mm, plus several loose bundles of friable asbestos fibres approximately 2 x 1 x 0.5 mm.

Sample	Matrix	Laboratory Comment/Result
SS02	Fill	Four pieces of bonded asbestos cement sheeting approximately 40 x 40 x 5 mm plus several pieces of friable asbestos cement sheeting approximately 7 x 6 x 4 mm plus several loose bundles of friable asbestos fibres approximately 2 x 1 x 0.5 mm.
SS04	Fragment	Five pieces of bonded asbestos cement sheeting approximately 50 x 30 x 5 mm.

Nine of eighteen samples analysed were identified to contain asbestos. Whilst ASC NEPM compliant sample collection was not possible, the presence of loose bundles of friable asbestos fibres suggests that concentrations of asbestos in soil (w/w%) may exceed the ASC NEPM criteria. Additional assessment data would be required to confirm this.

7.3.2 Groundwater

TRH, BTEXN

Six groundwater samples were laboratory analysed and concentrations of TRH and BTEXN were below the adopted GAC. It is noted that with the exception of MW21, concentrations of BTEXN and TRH were below the laboratory LOR.

PAH

Six groundwater samples were laboratory analysed and concentrations of PAH were below the laboratory LOR. It is noted that the laboratory LOR for B(a)P (0.5 µg/L) was above the Australian Drinking Water Guideline criteria (0.01 µg/L).

VHC

Six groundwater samples were laboratory analysed and concentrations of VHC were below the laboratory LOR. It is noted that the laboratory LOR for vinyl chloride (1 µg/L) was above the Australian Drinking Water Guideline criteria of 0.3 µg/L.

Metals

Six groundwater samples were laboratory analysed and concentrations of the suite of eight metals were below the adopted ecological GAC, with the exception of:

- Cadmium: the concentration at monitoring well MW19 (6.1 µg/L) exceeded the adopted GAC of 0.7 µg/L.
- Copper: concentrations at MW16 and MW17 (2 µg/L) and MW19 (153 µg/L) exceeded the adopted GAC of 1.3 µg/L.
- Lead: the concentration at MW21 (9 µg/L) exceeded the adopted GAC of 4.4 µg/L
- Nickel: concentrations at MW17 (26 µg/L) and MW19 (128 µg/L) exceeded the adopted GAC of 7 µg/L.
- Zinc: concentrations at all wells (66 to 4180 µg/L) exceeded the adopted GAC of 15 µg/L.

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8.0 Discussion

8.1 Conceptual Site Model

The purpose of a Conceptual Site Model (CSM) is to assess the risks potentially present at the Site by identifying and describing contaminant sources, transport mechanisms, exposure pathways and sensitive receptors associated with the Site. The CSM is based on AECOM's review of background data and the results of this investigation and is summarised below:

Table 18 CSM

Consideration	Details
Site Setting	- The Site is located in a commercial/industrial area. - Current and proposed use is commercial/industrial.
Site History	- Detailed history of Site operations and processes utilised by A. Abrahams and Sons Pty Ltd and Rheem Australia not known. USTs known to have been present. - Site extensively filled. - Potential for the fill material to be contaminated and/or to have contaminated groundwater is considered to be moderate to high
CoPC	- CoPC are presented in Section 4.1 - Based on sample analysis data, principal contaminants of concern are identified to include PAH (B(a)P), lead, asbestos and long chain-length TRH in soil. - Based on sample analysis data, principal contaminants of concern are identified to include metals in groundwater (mainly copper, nickel and zinc).
Sources of Contamination	The following activities are known or suspected to have occurred: - Presence of fill materials. - Demolition of buildings. - Fuel Storage, below ground. AECOM notes that the specific locations of former features and nature of activities undertaken is not known. This ESA targeted some former contaminant sources but additional investigation data may be required to properly assess the contamination status of the Site.
Groundwater	Site groundwater conditions are summarised below: - Groundwater was present at approximately 1.1 to 3.1 m bgs, an average of approximately 2.3 m bgs (or 1 m AHD). - Future redevelopment activities may intersect groundwater, hence, short term exposure (incidental ingestion by intrusive maintenance workers is possible). - Elevation data are currently inconclusive with respect to groundwater flow direction. - Groundwater is anticipated to flow towards Alexandra Canal but may be tidal and change flow direction depending on the tide. - The Site is located in an area where extraction of groundwater for domestic purposes is banned. Influences on the groundwater conditions at the Site may include, but not necessarily be limited to: - Depth to groundwater may be influenced by periods of above average rainfall and/or prolonged droughts. - Excavations to facilitate installation of USTs and/or other subsurface infrastructure and subsequent filling with porous backfill materials may cause localised 'mounding' of shallow groundwater. - Underground service trenches at the Site may influence the flow direction of shallow groundwater. - The Landfill adjacent to the Site may affect the groundwater gradient.
Extent of Soil Impacts	- Given the widespread occurrence of fill materials (and variable composition), AECOM considers that the extent of impacts in fill materials are unlikely to be 'delineated'. - AECOM identified lead, PAH and asbestos contamination in fill materials. - Additional investigation locations will likely identify additional contamination in Fill materials. - Natural soils have not been identified to be contaminated.

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Consideration	Details
Extent of Groundwater Impacts	- No sheen, hydrocarbon odours or LNAPL were identified in the monitoring wells gauged and sampled by AECOM. - Concentrations of some dissolved metals (mostly copper, nickel and zinc) exceeded the ASC NEPM GILs for the protection of marine water aquatic ecosystems.
Potential transport mechanisms and exposure pathways	- Asbestos in Soil: A complete pathway would exist where soil disturbance/excavation is undertaken without implementation of appropriate control measures, including personnel protective equipment (PPE). - Lead in Soil: there is a potential for direct dermal contact and/or ingestion of lead and metal contaminants in soil however, this is considered to be low for the current and proposed Site use. Adoption of management measures would be required during Site redevelopment plus implementation and adherence to a long term Site Management Plan after Site redevelopment. - Hydrocarbons and PAH in soil: as per lead and metals in soil. Volatile hydrocarbons (i.e. BTEXN and TRH C6-C10) have not been identified to date. Based on the available soil and groundwater analysis data, the vapour Inhalation risk is currently considered to be low. - Metals in Groundwater: potential direct dermal contact and incidental ingestion by future construction workers and/or subsurface maintenance workers. Risk considered to be low and could be managed by adoption of appropriate control mechanisms and/or PPE. - Potential migration of groundwater impacted with metals to the Canal is considered to be low risk, given that the Canal is “Regulated” Site.
Potential Receptors of Contamination	Potential human receptors: - Current Site workers, contractors and visitors. The current risk is considered to be low given that the Site is mostly paved. - Construction and maintenance workers during redevelopment. - Future Site workers, contractors and visitors. - Occupants of nearby commercial/industrial premises during Site redevelopment. Potential environmental receptors: - Fauna in groundwater beneath the Site. - Groundwater migrating to the Alexandra Canal.

8.2 Proposed Redevelopment

Information supplied by GPS (to date) indicates that the proposed redevelopment will comprise free standing warehouses, internal roadways and car-parks and some landscaped areas. GPS have advised that:

- The warehouse buildings would comprise ‘slab-on-ground’ construction. The concrete slabs would be supported by piers installed into geotechnically appropriate material at depth.
- No basements or sunken-loading docks are contemplated.
- Installation of sub-surface utilities (e.g. hydrant ring-mains, sewer, electricity etc) will be required.

8.3 Soil Impact

The data obtained from this investigation identified lead, B(a)P, TRH and asbestos impacts in Fill materials. The contaminants are non-volatile and are unlikely to present a vapour inhalation risk and once the Site is redeveloped, the floor slabs and hardstand roadways should provide an effective barrier to the impacted materials. Controls will be required to manage potential exposure to asbestos, lead and B(a)P impacts during redevelopment and subsequent operational phase.

Given the volume of fill material inferred to be present and the variability in contaminant concentrations, it is considered that excavation(s) into fill materials to remove contaminant concentrations exceeding commercial/industrial land use criteria are unlikely to be ‘validated’.

With respect to the proposed redevelopment and based on the available data, AECOM considers that the Site can be made suitable for commercial/industrial land use however, implementation of control/management mechanisms will be required. These are envisaged to include but not necessarily be limited to:

- Demolition and removal of existing buildings and pavements under a Construction Phase Site Management Plan (CSMP) for contamination. The CSMP would also need to address contamination-related risks associated with earthworks to prepare the Site surface for redevelopment and include contingency for the management of expected (e.g. asbestos) and unexpected finds (e.g. USTs encountered, unusual conditions, buried drums and other wastes etc). The CSMP would include information that is typically presented in a Remedial Action Plan (RAP).
- Surplus fill materials should be appropriately disposed off-site in accordance with NSW EPA (2014) Waste Guidelines. Given the current data indicates GSW through to a HW classification, where possible, fill materials should be re-used at Site.
- Survey of site surface after earthworks to record the level (m AHD) of residual fill materials.
- Placement of non-contaminated materials (e.g. Virgin Excavated Natural Material [VENM] or crushed concrete) above the residual fill material to form a temporary barrier to the fill materials. The barrier may need to be in the order of 0.3 to 0.5 m thick. Surveying should be completed to confirm the depth of cover.
- Excavations for the installation of services should be lined with geofabric and backfilled with VENM, to minimise potential exposure to construction workers and future maintenance workers. All service trenches should be surveyed, to allow appropriate long term management.
- Landscape areas should have a minimum cover of 0.5 m of VENM. Geofabric should separate the residual fill materials and the VENM.
- A 'validation' report prepared by an appropriate consultant, verifying that the CSMP was adhered to and including all relevant sample analysis data, air monitoring records, waste disposal documentation (as applicable), survey data and photographic evidence.
- Preparation and adherence to an Operational-phase or Long Term Site Management Plan (LTSMP).

8.4 Groundwater Impact

The current data has identified high concentrations of zinc, nickel and copper in groundwater and to a lesser extent, cadmium and lead. Given the high concentrations of lead in fill, it does not appear to be significantly leaching into groundwater. Similarly, B(a)P has not been detected in groundwater at concentrations above the laboratory LOR, indicating a low leaching potential. AECOM notes that PAH compounds typically have low solubility. Volatile compounds such as BTEXN, short chain-length TRH and VHC have not been identified in groundwater to date.

Based on the current data and given consideration of the ban on domestic use of groundwater, the presence of metals impacts is not considered to affect Site suitability for continued commercial/industrial land use. Management of potential exposure to groundwater should be documented in the CSMP and LTSMP.

The impacts identified in groundwater could potentially migrate to Alexandra Canal and its' bed is known to be contaminated with chlorinated hydrocarbons, pesticides and metals. Additional assessment data is recommended, to assess if the Site is the source or adjacent landfill Site and to evaluate the groundwater flow direction. The additional assessment should focus on historical process areas, which would require review of historic site plans held by Council followed by targeted assessment.

Additional assessment data may be required during redevelopment in the event that USTs or other potential contaminant sources are identified.

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9.0 Conclusions

The Site has been assessed generally following the guidelines endorsed by the NSW EPA. The assessment included a review of Site history and background data (Phase I ESA) followed by intrusive investigation, sampling and analysis (Phase II ESA).

The Phase I ESA data indicated that Site was extensively filled with materials and has been utilised since the 1940s for the production of packaging (hessian bags and then plastic containers and other plastic products) and then as a warehouse type estate. Historical use included above and below ground storage of petroleum hydrocarbons, inks, gases, adhesives and vehicle workshop(s). The Site has undergone many stages of building alterations, removals and additions.

The limited scope Phase II ESA was completed in readily accessible areas across the Site. Twenty two soil boreholes were completed and five groundwater monitoring wells were installed and sampled. Fill materials were identified at each borehole completed and the current data indicates that it extends, on average, to approximately 3.3 m depth. Groundwater is present in the fill materials and current data indicates it is present between 1.1 and 3.1 m. The soil sampling density completed is approximately half the minimum rate recommended in the NSW EPA (1995) Sampling Design Guidelines, but given the encountered conditions, is considered sufficient to provide an indication of Site suitability for continued commercial/industrial land use.

The fill materials have been identified to be contaminated with lead, B(a)P, long chain-length TRH and asbestos. The volume of fill material is estimated to be in the order of 120 000 m^3. Contamination at concentrations exceeding the adopted assessment criteria has not been identified in natural soils underlying the fill however, acid sulfate soil conditions are likely to be present.

Groundwater has high concentrations of zinc, nickel and copper and to a lesser extent, cadmium and lead. Given the high concentrations of lead in fill, it does not appear to be significantly leaching into groundwater. Similarly, B(a)P has not been detected in groundwater. Volatile compounds have not been identified in groundwater to date. Additional assessment data would be required to assess if the Site is the source of the metals impacts and to evaluate the groundwater flow direction.

Based on the available data, the following conclusions are made:

- With respect to the proposed redevelopment, AECOM considers that the Site can be made suitable for commercial/industrial land use however, implementation of control/management mechanisms will be required.
- A review of historical Site plans held by Council to evaluate the location of former processes/activities followed by a targeted assessment should be completed, to confirm if the Site can be made suitable for commercial/industrial land use with implementation of control/management mechanisms.
- The control mechanisms would include the preparation and adherence to a Construction-phase Site Management Plan (CSMP) and after redevelopment, a Long Term Site Management Plan (LTSMP).
- Additional assessment data may be required during the demolition-construction phase.

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10.0 References

AECOM. 2011. *UPSS Stage 1 Inspection Program: Burrows Industrial Estate*. 18 November 2011.

Australian and New Zealand Environment Conservation Council and Agriculture Resource Management Council of Australia and New Zealand (ANZECC). 2000. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.

Friebel, E. and Nadebaum, P. 2011. *Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater, CRC CARE Technical Report No. 10*. Cooperative Research Centre for Contamination Assessment and Remediation of the Environment, Adelaide, Australia.

NEPC, 2013. *National Environment Protection (Assessment of Site Contamination) Measure 1999*. National Environment Protection Council. May 2013.

NSW DEC. 2006. *Guidelines for the NSW Site Auditor Scheme (2nd Edition)*. Department of Environment and Conservation NSW (NSW DEC).

NSW EPA. 2014. *Waste Classification Guidelines, Part 1: Classifying Waste*. November 2014.

NSW OEH. 2011. *Guidelines for Consultants Reporting on Contaminated Sites*. NSW Government Office of Environment & Heritage (OEH).

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Appendix A

Figures

G:\ENVGIS\Projects\604 Projects\60438840 Burrows Industrial Estate\FIGURES\60438840 F2 Site Layout and Sampling Locations 24 09 2015 TO Rev A

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SITE LAYOUT AND SAMPLING LOCATIONS

Burrows Industrial Estate
New South Wales

Note: Unit areas are approximate and inferred only

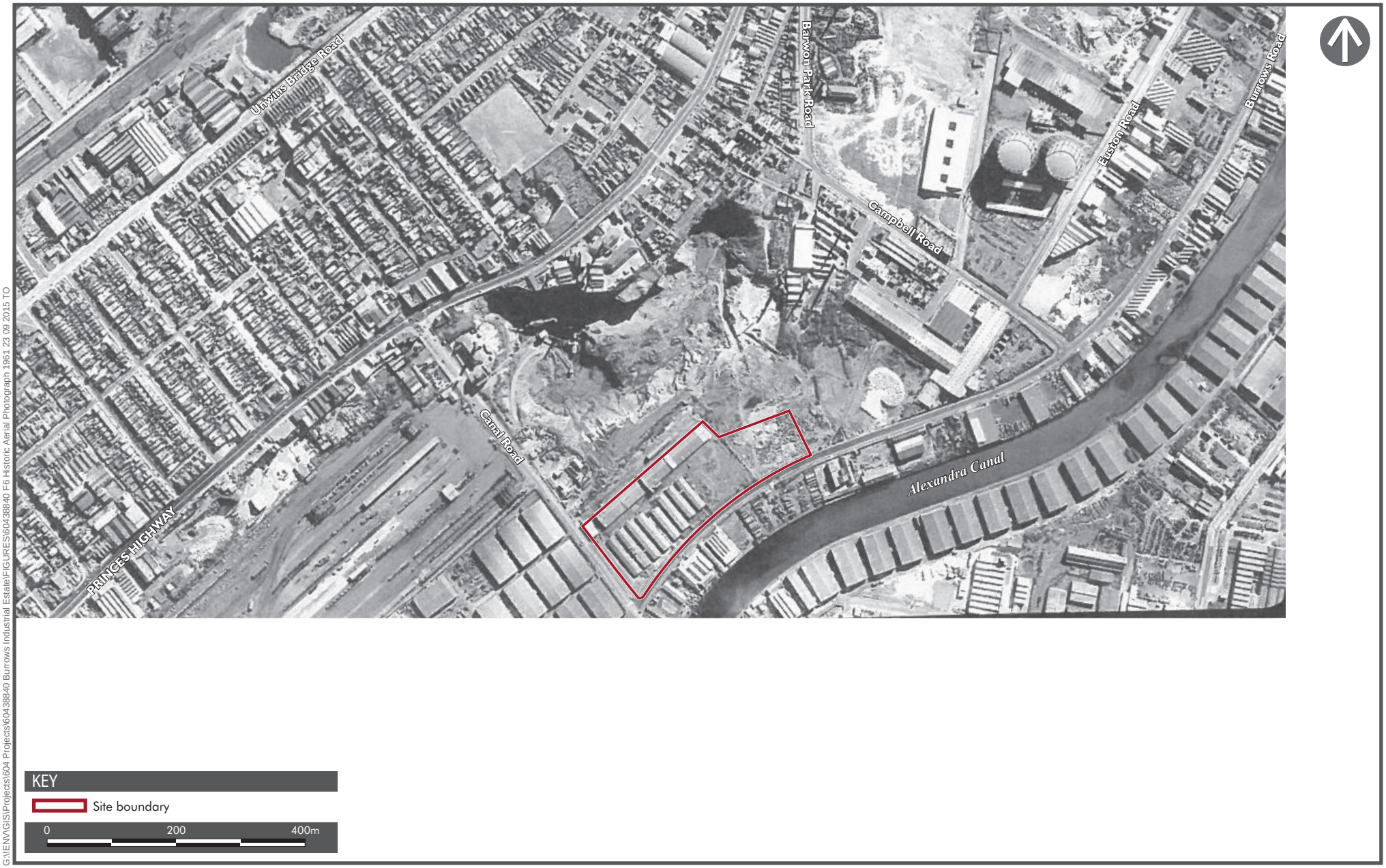
FIGURE 2

G:\ENVGIS\Projects\604 Projects\60438840 Burrows Industrial Estate\FIGURES\60438840 F5 Historic Aerial Photograph 1951 23 09 2015 TO

AECOM

HISTORIC AERIAL PHOTOGRAPH 1951
Burrows Industrial Estate
New South Wales

FIGURE 5



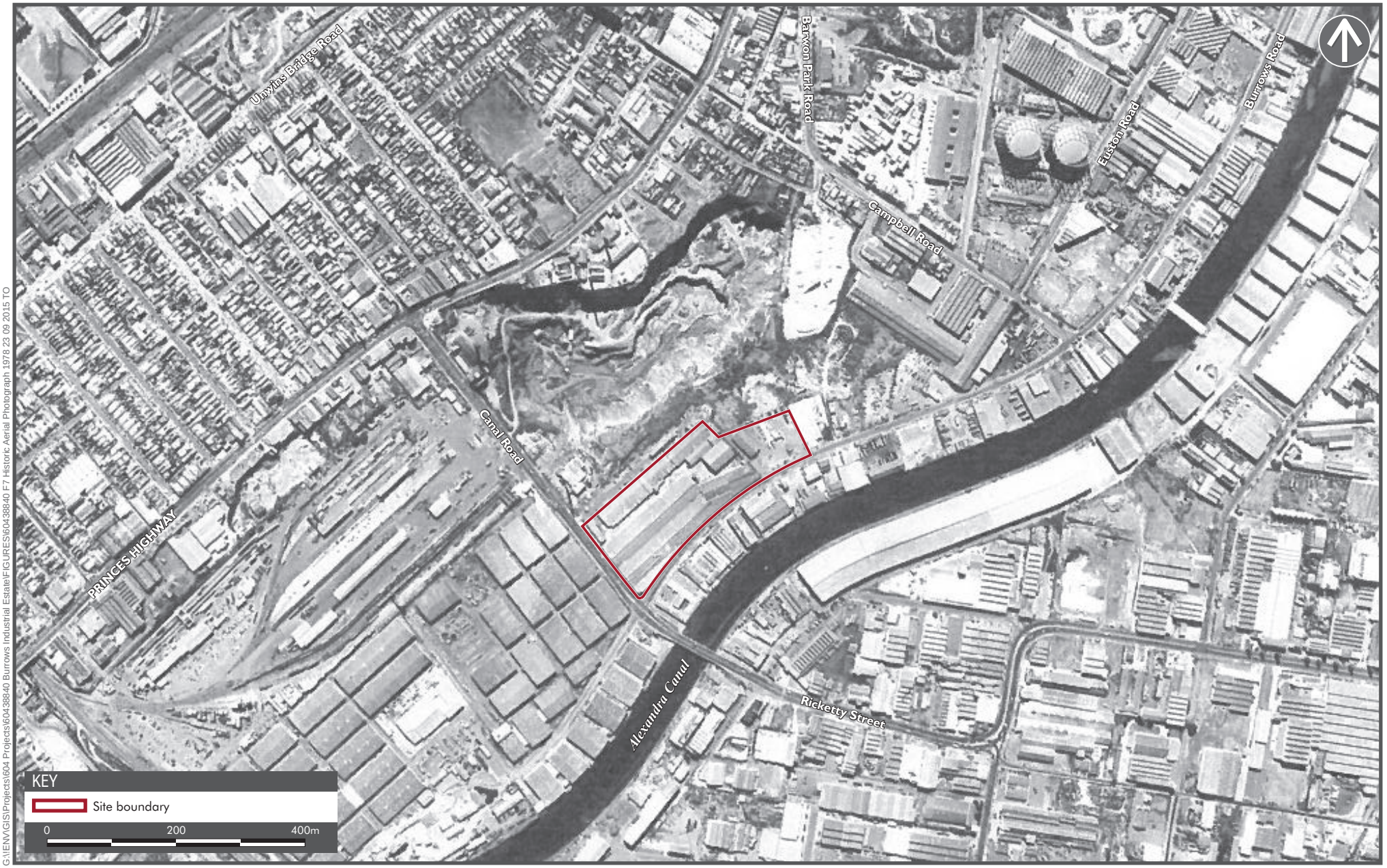
G:\ENVGIS\Projects\604 Projects\60438840 Burrows Industrial Estate\FIGURES\60438840 F6 Historic Aerial Photograph 1961 23 09 2015 TO

AECOM

HISTORIC AERIAL PHOTOGRAPH 1961

Burrows Industrial Estate
New South Wales

FIGURE 6



G:\ENVGIS\Projects\604 Projects\60438840 Burrows Industrial Estate\FIGURES\60438840 F7 Historic Aerial Photograph 1978 23 09 2015 TO

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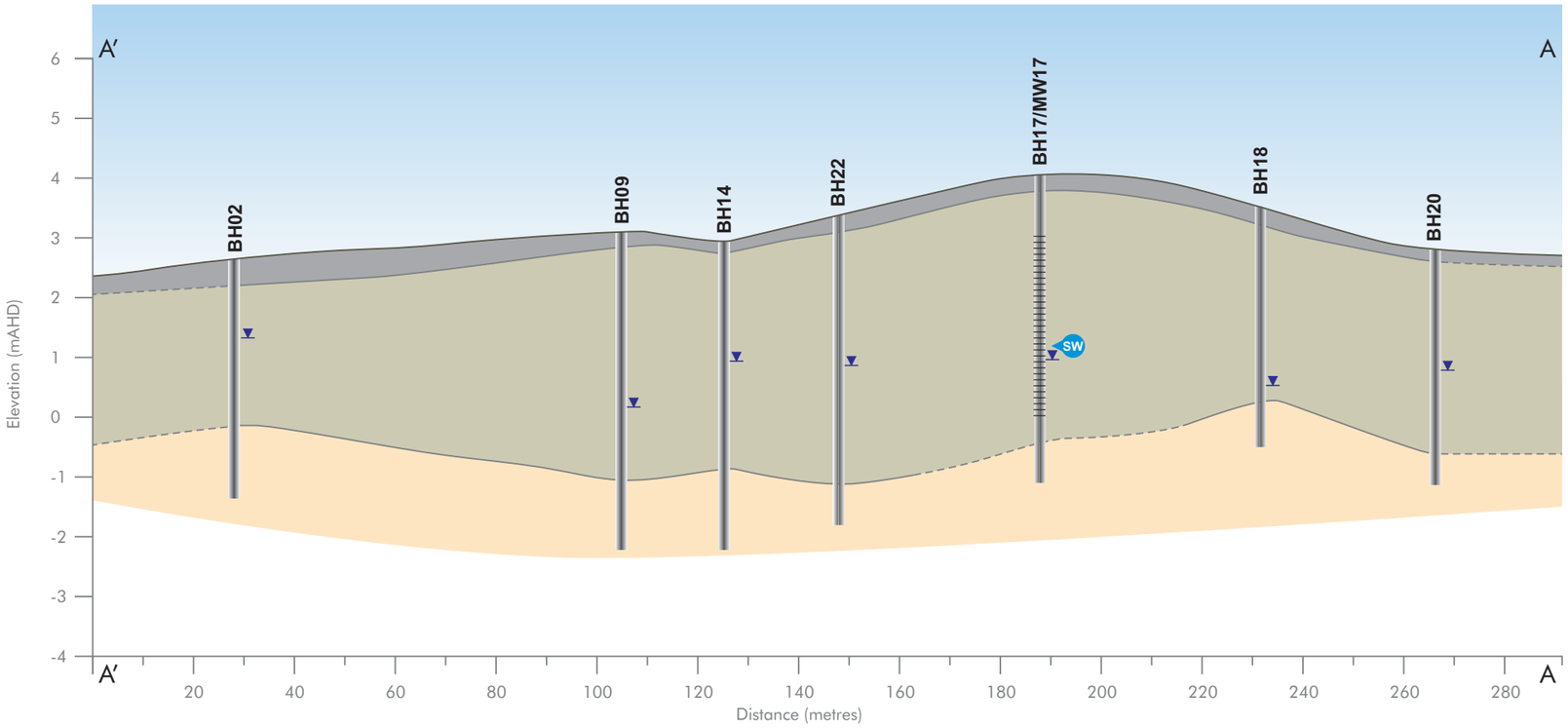
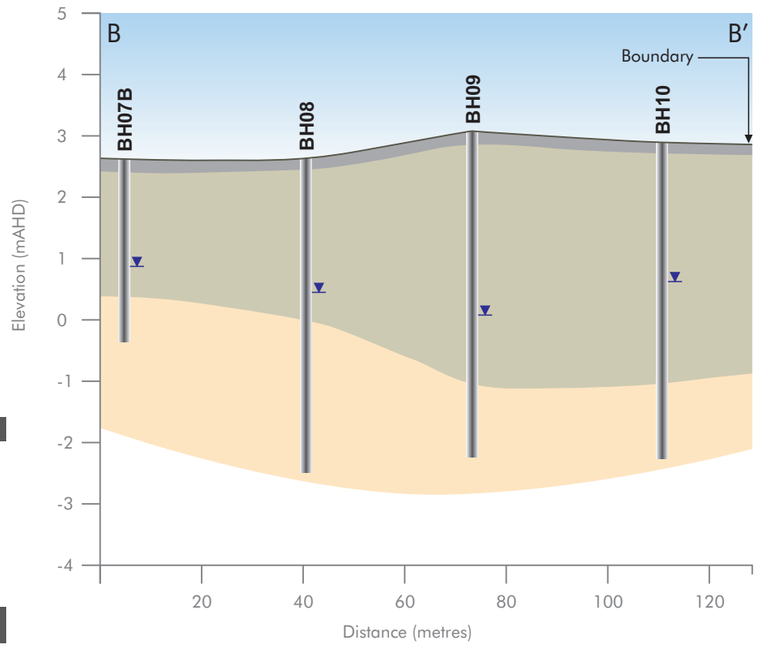
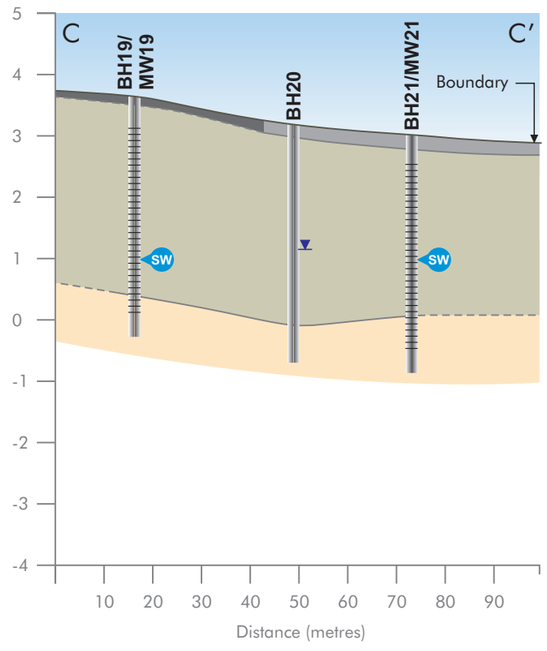
HISTORIC AERIAL PHOTOGRAPH 1978

Burrows Industrial Estate
New South Wales

FIGURE 7







KEY

- Asphalt
- Concrete
- Fill
- Natural (clay, sandy clay, sand, clayey sand, sandy silt)
- Screened interval
- Groundwater encountered
- SW Stabilised groundwater level

See figured dimensions

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CROSS SECTIONS

Burrows Industrial Estate
New South Wales

FIGURE 12

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Appendix B

Tables

Table T1 - Sample Analysis Register

Client Name: Goodman
Project Name: Burrows Industrial Estate
Project No: 60438840

Sample Location & Depth	Sample Date	Sample Type	PID (ppm)	Rationale	Analyses								
					TRH, BTEXN	PAH	Metals	OCP, OPP, PCB	Phenols	Asbestos	VHC	TCLP - metals	TCLP - PAH
BH01_0.3-0.4	21/08/2015	Fill	0.1	Assess for asbestos						1			
BH01_1.0-1.1	21/08/2015	Fill	-	Assess Fill Material (AFM)	1	1	1	1					
BH01_3.8-3.9	21/08/2015	Sandy Clay	-	Assess Natural	1	1							
BH02_0.4-0.5	29/08/2015	Fill	0.2	AFM	1	1	1			1			
BH02_2.0-2.1	29/08/2015	Fill	2.9	AFM			1						
BH02_3.0-3.1	29/08/2015	Silty Clay	14.1	Assess natural, high PID	1								
BH03_0.2-0.3	29/08/2015	Fill	0.1	AFM		1	1			1			
BH03_1.0-1.2	29/08/2015	Fill	2.1	AFM	1	1	1			1			
BH03_3.0-3.1	29/08/2015	Sandy Clay	19.5	Assess natural, high PID	1		1						
BH04_0.5-0.6	20/08/2015	Fill	0.5	AFM, hydrocarbon odour	1	1	1						
BH04_1.0-1.1	20/08/2015	Fill	0.6	AFM		1	1					1	1
BH04_2.3-2.4	20/08/2015	Silty Clay	0.1	Assess Natural	1		1						
BH05_0.5-0.6	20/08/2015	Fill	1.8	AFM	1	1	1	1	1		1		
BH05_1.0-1.1	20/08/2015	Fill	0.4	AFM		1	1						
BH05_2.3-2.4	20/08/2015	Sandy Silt	0.7	Assess Natural	1		1						
BH06_1.0-1.1	21/08/2015	Fill	0.2	AFM			1	1		1			
BH07A_0.5-0.6	20/08/2015	Fill	0.1	AFM		1	1	1		1			
BH07B_1.2-1.3	21/08/2015	Fill	0.9	AFM	1	1	1	1		1			
BH07B_2.3-2.4	21/08/2015	Silty Clay	0.4	Assess Natural	1		1						
BH08_0.17-0.18	20/08/2015	Fill	0.5	AFM			1	1					
BH08_1.0-1.1	20/08/2015	Fill	0.2	AFM	1	1	1						
BH08_2.5-2.6	20/08/2015	Fill	0.3	AFM		1	1						
BH08_3.7-3.8	20/08/2015	Silty Sand	0.5	Assess Natural	1		1						
BH09_0.25-0.35	21/08/2015	Fill	0.1	AFM		1	1						
BH09_4.0-4.2	21/08/2015	Fill	0.4	AFM		1	1						
BH09_4.5-4.6	21/08/2015	Sandy Clay	390.1	Assess Natural, high PID	1	1	1		1		1		
BH10_0.15-0.25	21/08/2015	Fill	0.1	AFM				1					
BH10_4.0-4.1	21/08/2015	Clayey Sand	20.1	Assess Natural, high PID	1		1						
BH11_0.2-0.3	20/08/2015	Fill	0.1	AFM		1	1						
BH11_2.3-2.4	20/08/2015	Fill	0.8	AFM	1	1	1						
BH11_3.3-3.4	20/08/2015	Sandy Silt	0.5	Assess natural, hydrocarbon odour	1		1						
BH12_0.15-0.25	21/08/2015	Fill	0.1	AFM		1	1						
BH12_1.0-1.1	21/08/2015	Fill	0.1	AFM			1						
BH12_1.8-1.9	21/08/2015	Fill	0.4	AFM						1			
BH12_3.6-3.7	21/08/2015	Fill	3.5	AFM, odour and PID	1		1						
BH13_0.4-0.5	20/08/2015	Fill	0.1	AFM		1	1						
BH13_3.6-3.7	20/08/2015	Silty Sand	6.6	Assess natural				1					
BH14_0.45-0.55	21/08/2015	Fill	-	AFM, below concrete slab				1					
BH14_1.8-1.9	21/08/2015	Fill	0.6	AFM		1	1	1					
BH14_4.0-4.1	21/08/2015	Sandy Clay	150.1	Assess Natural, high PID	1				1		1		
BH15_0.4-0.5	21/08/2015	Fill	0.1	AFM		1	1			1			
BH16_0.7-0.8	21/08/2015	Fill	0	AFM	1	1	1	1					
BH16_2.0-2.1	22/08/2015	Fill	0.9	AFM	1		1					1	
BH16_3.0-3.1	22/08/2015	Fill	4.3	AFM			1						
BH17_1.0-1.1	21/08/2015	Fill	0.1	AFM	1		1						
BH17_2.0-2.1	22/08/2015	Fill	15.2	AFM, high PID and hydrocarbon odour	1	1	1					1	
BH18_0.7-0.8	29/08/2015	Fill	0	AFM	1	1	1			1			
BH18_2.0-2.1	29/08/2015	Fill	0.2	AFM		1	1						
BH19_2.0-2.2	22/08/2015	Fill	1.9	AFM	1		1						
BH20_0.5-0.6	29/08/2015	Fill	0.2	AFM		1	1			1			
BH20_1.0-1.1	29/08/2015	Fill	0.4	AFM		1	1			1			
BH20_2.0-2.1	29/08/2015	Fill	0.3	Groundwater encountered	1								
BH21_0.7-0.8	21/08/2015	Fill	0.1	AFM	1	1	1			1			1
BH21_2.7-2.8	22/08/2015	Fill	0.2	AFM	1		1						
BH21_3.0-3.1	22/08/2015	Sand	2.1	Assess natural	1	1	1						
BH22_0.3-0.4	21/08/2015	Fill	0.1	assess for asbestos						1			
BH22_0.45	21/08/2015	Fragment	-	assess for asbestos						1			
BH22_0.8-0.9	21/08/2015	Fill	0.1	AFM		1	1						
BH22_2.2-2.3	21/08/2015	Fill	0.1	AFM	1	1	1					1	
BH22_4.5-4.7	21/08/2015	Sandy Clay	26.7	Assess natural, high PID	1	1	1						
SS01	29/08/2015	Fill	-	assess for asbestos						1			
SS02	29/08/2015	Fill	-	assess for asbestos						1			
SS04_Frag	29/08/2015	Fragment	-	assess for asbestos						1			
				Subtotal, Primary Soil Samples	**32**	**33**	**49**	**11**	**3**	**18**	**3**	**4**	**2**
QC100	21/08/2015	Split	-	BH22_4.5-4.7	1	1	1						
QC201	21/08/2015	Split	-	BH07B_1.2-1.3	1	1	1	1	1		1		
QC101	21/08/2015	Duplicate	-	BH09_4.0-4.2		1	1						
QC200	20/08/2015	Duplicate	-	BH05_1.0-1.1		1	1						
QC202	21/08/2015	Duplicate	-	BH21_0.7-0.8	1	1	1						
QC102	21/08/2015	Duplicate	-	BH01_3.8-3.9	1								
QC111	29/08/2015	Duplicate	-	BH03_1.0-1.2	1	1	1						
				Total Soil Samples	**37**	**39**	**55**	**12**	**4**	**18**	**4**	**4**	**2**
MW01	31/08/2015	Primary	-	Assess Groundwater	1	1	1				1		
MW16	31/08/2015	Primary	-	Assess Groundwater	1	1	1				1		
MW17	31/08/2015	Primary	-	Assess Groundwater	1	1	1				1		
MW19	31/08/2015	Primary	-	Assess Groundwater	1	1	1				1		
MW21	31/08/2015	Primary	-	Assess Groundwater	1	1	1				1		
				Subtotal, Primary Groundwater Samples	**5**	**5**	**5**	**0**	**0**	**0**	**5**	**0**	**0**
TB	31/08/2015	Blank	-	Quality Control	1								
QC200	31/08/2015	Split	-	MW01	1	1	1				1		
QC201	31/08/2015	Rinsate	-	Quality Control	1								
				Total GroundwaterSamples	**8**	**6**	**6**	**0**	**0**	**0**	**6**	**0**	**0**

Table T2 - Groundwater Elevation

Well ID	Easting	Northing	Gauging Date	Total Well Depth	TOC Elevation	SWL	GWE
				(m btoc)	(mAHD)	(m btoc)	(mAHD)
MW01	331543.404	6245408.202	31/08/2015	3.454	2.12	1.096	1.024
MW16	331688.598	6245470.9	31/08/2015	4.441	4.15	3.16	0.990
MW17	331700.452	6245465.954	31/08/2015	4.091	4.04	3.065	0.975
MW19	331743.935	6245525.412	31/08/2015	3.920	3.44	2.449	0.991
MW21	331791.781	6245494.973	31/08/2015	3.895	3.04	2.026	1.014

Notes
m btoc = metres below top of casing
SWL = standing water level
TOC = top of casing
AHD = Australian Height Datum

Table T3 - Groundwater Geochemical Parameters

Client Name: Goodman
Project Name: Burrows Industrial Estate
Project No: 60438840

Well ID	Date	Purge Volume (L)	DO (mg/L)	EC (μScm^{-1})	pH	Eh (mV)	Temp' (°C)	Comments
Development								
MW01	25/08/2015	10	0.48	1019	7.05	102.2	19.5	Clear at 3L water removed, paramaters stabilised at 10L water removed
MW16	25/08/2015	11	1.36	2415	6.94	152.9	22.0	Purged dry at 4L, wait for recharge and again at 8L (sample tubing blocked with PVC cuttings). Parameters stabilised and water clear at 11L water removed.
MW17	25/08/2015	9	0.18	1357	6.82	108.0	21.8	Parameters stabilised and water clear at 9L water removed
MW19	25/08/2015	9	0.28	1067	6.71	283.7	19.0	Parameters stabilised and water clear at 9L water removed
MW21	25/08/2015	8	0.96	957	7.04	160.1	17.7	Parameters stabilised and water clear at 8L water removed
Purging								
MW01	31/08/2015	3	-	1000	6.79	140.0	19.6	Clear, low turbidity, no odour or sheen observed. DO probe malfunction
MW16	31/08/2015	4	0.92	2206	6.88	222.6	21.7	Clear, low turbidity, no odour or sheen observed
MW17	31/08/2015	3	-	1259	6.68	158.4	21.0	Clear, low turbidity, no odour or sheen observed. DO probe malfunction
MW19	31/08/2015	4	0.02	820	6.58	268.4	18.4	Clear, low turbidity, no odour or sheen observed
MW21	31/08/2015	4.0	0.07	806	6.73	216.2	16.9	Clear, low turbidity, no odour or sheen observed

Notes
DO = dissolved oxygen
EC = electrical conductivity
Eh = Redox potential
Redox Correction factor = +205 mV (applied to field readings)

Sample Location & Depth	Sample Date	Sample Type	PID	BTEX				TRH						PAH				Metals								OCP and OPP									VHC							Phenols		PCB	
				Benzene	Toluene	Ethylbenzene	Xylenes	C6 - C10	C6 - C10 minus BTEX (F1)	>C10 - C16	>C10 - C16 minus Naphthalene (F2)	>C16 - C34 (F3)	>C34 - C40 (F4)	Naphthalene	Benzo(a)pyrene	Benzo(a)pyrene TEQ (LOR)	Sum of PAH	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	Mercury	Aldrin + Dieldrin	Chlordane	Endosulfan	Endrin	DDD + DDE + DDT	Heptachlor	Hexachlorobenzene (HCB)	Methoxychlor	Chlorpyrifos	Tetrachloroethene (PCE)	Trichloroethene (TCE)	1.1-Dichloroethene	trans-1.2-Dichloroethene	cis-1.2-Dichloroethene	Vinyl chloride	Carbon Tetrachloride	Phenol	Pentachlorophenol	PCB	Asbestos
ASC NEPM 2013 - HIL D																40	4000	3000	900	3600	2E+05	1500	6000	4E+05	730	45	530	2000	100	3600	50	80	2500	2000								2E+05	660	7	Yes
HSL D, Vapour Intrusion (sand)			0-<1m	3	NL	NL	230		260		NL			NL																															
			1m-<2m	3	NL	NL	NL		370		NL			NL																															
			2m-<4m	3	NL	NL	NL		630		NL			NL																															
			> 4m	3	NL	NL	NL		NL		NL			NL																															
CRC Care IMW, DIRECT CONTACT				1100	3E+05	85000	2E+05		82000		62000	85000	1E+05	29000																															
CRC Care HSL D, DIRECT CONTACT				430	99000	27000	81000		26000		20000	27000	38000	11000																															
NSW EPA (2014) - GSW				10	288	600	1000								0.8		200	100	20	100		100	40		4			60						4	14	10				4		288		<50	
BH01_0.3-0.4	21/08/2015	Fill	0.1																																										Yes
BH01_1.0-1.1	21/08/2015	Fill	-	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	910	240	0.6	29.1	41.9	278	14	2	58	3040	1510	26	1560	2.3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05										<0.1	
BH01_3.8-3.9	21/08/2015	Sandy Clay	-	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<0.5	<0.5	1.2	<0.5																												
QC102	21/08/2015	Duplicate, BH01_3.8-3.9		<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100																																
RPD				nc	nc	nc	nc	nc	nc	nc	nc	nc	nc																																
BH02_0.4-0.5	29/08/2015	Fill	0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<0.5	<0.5	1.2	<0.5	<5	<1	7	140	79	3	106	0.2																				No
BH02_2.0-2.1	29/08/2015	Fill	2.9															59	<1	33	783	1410	28	815	0.6																				
BH02_3.0-3.1	29/08/2015	Silty Clay	14.1	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	380	160																																
BH03_3.0-3.1	29/08/2015	Fill	0.1	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100					17	<1	23	14	31	12	85	<0.1																				
BH03_0.2-0.3	29/08/2015	Fill	2.1											<0.5	0.9	1.7	10.7	<5	<1	8	228	338	6	279	1.0																				No
BH03_1.0-1.2	29/08/2015	Fill	19.5	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	380	110	0.6	6.9	10.1	94.0	6	<1	12	114	731	9	268	0.6																				Yes
QC111	29/08/2015	Duplicate, BH03_1.0-1.2		<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	310	<100	<0.5	5.0	7.2	63.3	60	7	68	2240	2230	107	3460	1.0																				
RPD				nc	nc	nc	nc	nc	nc	nc	nc	20	nc	nc	**32**	**34**	**39**	**164**	nc	**140**	**181**	**101**	**169**	**171**	**50**																				
BH04_0.5-0.6	20/08/2015	Fill	0.5	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	100	<100	<0.5	1.6	2.6	15.7	52	2	28	218	1030	48	1590	1.0																				
BH04_1.0-1.1	20/08/2015	Fill	0.6											0.8	13.4	19.8	158	311	1	105	293	10400	24	1170	1.6																				
BH04_2.3-2.4	20/08/2015	Silty Clay	0.1	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	230	240					14	<1	26	17	67	4	46	<0.1																				
BH05_0.5-0.6	20/08/2015	Fill	1.8	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	140	<100	<0.5	1.1	2.0	11.2	13	3	20	296	1470	26	4070	0.9	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<2	<0.1	
BH05_1.0-1.1	20/08/2015	Fill	0.4											<0.5	1.3	2.2	12.5	19	<1	70	321	1000	27	750	2.5																				
QC200	20/08/2015	Duplicate, BH05_1.0-1.1												<0.5	<0.5	1.3	4.1	76	4	69	634	3180	42	890	15.2																				
RPD														nc	nc	**51**	**101**	**120**	nc	1	**66**	**104**	43	17	**144**																				
BH05_2.3-2.4	20/08/2015	Sandy Silt	0.7	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	210	<100					12	<1	14	86	113	4	522	<0.1																				
BH06_1.0-1.1	21/08/2015	Fill	0.2															13	<1	8	71	313	6	366	0.3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05										<0.1	No
BH07A_0.5-0.6	20/08/2015	Fill	0.1											<0.5	0.6	1.3	3.0	84	13	121	4410	6310	80	20400	0.7	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<1.0	<0.25										<0.1	Yes
BH07B_1.2-1.3	21/08/2015	Fill	0.9	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	850	180	<0.5	1.9	3.0	16.0	8	2	128	85	7530	13	1120	6.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05										<0.1	No
QC201	21/08/2015	Split, BH07B_1.2-1.3		<0.2	<0.5	<1	<2	<25	<25	<50	<50	730	170	<0.1	1.6	2.2	12	25	3	180	430	14000	30	2600	15	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1	<1	<1	<1	<1	<5		<0.1	
RPD				nc	nc	nc	nc	nc	nc	nc	nc	15	6	nc	17	**31**	29	**103**	40	34	**134**	**60**	**79**	**80**	**83**	nc	nc	nc	nc	nc	nc	nc	nc	nc											
BH07B_2.3-2.4	21/08/2015	Silty Clay	0.4	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	360	100					26	1	19	183	372	22	1460	0.6																				
BH08_0.17-0.18	20/08/2015	Fill	0.5															19	1	24	1020	1060	23	1010	0.4	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05										<0.1	
BH08_1.0-1.1	20/08/2015	Fill	0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	350	<100	<0.5	0.7	1.5	8.9	52	3	33	396	1930	39	2630	0.7																				
BH08_2.5-2.6	20/08/2015	Fill	0.3											<0.5	1.4	2.9	25.2	42	3	200	1280	1470	51	4830	3.4																				
BH08_3.7-3.8	20/08/2015	Silty Sand	0.5	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	380	<100					18	<1	20	447	85	17	348	6.0																				
BH09_0.25-0.35	21/08/2015	Fill	0.1											<0.5	<0.5	1.2	<0.5	<5	<1	6	7	6	<2	30	<0.1																				
BH09_4.0-4.2	21/08/2015	Fill	0.4											<0.8	<0.8	1.2	<0.5	218	25	435	4340	3710	240	14200	2.7																				
QC101	21/08/2015	Duplicate, BH09_4.0-4.2												<0.5	<0.5	1.2	<0.5	80	9	106	3150	3480	214	4780	0.8																				
RPD														nc	nc	0	nc	**93**	**94**	**122**	32	6	11	**99**	**109**																				
BH09_4.5-4.6	21/08/2015	Sandy Clay	390.1	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<0.8	<0.8	1.2	<0.5	19	<1	31	10	13	10	21	<0.1										<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.8	<2		
BH10_0.15-0.25	21/08/2015	Fill	0.1																							<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05										<0.1	
BH10_4.0-4.1	21/08/2015	Clayey Sand	20.1	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100					26	<1	31	69	189	16	417	<0.1																				
BH11_0.2-0.3	20/08/2015	Fill	0.1											<0.5	0.9	1.7	10.4	26	2	39	482	3480	96	1540	0.5																				
BH11_2.3-2.4	20/08/2015	Fill	0.8	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	150	<100	<0.5	<0.5	1.2	<0.5	56	5	125	23300	2590	226	6980	0.1																				
BH11_3.3-3.4	20/08/2015	Sandy Silt	0.5	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	650	310					22	<1	23	78	142	15	550	0.3																				
BH12_0.15-0.25	21/08/2015	Fill	0.1											<0.5	1.1	2.0	11.1	41	6	36	2460	2290	75	5200	1.7																				
BH12_1.0-1.1	21/08/2015	Fill	0.1															34	2	47	12400	1530	57	2040	1.0																				
BH12_1.8-1.9	21/08/2015	Fill	0.4																																										No
BH12_3.6-3.7	21/08/2015	Fill	3.5	<0.2	<0.5	<0.5	<0.5	<10	<10	70	70	1660	430					385	9	36	576	2770	37	5750	0.9																				
BH13_0.4-0.5	20/08/2015	Fill	0.1											<0.5	1.6	2.6	16.0	35	10	258	971	1420	58	3040	0.9																				
BH13_3.6-3.7	20/08/2015	Silty Sand	6.6																							<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05										<0.1	
BH14_0.45-0.55	21/08/2015	Fill	-																							<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05										<0.1	
BH14_1.8-1.9	21/08/2015	Fill	0.6											<0.5	<0.5	1.2	<0.5	30	3	29	298	478	23	2060	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05										<0.1	
BH14_4.0-4.1	21/08/2015	Sandy Clay	150.1	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100																						<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<2		
BH15_0.4-0.5	21/08/2015	Fill	0.1											<0.5	<0.5	1.2	<0.5	<5	<1	100	28	5	89	46	<0.1																				No
BH16_0.7-0.8	21/08/2015	Fill	0	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<0.5	<0.5	1.2	<0.5	49	15	429	5480	2250	520	11600	0.4	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05										<0.1	
BH16_2.0-2.1	22/08/2015	Fill	0.9	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	370	220					136	19	109	3520	3290	167	7710	20.4																				
BH16_3.0-3.1	22/08/2015	Fill	4.3															71	10	182	7430	4370	254	14000	1.7																				
BH17_1.0-1.1	21/08/2015	Fill	0.1	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100					62	16	54	26400	6060	1320	21400	0.1																				
BH17_2.0-2.1	22/08/2015	Fill	15.2	<0.2	<0.5	<0.5	<0.5	16	16	2610	2610	**22300**	1620	<0.5	<0.5	1.2	8.7	62	4	607	12200	1150	738	2560	0.1																				
BH18_0.7-0.8	29/08/2015	Fill	0	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50	<0.5	1.2	<0.5	20	2	28	476	469	68	704	0.1																				No
BH18_2.0-2.1	29/08/2015	Fill	0.2												<0.5	1.2	<0.5	48	<1	63	294	1610	45	2240	<0.1																				
BH19_2.0-2.2	22/08/2015	Fill	1.9	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	440	270					54	1	33	299	559	21	5700	0.7																				
BH20_0.5-0.6	29/08/2015	Fill	0.2												<0.5	1.2	<0.5	<5	<1	8	10	29	6	53	<0.1																				No
BH20_1.0-1.1	29/08/2015	Fill	0.4												<0.5	1.2	<0.5	116	4	9	208	2030	41	4290	<0.1																				No
BH20_2.0-2.1	29/08/2015	Fill	0.3	<0.2	<0.5	<0.5	<0.5	<10	<10	140	140	3940	780	4860																															
BH21_0.7-0.8	21/08/2015	Fill	0.1	<0.2	<0.5	<0.5	<0.5	<10	<10	7440	7400	**47500**	10100	57.3	102	159	2170	31	1	12	155	234	23	367	0.3																				Yes
QC202	21/08/2015	Duplicate, BH21_0.7-0.8		<0.2	<0.5	<0.5	<0.5	<10	<10	3740	3720	**31900**	6230	50.0	106	158	2320	39	1	10	140	201	33	382	0.3																				
RPD				nc	nc	nc	nc	nc	nc	**66**	**66**	**39**	**47**	14	4	1	7	23	0	18	10	15	36	4	0																				
BH21_2.7-2.8	22/08/2015	Fill	0.2	0.9	<0.5	<0.5	<0.5	<10	<10	80	80	960	500					28	3	244	337	4430	86	3170	3.2																				
BH21_3.0-3.1	22/08/2015	Sand	2.1	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	150	<100	<0.5	<0.5	1.2	<0.5	<5	<1	7	11	42	6	90	<0.1																				
BH22_0.3-0.4	21/08/2015	Fill	0.1																																										Yes
BH22_0.45	21/08/2015	Fragment	-																																										Yes
BH22_0.8-0.9	21/08/2015	Fill	0.1											4.6	50.9	64.1	699	357	1	19	444	554	12	862	0.8																				
BH22_2.2-2.3	21/08/2015	Fill	0.1	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<0.5	<0.5	1.2	<0.5	119	3	29	550	6300	2700	14500	0.3																				
BH22_4.5-4.7	21/08/2015	Sandy Clay	26.7	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<0.5	<0.5	1.2	<0.5	13	<1	20	6	14	7	26	<0.1																				
QC100	21/08/2015	Split, BH22_4.5-4.7		<0.2	<0.5	<1	<2	<25	<25	<50	<50	<100	<100	<0.1	<0.05	<0.5	<0.1	9	<0.4	11	8	29	6	64	<0.1																				
RPD				nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	36	nc	**58**	29	**70**	15	**84**	nc																				
SS01	29/08/2015	Fill	-																																										Yes
SS02	29/08/2015	Fill	-																																										Yes
SS04-FRAG	29/08/2015	Fragment	-																																										Yes
			n samples	37				37						39				55								12									4							4		12	18
			n > criteria	0				n/a	0	n/a	0	**3**	0	0	n/a	**4**	0	0	0	0	0	**23**	0	0	0	0									n/a							0		0	**9**
			minimum	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<0.5	<0.5	<0.5	<0.5	<5	<0.4	6	6	5	<2	21	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<2	<0.1	No
			maximum	0.9	<0.5	<1	<2	<25	16	7440	7400	47500	10100	4860	106	159	2320	385	25	607	26400	14000	2700	21400	20.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<1	<1	<1	<1	<1	<5	<1	<5	<2	<0.1	Yes

Notes
Results = mg/kg
LOR = limit of reporting
< # = not detected above LOR
RPD = Relative Percent Difference
nc = not calculated, result(s) < LOR
Bold RPD = RPD > DQI
HSL D / HIL D = commercial/industrial land use
Shade + Bold = result > criteria
NL = not limiting

Table T5 - Petroleum Hydrocarbons in Soil

Client Name: Goodman
Project Name: Burrows Industrial Estate
Project No: 60438840

Sample Location & Depth	Sample Date	Sample Type	PID	BTEX				TRH					
				Benzene	Toluene	Ethylbenzene	Xylenes	C6 - C10	C6 - C10 minus BTEX (F1)	>C10 - C16	>C10 - C16 minus Naphthalene (F2	>C16 - C34 (F3)	>C34 - C40 (F4)
ESL - coarse soil (C/I)				**75**	**135**	**165**	**180**		**215**		**170**	**1700**	**3300**
Management Limits - coarse soil (C/I)									**700**		**1000**	**3500**	**10000**
BH01_1.0-1.1	21/08/2015	Fill	-	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	910	240
BH01_3.8-3.9	21/08/2015	Sandy Clay	-	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100
QC102	21/08/2015	Duplicate	-	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100
BH02_0.4-0.5	29/08/2015	Fill	0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100
BH02_3.0-3.1	29/08/2015	Silty Clay	14.1	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	380	160
BH03_3.0-3.1	29/08/2015	Fill	0.1	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100
BH03_1.0-1.2	29/08/2015	Sandy Clay	19.5	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	380	110
QC111	29/08/2015	Duplicate	-	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	310	<100
BH04_0.5-0.6	20/08/2015	Fill	0.5	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	100	<100
BH04_2.3-2.4	20/08/2015	Silty Clay	0.1	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	230	240
BH05_0.5-0.6	20/08/2015	Fill	1.8	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	140	<100
BH05_2.3-2.4	20/08/2015	Sandy Silt	0.7	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	210	<100
BH07B_1.2-1.3	21/08/2015	Fill	0.9	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	850	180
QC201	21/08/2015	Split	-	<0.2	<0.5	<1	<2	<25	<25	<50	<50	730	170
BH07B_2.3-2.4	21/08/2015	Silty Clay	0.4	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	360	100
BH08_1.0-1.1	20/08/2015	Fill	0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	350	<100
BH08_3.7-3.8	20/08/2015	Silty Sand	0.5	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	380	<100
BH09_4.5-4.6	21/08/2015	Sandy Clay	390.1	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100
BH10_4.0-4.1	21/08/2015	Clayey Sand	20.1	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100
BH11_2.3-2.4	20/08/2015	Fill	0.8	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	150	<100
BH11_3.3-3.4	20/08/2015	Sandy Silt	0.5	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	650	310
BH12_3.6-3.7	21/08/2015	Fill	3.5	<0.2	<0.5	<0.5	<0.5	<10	<10	70	70	1660	430
BH14_4.0-4.1	21/08/2015	Sandy Clay	150.1	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100
BH16_0.7-0.8	21/08/2015	Fill	0	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100
BH16_2.0-2.1	22/08/2015	Fill	0.9	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	370	220
BH17_1.0-1.1	21/08/2015	Fill	0.1	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100
BH17_2.0-2.1	22/08/2015	Fill	15.2	<0.2	<0.5	<0.5	<0.5	16	16	2610	**2610**	**22300**	1620
BH18_0.7-0.8	29/08/2015	Fill	0	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100
BH19_2.0-2.2	22/08/2015	Fill	1.9	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	440	270
BH20_2.0-2.1	29/08/2015	Fill	0.3	<0.2	<0.5	<0.5	<0.5	<10	<10	140	140	**3940**	780
BH21_0.7-0.8	21/08/2015	Fill	0.1	<0.2	<0.5	<0.5	<0.5	<10	<10	7440	**7400**	**47500**	**10100**
QC202	21/08/2015	Duplicate	-	<0.2	<0.5	<0.5	<0.5	<10	<10	3740	**3720**	**31900**	**6230**
BH21_2.7-2.8	22/08/2015	Fill	0.2	0.9	<0.5	<0.5	<0.5	<10	<10	80	80	960	500
BH21_3.0-3.1	22/08/2015	Sand	2.1	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	150	<100
BH22_2.2-2.3	21/08/2015	Fill	0.1	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100
BH22_4.5-4.7	21/08/2015	Sandy Clay	26.7	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100
QC100	21/08/2015	Split	-	<0.2	<0.5	<1	<2	<25	<25	<50	<50	<100	<100

Notes	**n samples**	37				37					
Results = mg/kg	**n > ESL**	0	0	0	0	n/a	0	n/a	**3**	**4**	**2**
LOR = limit of reporting	**n > ML**	n/a	n/a	n/a	n/a	n/a	0	n/a	**3**	**4**	**1**
< # = not detected above LOR	**minimum**	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100
Shade + Bold = result > criteria	**maximum**	0.9	<0.5	<1	<2	16	16	7440	7400	47500	10100

ESL: apply to 2 m. low reliability, except F1 & F2 (moderate reliability)

Table T6 - Leachate Sample Results

Client Name: Goodman
Project Name: Burrows Industrial Estate
Project No: 60438840

Sample ID_Depth	NSW EPA (2014) Waste Classification						BH04_1.0-1.1		BH16_2.0-2.1		BH17_2.0-2.1		BH21_0.7-0.8		BH22_2.2-2.3	
Sample Type							Soil	TCLP	Soil	TCLP	Soil	TCLP	Soil	TCLP	Soil	TCLP
Material Type	GSW			RSW			Fill		Fill		Fill		Fill		Fill	
Date Sampled	CT1	TCLP1	SCC1	CT2	TCLP2	SCC2	20/08/2015		22/08/2015		22/08/2015		21/08/2015		21/08/2015	
Units	mg/kg	mg/L	mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L
Arsenic	100	5	500	400	20	2000	311	0.4	136		62		31		119	<0.1
Cadmium	20	1	100	80	4	400	1		19		4		1		3	
Chromium	100	5	1900	400	20	7600	105		109		607	<0.05	12		29	
Copper	-	-	-	-	-	-	293		3520		12200		155		550	
Lead	100	5	1500	400	20	6000	10400	15.9	3290		1150		234		6300	47.1
Nickel	40	2	1050	160	8	4200	24		167		738		23		2700	0.6
Zinc	-	-	-	-	-	-	1170		7710		2560		367		14500	
Mercury	4	0.2	50	16	0.8	200	1.6		20.4	<0.001	0.1		0.3		0.3	
Benzo(a)pyrene	0.8	0.04	10	3.2	0.16	23	13.4	<0.0005			<0.5		102	<0.0005	<0.5	
Sum of reported PAH	-	-	200	-	-	800	158				8.7		2170		<0.5	

Notes:
mg/kg = milligrams per kilogram.
mg/L = milligrams per litre
< = not detected above LOR
- = not analysed and/or no criteria
Shading = interpreted classification
Red = interpreted Hazardous Waste

Metallurgical furnace slag present. Lead and B(a)P classification based on 2009/07	Slag present. Lead and B(a)P classification based on 2009/07 No Pb TCLP test based on BH04_1.0-1.1	Slag present. Hexavalent Cr classification based on 2009/07 No Pb or Ni TCLP test based on BH04_1.0-1.1 and BH22_2.2-3.3	Slag present. Lead and B(a)P classification based on 2009/07 No Pb TCLP test based on BH04_1.0-1.1

Table T7 - Groundwater Results

Client Name: Goodman
Project Name: Burrows Industrial Estate
Project No: 60438840

Sample Location	Sample Type	Sample Date	BTEXN							TRH						Metals								PAH	VHC							
			Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Naphthalene	C6 - C10	C6 - C10 minus BTEX (F1)	>C10 - C16	>C10 - C16 minus Naphthalene (F2)	>C16 - C34	>C34 - C40	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	Mercury	B(a)P	Tetrachloroethene (PCE)	Trichloroethene (TCE)	1,2-Dichloroethene (1,2-DCE)	1,1-Dichloroethene (1,1-DCE)	Chloroethene (Vinyl chloride)	Tetrachloromethane (carbon tetrachloride)	Hexachlorobutadiene
HH GAC	HSL D (SAND 2-<4m)		5000	NL	NL			NL	NL		6000		NL																			
	ADWG (2013)		1	800	300			600								10	2	50	2000	10	20		1	0.01	50		60	30	0.3	3	0.7
	Adopted HH GAC		**5000**								**6000**																					
Eco GAC	ASC NEPM Fresh Water GIL		950			350	200		16							24	0.2	1	1.4	3.4	11	8	0.06									
	ASC NEPM Marine Water GIL		500						50								0.7	4.4	1.3	4.4	7	15	0.1									
	Adopted ECO GAC		**500**						**50**								**0.7**	**4.4**	**1.3**	**4.4**	**7**	**15**	**0.1**									
MW01	Primary	31/08/2015	<1	<2	<2	<2	<2	<2	<5	<20	<20	<100	<100	<100	<100	6	<0.1	<1	<1	<1	3	**92**	<0.1	<0.5	<5	<5	<5	<5	<1	<5	<5
QC200	Split, MW01	31/08/2015	<1	<1	<1	<2	<1	<2	<1	<10	<10	<50	<50	<100	<100	5	<0.1	<1	<1	<1	2	**80**	<0.05	<1	<1	<1	<1	<1	<0.3	<1	<1
RPD			nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	40	14	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
MW16	Primary	31/08/2015	<1	<2	<2	<2	<2	<2	<5	<20	<20	<100	<100	<100	<100	8	<0.1	<1	**2**	4	7	**291**	<0.1	<0.5	<5	<5	<5	<5	<1	<5	<5
MW17	Primary	31/08/2015	<1	<2	<2	<2	<2	<2	<5	<20	<20	<100	<100	<100	<100	9	0.2	<1	**2**	4	**26**	**889**	<0.1	<0.5	<5	<5	<5	<5	<1	<5	<5
MW19	Primary	31/08/2015	<1	<2	<2	<2	<2	<2	<5	<20	<20	<100	<100	<100	<100	9	**6.1**	<1	**153**	**9**	**128**	**4180**	<0.1	<0.5	<5	<5	<5	<5	<1	<5	<5
MW21	Primary	31/08/2015	<1	<2	<2	<2	<2	<2	8	<20	<20	170	160	120	<100	1	0.2	<1	1	<1	4	**66**	<0.1	<0.5	<5	<5	<5	<5	<1	<5	<5
QC201	Rinsate	31/08/2015	<1	<2	<2	<2	<2	<2	<5	<20	<20	<100	<100	<100	<100																	
TB	Trip Blank	31/08/2015	<1	<2	<2	<2	<2	<2	<5	<20	<20																					

Notes
µg/L = micrograms per litre
All results and criteria = µg/L
LOR = Limit of Reporting
RPD = Relative Percentage Difference
nc = not calculated, result(s)<LOR
Eco GAC = Ecological Groundwater Assessment Criteria:
ASC NEPM Groundwater Investigation Levels (based on ANZECC 2000)
HH GAC = Human Health Groundwater Assessment Criteria:
ASC NEPM 2013 HSLs for Vapour Intrusion
ADWG = Australian Drinking Water Guidelines (2013)
NL - Not Limiting – A 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.
< denotes result less than LOR
Bold/Italic = RPD>50%
Highlighted/bold = Exceedence of HH GAC
Red/bold = Exceedence of Eco GAC

D R A F T

Appendix C

Data Validation

D R A F T

Appendix D

Background

D R A F T

Appendix E

Plates

D R A F T

Appendix F

Logs

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000

MONITORING WELL LOG BH01 / MW01

PROJECT NUMBER	60438840	**DATE**	21 & 22 August 2015
PROJECT NAME	Burrows Industrial Estate	**BLANK**	0.0 to 0.454 m bgs
LOCATION	1-3 Burrows Road, Alexandria NSW	**SCREEN**	0.454 to 3.454 m bgs
DRILLING METHOD	Hand Auger / Push-tube / Solid Auger	**GRAVEL PACK**	0.3 to 3.454 m bgs
SAMPLING METHOD	Hand Auger / Push-tube	**SANITARY SEAL/BENTONITE**	0.1 to 0.3 m bgs
SURFACE ELEVATION	2.210 m AHD	**STABILISED WATER LEVEL**	1.030 m BTOC
WELL HEAD/TOC	2.12 m AHD	**GROUND WATER ELEVATION**	1.090 m AHD
LOGGED BY	K. Pigram	**NORTHING**	6245408.202
COMMENTS		**EASTING**	331543.004

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
				0.2		CONCRETE	Concrete Slab	0.17	Cement Grout
						FILL	Gravel FILL. Roadbase	0.19	Bentonite
0.1		BH01_0.3-0.4	✳	0.4		CONCRETE	Concrete Slab	0.30	Casing
				0.6		FILL	Gravelly Sand FILL. Dark brown with orange ironstone gravels, medium grained sand, loose to medium dense, dry to slightly moist. Contains minor silt, ironstone gravels (20%), sand (80%) and piece of white porcelain.		
		BH01_1.0-1.1	✳	0.8					
				1.0					
				1.2			Becoming slightly moist from 1.0 m bgs. Contains minor soft, low plasticity clay (10%).		
				1.4			Water level at 1.25 m bgs; measured in borehole with tape measure		
				1.6					
				1.8					
				2.0		FILL	Sandy Clay FILL. Possible reworked natural. Dark grey brown with light grey mottling, medium stiff, moist to saturated, low plasticity.	2.00	Graded Sand
		BH01_2.0-2.1		2.2					Slotted Screen
				2.4					
				2.6					
				2.8		CL	Sandy CLAY. Dark grey/brown, medium stiff, saturated, medium plasticity. Contains shells, clay content increasing with depth. Slight hydrogen sulphide odour noted.	2.80	
		BH01_2.8-3.0		3.0					
				3.2					
				3.4					
				3.6					Cave-in
		BH01_3.8-3.9	✳	3.8			Becoming light grey from 3.8 m bgs.	3.90	
							Borehole terminated at 3.9 m bgs; target depth reached Total Depth: 3.90 m		

60438840_BORELOGS_20150826.GPJ 28/9/15

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000

BOREHOLE_ LOG BH02

PROJECT NUMBER 60438840 **DATE** 29 Aug 15
PROJECT NAME Burrows Industrial Estate
LOCATION 1-3 Burrows Road, Alexandria NSW
DRILLING METHOD Hand Auger / Push-tube / Solid Auger
SAMPLING METHOD Hand Auger / Push-tube
SURFACE ELEVATION 2.580 m AHD

LOGGED BY K. Pigram **NORTHING** 6245363.848
COMMENTS **EASTING** 331576.145

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
				0.2		CONCRETE	Concrete Slab	
				0.4		CONCRETE	Concrete gravels/broken pieces of Slab	0.32 / 0.40
0.2		BH02_0.4-0.5	✳	0.6		FILL	Gravelly Sand FILL. Grey/brown and white, loose to medium dense, dry to slightly moist. Contains sandstone and concrete gravels (<10 mm diameter).	
				0.8			Refusal with hand auger at 0.8 m bgs; switch to push-tube.	
0.4		BH02_1.0-1.1		1.0			Becoming moist from 1.0 m bgs. Contains terracotta, glass and ceramic fragments and concrete gravels.	
				1.2			Becoming saturated at 1.3 m bgs	
				1.4				
				1.6				1.70
				1.8		FILL	Clayey Gravelly Sand FILL. Dark grey/brown, dense, saturated. Contains slag and ceramic gravels (30%), soft, low plasticity clay (20%), medium grained sand (40%) and minor silt.	
2.9		BH02_2.0-2.1	✳	2.0				
				2.2				
				2.4				
				2.6				
				2.8				2.90
14.1		BH02_3.0-3.1	✳	3.0		CH	CLAY. Dark grey/brown / black, medium stiff, saturated, high plasticity. Contains trace sand and trace silt and shell fragments. Slight hydrogen sulphide odour.	
				3.2				
				3.4				3.40
				3.6		CL-CH	Sandy CLAY. Dark grey/brown, stiff, saturated, medium to high plasticity. Contains fine to medium grained sand (20%) and shell fragments. Slight to moderate hydrogen sulphide odour.	
2.5		BH02_3.8-3.9		3.8				3.90
							Borehole terminated at 3.9 m bgs; target depth reached Total Depth: 3.90 m	

60438840_BORELOGS_20150826.GPJ 28/9/15

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000

BOREHOLE_ LOG BH03

PROJECT NUMBER 60438840
PROJECT NAME Burrows Industrial Estate
LOCATION 1-3 Burrows Road, Alexandria NSW
DRILLING METHOD Hand Auger / Push-tube / Solid Auger
SAMPLING METHOD Hand Auger / Push-tube
SURFACE ELEVATION 2.320 m AHD

DATE 29 Aug 15

LOGGED BY K. Pigram
COMMENTS

NORTHING 6245317.163
EASTING 331596.394

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						CONCRETE	Concrete Slab	0.14
0.1		BH03_0.2-0.3	✳	0.2		FILL	Gravelly Sand FILL. Dark brown/grey, yellow, white, fine to medium grained, medium dense, slightly moist. Contains minor silt, sandstone and roadbase gravels (30%, <10 mm diameter).	
0.3		BH03_0.5-0.6		0.4				
				0.6			Becoming white and dark grey/brown mottling and dense from 0.3 m bgs. Contains crushed sandstone.	
				0.8		FILL	Refusal with hand auger at 0.6 m bgs on sandstone boulders; switch to solid auger.	0.80
3.4		BH03_1.0-1.2	✳	1.0				
				1.2			Switch to push-tube at 0.8 m bgs	
2.1		BH03_1.4-1.5		1.4			Gravelly Clayey Sand FILL. Dark grey/brown, dense, moist to saturated. Contains sandstone and slag gravels (30%), sand (40%) and medium stiff, low plasticity clay (30%).	
				1.6				
				1.8			Becoming very dark/brown and saturated from 1.3 m bgs.	
0.7		BH03_2.0-2.1		2.0			As above, contains sand (50%), minor silt (10%), soft, low plasticity clay (20%), slag gravels and ceramic pieces (20%).	
				2.2				
				2.4				
				2.6				
				2.8				
				3.0				3.00
19.5		BH03_3.0-3.1	✳	3.2		CH	Sandy CLAY. Dark grey/brown, stiff, saturated, medium to high plasticity. Contains trace silt and fine to medium grained sand (20%), shell fragments. Moderate hydrogen sulphide odour.	
				3.4				
				3.6				
21.3		BH03_3.8-3.9		3.8				3.90
							Borehole terminated at 3.9 m bgs; target depth reached Total Depth: 3.90 m	

60438840_BORELOGS_20150826.GPJ 28/9/15

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000

BOREHOLE_ LOG BH04

PROJECT NUMBER 60438840
PROJECT NAME Burrows Industrial Estate
LOCATION 1-3 Burrows Road, Alexandria NSW
DRILLING METHOD Hand Auger / Push-tube / Solid Auger
SAMPLING METHOD Hand Auger / Push-tube
SURFACE ELEVATION 2.250 m AHD

DATE 20 Aug 15

LOGGED BY L. Gibb
COMMENTS

NORTHING 6245416.112
EASTING 331553.645

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						ASPHALT	Bitumen Hardstand	0.06
0.0		BH04_0.15-0.25		0.2		CONCRETE	Concrete Slab	0.20
				0.4		FILL	Gravelly Sand FILL. Black and grey, loose, moist. Contains minor medium sitff, low plasticity clay pockets, subangular blue metal gravels, minor vesicular slag gravels (2-5 mm diameter).	
0.5		BH04_0.5-0.6	✳	0.6				
				0.8		FILL	Becoming black with brown mottling from 0.4 m bgs. Mild hydrocarbon odour.	0.80
				1.0			Becoming brown with orange mottling from 0.6 m bgs	
				1.2		FILL	Silty Sandy Gravel FILL. Black/brown with orange mottling, medium dense, slightly moist.	1.10
0.6		BH04_1.0-1.1	✳	1.4			Contains ceramic tile fragments, aluminium, ironstone gravels from 0.9 m bgs. Slight odour noted.	
0.1		BH04_1.5-1.6		1.6		FILL	Silty Gravelly Sand FILL. Very moist to saturated. Contains vesicular slag (10 mm diameter), shell fragments. Slight odour noted.	1.50
				1.8			Sandy Gravel FILL. Saturated. Iron stained slag gravels with pockets of grey medium to coarse grained silty sand. Contains shell fragments and rusted bolts and nails.	
				2.0				
				2.2				2.30
0.1		BH04_2.3-2.4	✳	2.4		CL		2.50
				2.6		SM	Silty CLAY. Dark grey and black, moist, medium plasticity. Contains organic fibres. Slight hydrogen sulphide odour.	
0.2		BH04_2.7-2.8		2.8			Silty SAND. Light grey and dark brown, fine to medium grained, moist. Contains organic fibres and shell fragments.	
				3.0			Becoming light browm, medium dense and saturated from 2.7 m bgs. Contains numerous organic fibres. Organic odour noted.	
				3.2				
				3.4				
0.1		BH04_3.5-3.6		3.6			Contains high shell fragment content and organic fibres from 3.5 m bgs	
				3.8				3.90
							Borehole terminated at 3.9 m bgs; target depth reached Total Depth: 3.90 m	

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000

BOREHOLE_ LOG BH05

PROJECT NUMBER 60438840
PROJECT NAME Burrows Industrial Estate
LOCATION 1-3 Burrows Road, Alexandria NSW
DRILLING METHOD Hand Auger / Push-tube / Solid Auger
SAMPLING METHOD Hand Auger / Push-tube
SURFACE ELEVATION 2.190 m AHD

DATE 20 Aug 15

LOGGED BY L. Gibb
COMMENTS

NORTHING 6245401.397
EASTING 331587.754

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						ASPHALT	Bitumen Hardstand	0.05
						CONCRETE		0.19
1.0		BH05_0.25-0.35		0.2		FILL	Concrete Slab	
				0.4		FILL		0.40
1.8		BH05_0.5-0.6	✳	0.6		FILL	Gravelly Sand FILL. Black and dark brown, medium to coarse grained, loose to medium dense, dry. Contains pockets of silt, sandstone and blue metal gravels. Slight odour.	0.50
				0.8			Clay FILL. Orange with black mottling, stiff, high plasticity. Contains rusted nails and sandstone gravels (20-50 mm diameter).	
0.4		BH05_1.0-1.1	✳	1.0				
				1.2			Silty Sand FILL. Black, medium to coarse grained, medium dense, dry. Contains minor sandstone gravels, glass and ceramic fragments. Slight odour noted.	
				1.4			Iron staining of sandstone gravels noted from 0.8 m bgs. Contains bone and slag fragments.	
0.0		BH05_1.5-1.6		1.6			Becoming very moist from 1.0 m bgs. Contains glass, metal and ceramic fragments. Slight odour noted.	
				1.8			Becoming saturated from 1.3 m bgs	
				2.0			Contains numerous glass and ceramic fragments from 1.5 m bgs	
				2.2				2.30
0.7		BH05_2.3-2.4	✳	2.4		ML	Sandy SILT. Brown with black mottling, saturated. Strong sulphuric odour noted.	2.50
				2.6		SM	Silty SAND. Light grey with black mottling. Strong sulphuric odour noted.	
0.4		BH05_2.7-2.8		2.8			Becoming dark grey from 2.7 m bgs. Increase in Silt content and strong sulphuric odour noted.	
0.7		BH05_3.0-3.1		3.0		ML	Sandy SILT. Dark grey, fine grained, saturated. Contains high silt content and minor organic fibres.	3.00
				3.2				
				3.4				3.50
				3.6		SM	Silty SAND. Dark grey/black and light grey, fine to medium grained. Contains numerous shell fragments. Strong hydorgen sulphide odour noted.	
0.5		BH05_3.7-3.8		3.8			Increase in silt content and strong hydrogen sulphide odour noted from 3.7 m bgs	3.90
							Decreasing shell fragments noted from 3.8 m bgs	
							Borehole terminated at 3.9 m bgs; target depth reached Total Depth: 3.90 m	

60438840_BORELOGS_20150826.GPJ 28/9/15

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000

BOREHOLE_ LOG BH06

PROJECT NUMBER 60438840
PROJECT NAME Burrows Industrial Estate
LOCATION 1-3 Burrows Road, Alexandria NSW
DRILLING METHOD Hand Auger / Push-tube / Solid Auger
SAMPLING METHOD Hand Auger / Push-tube
SURFACE ELEVATION 2.690 m AHD

DATE 21 Aug 15

LOGGED BY K. Pigram
COMMENTS

NORTHING 6245356.492
EASTING 331632.445

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						CONCRETE	Concrete Slab	0.15
				0.2		FILL	Gravelly Sand FILL. Yellow, medium grained. Contains minor sandstone gravels.	
				0.4		FILL	Hand auger refusal at 0.4 m bgs; switch to solid auger.	0.40
				0.6		FILL	Gravel FILL. Light grey/white. Slightly weathered sandstone.	0.65
				0.8				
0.2		BH06_1.0-1.1	✳	1.0			Swtich to push-tube at 0.65 m bgs.	1.10
							Gravelly Sand FILL. Loose to medium dense, dry.	
							Push-tube refusal at 0.8 m bgs; switch to solid augers.	
							Borehole terminated at 1.1 m bgs; refusal with solid augers on concrete - abandon borehole. Total Depth: 1.10 m	

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000

BOREHOLE_ LOG BH07

PROJECT NUMBER 60438840
PROJECT NAME Burrows Industrial Estate
LOCATION 1-3 Burrows Road, Alexandria NSW
DRILLING METHOD Hand Auger / Push-tube / Solid Auger
SAMPLING METHOD Hand Auger / Push-tube
SURFACE ELEVATION 2.560 m AHD

DATE 20 Aug 15

LOGGED BY L. Gibb
COMMENTS

NORTHING 6245440.796
EASTING 331577.783

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						ASPHALT	Bitumen Hardstand	0.05
				0.2		CONCRETE	Concrete Slab	0.20
0.1		BH07_0.4-0.5		0.4		FILL	Gravelly Sand FILL. Black. Contains brick and sandstone gravels and minor slag gravels.	0.68
				0.6			Borehole terminated at 0.68 m bgs; refusal with hand auger - relocate borehole Total Depth: 0.68 m	

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000

BOREHOLE_ LOG BH07A

PROJECT NUMBER 60438840
PROJECT NAME Burrows Industrial Estate
LOCATION 1-3 Burrows Road, Alexandria NSW
DRILLING METHOD Hand Auger / Push-tube / Solid Auger
SAMPLING METHOD Hand Auger / Push-tube
SURFACE ELEVATION 2.560 m AHD

DATE 20 Aug 15

LOGGED BY L. Gibb
COMMENTS

NORTHING 6245440.796
EASTING 331577.783

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						ASPHALT	Bitumen Hardstand	0.05
0.1		BH07A_0.15-0.25		0.2		CONCRETE	Concrete Slab	0.15
				0.4		FILL	Silty Gravel FILL. Black, saturated (from concrete coring). Contains slag gravels, weathered brick fragments and plastic.	0.50
0.1		BH07A_0.5-0.6	✳	0.6		FILL	Silty Sand FILL. Black, coarse grained sand. Contains small slag gravels, rusted metal and glass fragments.	0.70
							Borehole terminated at 0.7 m bgs; hand auger refusal on bricks and concrete - relocate borehole Total Depth: 0.70 m	

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000

BOREHOLE_ LOG BH07B

PROJECT NUMBER 60438840
PROJECT NAME Burrows Industrial Estate
LOCATION 1-3 Burrows Road, Alexandria NSW
DRILLING METHOD Hand Auger / Push-tube / Solid Auger
SAMPLING METHOD Hand Auger / Push-tube
SURFACE ELEVATION 2.560 m AHD

DATE 21 Aug 15

LOGGED BY L. Gibb
COMMENTS

NORTHING 6245440.796
EASTING 331577.783

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						ASPHALT	Bitumen Hardstand	0.05
						CONCRETE	Concrete Slab	0.19
0.0		BH07B_0.2-0.3		0.2		FILL	Gravelly Sand FILL. Dark brown with iron staining, loose to medium dense, slightly moist. Contains grey slag and ironstone gravels. Potential bonded ACM fragment noted.	
0.1		BH07B_0.5-0.6		0.4				
0.1		BH07B_0.8-0.9		0.6				
0.1		BH07B_1.0-1.1		0.8		FILL	Increase in silt content and decrease in slag gravels from 0.5 m bgs. Contains green degraded fibrous material.	0.80
0.9		BH07B_1.2-1.3	✳	1.0		FILL	Large fragment of red and black slag noted at 0.7 m bgs	1.00
0.4		BH07B_1.6-1.7		1.2		FILL	Gravelly Silty FILL. Black, grey and orange, slightly moist. Contains metallic slag gravels (5-10 mm diameter) and pockets of silty clay.	1.30
				1.4			Silty Sand FILL. Dark brown, coarse grained, slightly moist. Contains subangular ironstone gralves (<2-5 mm diameter) and fragments of rusted metal.	
				1.6				
				1.8 ▽		FILL	Switch to push-tube at 1.1 m bgs.	1.80
				2.0				
				2.2			Becoming dark brown/black from 1.1 m bgs. Contains ceramic tile, glass and metal fragments and slag gravels.	
0.4		BH07B_2.3-2.4	✳	2.4		CH	Pockets of black staining noted and becoming moist from 1.2 m bgs. Contains glass, bark, ceramic and shell fragments.	2.30
				2.6				
0.3		BH07B_2.8-2.9		2.8		SM	Silty Clay FILL. Orange with black mottling.	2.80
				3.0			Becoming grey with orange mottling and moist to saturated from 1.5 m bgs. Contains minor ironstone gravels. Slight odour noted.	3.00
							Silty Gravel FILL. Orange/red brown, saturated. Ironstone gravels.	
							Silty CLAY. Dark grey, medium stiff, high plasticity, saturated. Hydrogen sulphide odour.	
							Becoming soft with high plasticity from 2.6 m bgs. Increase in grey sand content.	
							Sandy SILT. Dark grey, medium dense, saturated. Hydrogen sulphide odour.	
							Borehole terminated at 3.0 m bgs; target depth reached Total Depth: 3.00 m	

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000

BOREHOLE_ LOG BH08

PROJECT NUMBER 60438840
PROJECT NAME Burrows Industrial Estate
LOCATION 1-3 Burrows Road, Alexandria NSW
DRILLING METHOD Hand Auger / Push-tube / Solid Auger
SAMPLING METHOD Hand Auger / Push-tube
SURFACE ELEVATION 2.600 m AHD

DATE 20 Aug 15

LOGGED BY L. Gibb
COMMENTS

NORTHING 6245424.019
EASTING 331611.759

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
				0.0		ASPHALT	Bitumen Hardstand	0.02
0.5		BH08_0.17-0.18	✳	0.2		CONCRETE	Concrete Slab	0.14
				0.4		FILL		
0.2		BH08_0.5-0.6		0.6		FILL	Gravelly Sand FILL. Black with orange/yellow mottling, medium to coarse grained. Contains sandstone and ironstone gravels (2-5 mm diameter).	0.40
				0.8			Silty Sand FILL. Light brown, medium to coarse grained sand. Contains sandstone gravels (5-10 mm diameter) and minor silt.	
0.2		BH08_1.0-1.1	✳	1.0		FILL	Increase in sandstone and ironstone gravel content and large slag gravels noted from 0.7 m bgs.	1.00
				1.2			Scrap aluminium metal noted from 0.9 m bgs	
				1.4			Gravelly Sand FILL. Black with orange mottling, coarse grained. Contains rusted metal fragments, subangular sandstone and slag gravels (5-10 mm diameter).	
				1.6			Switch to push-tube from 1.2 m bgs - no recovery in push-tube from 1.2 to 2.2 m bgs	
				1.8				
				2.0				
				2.2 ▽		FILL	Gravelly Sand FILL. Black, saturated. Contains large slag gravels.	2.20
				2.4				
0.3		BH08_2.5-2.6	✳	2.6				2.70
				2.8		SM	Silty SAND. Black/dark grey, fine to medium grained, saturated. Strong sulphuric odour.	
				3.0				
				3.2				
				3.4				
				3.6				
0.5		BH08_3.7-3.8	✳	3.8			Becoming dark grey with brown mottling from 3.7 m bgs. Increase in silt content noted.	
				4.0				4.00
1.9		BH08_4.0-4.2		4.2		CH	Silty CLAY. Dark grey, medium stiff, saturated, high plasticity. Strong sulphuric odour noted.	
				4.4				
4.1		BH08_4.4-4.5		4.6			Increase in sand content noted from 4.3 m bgs. Contains minor shell fragments. Strong sulphuric odour noted.	
				4.8			No recovery in push-tube from 4.5 to 5.1 m bgs	
				5.0				5.10
							Borehole terminated at 5.1 m bgs; target depth reached Total Depth: 5.10 m	

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000

BOREHOLE_ LOG BH09

PROJECT NUMBER	60438840	**DATE**	21 Aug 15
PROJECT NAME	Burrows Industrial Estate		
LOCATION	1-3 Burrows Road, Alexandria NSW		
DRILLING METHOD	Hand Auger / Push-tube / Solid Auger		
SAMPLING METHOD	Hand Auger / Push-tube		
SURFACE ELEVATION	3.040 m AHD		
LOGGED BY	L. Gibb & K. Pigram	**NORTHING**	6245404.251
COMMENTS		**EASTING**	331640.584

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						CONCRETE	Concrete Slab	0.14
0.1		BH09_0.15-0.25	✳	0.2		FILL	Gravelly Sand FILL. Yellow, medium grained. Contains minor sandstone gravels.	
0.2		BH09_0.25-0.35	✳				Becoming pink, medium to coarse grained from 0.25 m bgs. Increase in sub-rounded sandstone gravel content.	
0.1		BH09_0.4-0.5		0.4				0.50
				0.6		FILL	Becoming black/dark brown from 0.4 m bgs. Contains brick fragments and sandstone gravels.	
				0.8				
				1.0			Hand auger refusal at 0.5 m bgs on Sandstone. Switch to Solid Auger on Geoprobe.	
				1.2				
				1.4			Gravelly Sand FILL. Brown with light orange/brown and white sandstone gravels, dry dense.	
0.1		BH09_1.5-1.6		1.6				
				1.8				
				2.0			Band of crushed concrete noted from 2.0 to 2.2 m bgs	
0.5		BH09_2.2-2.3		2.2			Becoming dark brown with red/brown, dry to slightly moist. Contains sandstone and ironstone gravels, minor silt and black ash.	
				2.4				
				2.6				
				2.8			Becoming dark brown/black, moist to saturated from 2.7 m bgs. Contains sandstone and ironstone gravels and slag gravels (<10 mm diameter).	
0.4		BH09_3.0-3.1		3.0	▽		Becoming green/brown from 3.0 to 3.1 m bgs. Sample collected	
				3.2				
				3.4				
				3.6				
				3.8				
0.4		BH09_4.0-4.2	✳	4.0				
139.8		BH09_4.2-4.3		4.2				4.20
				4.4		SC	Clayey SAND. Grey/brown, medium dense, saturated. Minor medium stiff, low to medium plasticity clay (20%). Moderate hydrogen sulphide odour.	4.50
390.1		BH09_4.5-4.6	✳	4.6		CL	Sandy CLAY. Dark grey/brown, saturated. Contains minor shell fragments. Sand content decreasing with depth. Moderate to strong hydrogen sulphide odour.	
				4.8				
				5.0				
				5.2				5.30
							Borehole terminated at 5.3 m bgs; target depth reached Total Depth: 5.30 m	

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000

BOREHOLE_ LOG BH10

PROJECT NUMBER 60438840
PROJECT NAME Burrows Industrial Estate
LOCATION 1-3 Burrows Road, Alexandria NSW
DRILLING METHOD Hand Auger / Push-tube / Solid Auger
SAMPLING METHOD Hand Auger / Push-tube
SURFACE ELEVATION 2.910 m AHD

DATE 21 Aug 15

LOGGED BY L. Gibb & K. Pigram
COMMENTS

NORTHING 6245375.677
EASTING 331665.802

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						CONCRETE	Concrete Slab	0.15
0.1		BH10_0.15-0.25	✳	0.2		FILL	Gravelly Sand FILL. Yellow, medium grained. Contains minor sandstone gravels.	
0.2		BH10_0.4-0.5		0.4			Becoming pink/brown, medium to coarse grained from 0.4 m bgs. Increase in well rounded sandstone gravel content.	
				0.6			Hand auger refusal at 0.55 m bgs on Sandstone; switch to Solid Augers on Geoprobe	
				0.8				
0.1		BH10_1.0-1.1		1.0			Becoming light grey, brown, black, orange, medium dense, dry to slightly moist. Contains ash, concrete, ironstone and slag gravels (40%), sand (60%).	
				1.2				
				1.4				
				1.6				
				1.8				
				2.0				2.10
0.2		BH10_2.1-2.2		2.2 ▽		FILL	Clayey Gravelly Sand FILL. Brown and dark grey/brown, medium dense, moist to saturated. Contains sand (40%), slag gravels (40%) and soft low plasticity clay (20%).	
				2.4				
				2.6				
				2.8				
0.4		BH10_3.0-3.1		3.0			Clay content increasing with depth; approx. 30% from 3.0 m bgs	
				3.2				
				3.4				
				3.6				
				3.8				3.90
20.1		BH10_4.0-4.1	✳	4.0		SC	Clayey SAND. Dark brown, medium dense, saturated. Contains sand (70%) and clay (30%).	
				4.2				
				4.4				4.50
				4.6		CL	Sandy CLAY. Dark brown, medium stiff, saturated, medium plasticity. Contains clay (60%) and sand (40%). Slight hydrogen sulphide odour.	
				4.8				
				5.0				5.10
							Borehole terminated at 5.1 m bgs; target depth reached Total Depth: 5.10 m	

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000

BOREHOLE_ LOG BH11

PROJECT NUMBER 60438840
PROJECT NAME Burrows Industrial Estate
LOCATION 1-3 Burrows Road, Alexandria NSW
DRILLING METHOD Hand Auger / Push-tube / Solid Auger
SAMPLING METHOD Hand Auger / Push-tube
SURFACE ELEVATION 3.120 m AHD

DATE 20 Aug 15

LOGGED BY L. Gibb
COMMENTS

NORTHING 6245465.678
EASTING 331605.73

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						ASPHALT	Bitumen Hardstand	0.05
						CONCRETE		0.20
0.1		BH11_0.2-0.3	✳	0.2		FILL	Concrete Slab	
				0.4			Gravelly Sand FILL. Dark brown/black, coarse grained, dry. Contains ash.	
0.1		BH11_0.5-0.6		0.6			Contains pockets of black silt, ash and glass fragments from 0.6 m bgs	
				0.8			Contains large ceramic tile fragments from 0.6 m bgs	
						FILL	Sandy Clay FILL. White/red/brown mottled, stiff, high plasticity.	0.90
0.1		BH11_1.0-1.1		1.0				
				1.2				
				1.4				
				1.6				
				1.8				
				2.0				2.00
0.1		BH11_2.0-2.1				FILL	Sandy Silt FILL. Black. Contains ceramic and glass fragments.	2.10
				2.2		FILL		2.20
0.8		BH11_2.3-2.4	✳			FILL	Gravelly Sand FILL. Light yellow, dense. Contains sandstone and vesicular slag gravels.	
				2.4			Silty Gravel FILL. Black with orange mottling. Contains slag and ironstone gravels.	
				2.6 ▽			Becoming red/brown from 2.5 m bgs. Decreased slag gravel content.	
				2.8			Becoming saturated from 2.6 m bgs	
0.5		BH11_3.0-3.1		3.0			Becoming dark grey from 3.0 m bgs	
				3.2				3.30
0.5		BH11_3.3-3.4	✳	3.4		ML	Sandy SILT. Black, dense. Hydrogen sulphide and hydrocarbon odour noted.	
0.4		BH11_3.6-3.7		3.6				
				3.8				3.90
							Borehole terminated at 3.9 m bgs; target depth reached Total Depth: 3.90 m	

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BOREHOLE_ LOG BH12

PROJECT NUMBER 60438840
PROJECT NAME Burrows Industrial Estate
LOCATION 1-3 Burrows Road, Alexandria NSW
DRILLING METHOD Hand Auger / Push-tube / Solid Auger
SAMPLING METHOD Hand Auger / Push-tube
SURFACE ELEVATION 3.620 m AHD

DATE 21 Aug 15

LOGGED BY L. Gibb
COMMENTS

NORTHING 6245472.364
EASTING 331645.559

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						ASPHALT	Bitumen Hardstand	0.03
0.1		BH12_0.15-0.25	✳	0.2		CONCRETE	Concrete Slab	0.14
				0.4		FILL	Gravelly Sand FILL. Black and white, coarse grained. Contains ash, slag (<5 mm diameter) and well rounded sandstone gravels, glass fragments.	0.50
0.1		BH12_0.5-0.6		0.6		FILL	Silty Sand FILL. Black, slightly moist. Contains minor slag and ash gravels.	0.60
0.1		BH12_0.6-0.7		0.8		FILL	Sandy Clay FILL. Yellow with grey mottling, slightly moist, high plasticity. Contains ceramic and glass fragments.	1.00
0.1		BH12_1.0-1.1	✳	1.0		FILL	Silty Sand FILL. Black with red mottling and yellow pockets, coarse grained sand. Contains ironstone and slag gravels, rusted metal and glass fragments.	
0.1		BH12_1.5-1.6		1.2			Becoming grey and white from 1.5 m bgs. Contains ash and vesicular slag gravels.	
0.4		BH12_1.8-1.9	✳	1.4				1.80
				1.6		FILL	Gravelly Sand FILL. Brown, caorse grained. Contains slag gravels and organic fibres.	
				1.8			No recovery in push-tube from 2.0 to 2.8 m bgs	
				2.0				
				2.2				
				2.4				
				2.6				
				2.8				2.80
				3.0		FILL	Silty Gravel FILL. Black. Contains coarse grained sand, concrete cobbles and sandstone gravels.	
0.2		BH12_3.2-3.3		3.2			Becoming red/brown and saturated from 3.0 m bgs. Contains ceramic fragments, weathered brick fragments and slag gravels.	
				3.4				
3.5		BH12_3.6-3.7	✳	3.6			Black staining and slight odour noted from 3.6 m bgs.	3.70
0.3		BH12_3.7-3.8		3.8		SM	Silty SAND. Light grey and dark grey. Hydrogen sulphide odour noted.	
				4.0			Borehole terminated at 4.0 m bgs; target depth reached Total Depth: 4.00 m	4.00

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BOREHOLE_ LOG BH13

PROJECT NUMBER 60438840
PROJECT NAME Burrows Industrial Estate
LOCATION 1-3 Burrows Road, Alexandria NSW
DRILLING METHOD Hand Auger / Push-tube / Solid Auger
SAMPLING METHOD Hand Auger / Push-tube
SURFACE ELEVATION 2.960 m AHD

DATE 20 Aug 15

LOGGED BY L. Gibb
COMMENTS

NORTHING 6245442.06
EASTING 331634.823

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						CONCRETE	Concrete Slab	0.17
0.1		BH13_0.2-0.3		0.2		FILL	Gravelly Sand FILL. Dark brown/black, coarse grained. Contains sandstone and ironstone gravels and glass fragments.	
0.1		BH13_0.4-0.5	✳	0.4			Becoming orange and brown mottled from 0.4 m bgs. Increased in ironstone gravels. Contains slag gravels and minor ceramic fragments.	
0.1		BH13_0.6-0.7		0.6			Becoming light grey and white, coarse grained from 0.6 m bgs. Contains sandstone gravels and glass fragments.	
				0.8				
0.1		BH13_1.0-1.1		1.0			Increase in ironstone gravel content from 1.0 m bgs. Contains rusted metal fragments and numerous glass fragments.	
				1.2				
				1.4			Switch to push-tube at 1.2 m bgs	1.50
0.2		BH13_1.5-1.6		1.6		FILL	Sandy Gravel FILL. Moist. Contains slag, sandstone and ironstone gravels.	
				1.8 ▽			Becoming red/brown and saturated from 1.8 m bgs. Contains silt and fragments of crushed shells.	
				2.0				
				2.2				
				2.4				
				2.6				
0.2		BH13_2.7-2.8		2.8			Becoming black from 2.7 m bgs	2.80
						ML	Sandy SILT. Black, dense. Organic odour.	3.00
0.3		BH13_3.0-3.1		3.0		SM	Silty SAND. Black and grey, medium grained, dense. Hydrogen sulphide odour.	
				3.2				
				3.4				
6.6		BH13_3.6-3.7	✳	3.6			Increase in sand content noted from 3.6 m bgs	
				3.8				3.90
							Borehole terminated at 3.9 m bgs; target depth reached Total Depth: 3.90 m	

AECOM Australia Pty Ltd
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BOREHOLE_ LOG BH14

PROJECT NUMBER 60438840
PROJECT NAME Burrows Industrial Estate
LOCATION 1-3 Burrows Road, Alexandria NSW
DRILLING METHOD Hand Auger / Push-tube / Solid Auger
SAMPLING METHOD Hand Auger / Push-tube
SURFACE ELEVATION 2.930 m AHD

DATE 21 Aug 15

LOGGED BY K. Pigram
COMMENTS

NORTHING 6245419.946
EASTING 331653.883

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
				0.2		CONCRETE	Concrete Slab	0.19
				0.4		FILL	Gravel FILL. Roadbase, medium dense.	0.30
						CONCRETE	Concrete Slab	0.44
		BH14_0.45-0.55	✳			FILL	Gravelly Sand FILL. Dark brown, medium dense, dry to slightly moist. Roadbase gravels (30%), sand (60%) and minor silt (10%).	
				0.6			Hand auger refusal at 0.6 m bgs on sandstone gravel (possible boulder/floater); switch to solid augers.	
2.5		BH14_1.0-1.1		0.8			Contains ash, glass, slag (10%) gravels. Contains ironstone and sandstone gravels and minor roadbase gravels from 1.0 m bgs.	
				1.0				
				1.2				
				1.4				1.50
				1.6		FILL	Sandy Gravel FILL. Brown/orange/grey, medium dense, moist to saturated. Contains sand (15-20%), slag gravels (80%) and trace clay (<10%).	
0.6		BH14_1.8-1.9	✳	1.8				
				2.0	▽		Water level measured within borehole with tape measure at 2.0 m bgs.	
				2.2				
				2.4				
				2.6				
				2.8			Sand increasing with depth from 2.7 m bgs	
0.2		BH14_3.0-3.1		3.0				
				3.2				
				3.4				
				3.6				
				3.8				3.80
						CL	Sandy CLAY. Dark grey/brown, medium stiff, saturated, low to medium plasticity. Contains sand (30%) and clay (70%). Clay increasing with depth. Moderate hydrogen sulphide odour.	
150.1		BH14_4.0-4.1	✳	4.0				
				4.2				
				4.4				
				4.6			Clay becoming medium stiff and medium to high plasticity from 4.5 m bgs.	
				4.8				
				5.0				5.10
							Borehole terminated at 5.1 m bgs; target depth reached Total Depth: 5.10 m	

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BOREHOLE_ LOG BH15

PROJECT NUMBER 60438840
PROJECT NAME Burrows Industrial Estate
LOCATION 1-3 Burrows Road, Alexandria NSW
DRILLING METHOD Hand Auger / Push-tube / Solid Auger
SAMPLING METHOD Hand Auger / Push-tube
SURFACE ELEVATION 2.700 m AHD

DATE 21 Aug 15

LOGGED BY K. Pigram
COMMENTS

NORTHING 6245398.482
EASTING 331674.617

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
				0.2		CONCRETE	Concrete Slab	0.22
0.1	☒	BH15_0.4-0.5	✳	0.4		FILL	Gravel FILL. Roadbase, medium dense, dry. Contains minor sand and minor low plasticity clay.	0.50
							Refusal at 0.5 m bgs with hand auger on concrete (possible second slab); switch to solid auger.	
							Refusal at 0.5 m bgs with solid auger; abandon borehole.	
							Total Depth: 0.50 m	

AECOM Australia Pty Ltd
Level 21, 420 George Street
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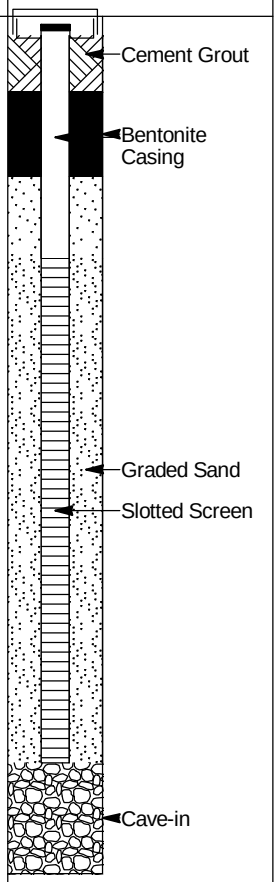
MONITORING WELL LOG BH16 / MW16

PROJECT NUMBER	60438840	**DATE**	21 & 22 August 2015
PROJECT NAME	Burrows Industrial Estate	**BLANK**	0.0 to 1.441 m bgs
LOCATION	1-3 Burrows Road, Alexandria NSW	**SCREEN**	1.441 to 4.441 m bgs
DRILLING METHOD	Hand Auger / Push-tube / Solid Auger	**GRAVEL PACK**	0.95 to 4.441 m bgs
SAMPLING METHOD	Hand Auger / Push-tube	**SANITARY SEAL/BENTONITE**	0.45 to 0.95 m bgs
SURFACE ELEVATION	4.230 m AHD	**STABILISED WATER LEVEL**	3.171 m BTOC
WELL HEAD/TOC	4.15 m AHD	**GROUND WATER ELEVATION**	0.979 m AHD
LOGGED BY	L. Gibb & K. Pigram	**NORTHING**	6245470.9
COMMENTS		**EASTING**	331688.598

PID (ppm)	SAMPLE NUMBER	DEPTH (m BGS)	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
		0.2	CONCRETE	Concrete Slab	0.17
		0.4	FILL	Sandy Gravel FILL. Yellow and dark grey, coarse grained sand. Contains sandstone cobbles, brick fragments and ceramic tile fragments.	
0.0	BH16_0.5-0.6	0.6			
0.0	BH16_0.7-0.8	0.8		Becoming black and orange from 0.7 m bgs. Contains slag gravels, ash, brick fragments, subrounded sandstone gravels and glass fragments.	
0.0	BH16_1.0-1.1	1.0			
		1.2	FILL	Dark brown with red iron staining from 1.0 m bgs. Contains slag and ironstone gravels.	1.20
		1.4		Switch to push-tube on Geoprobe from 1.2 m bgs. Completed 22 August 2015.	
		1.6			
		1.8			
0.9	BH16_2.0-2.1	2.0		Gravelly Sand FILL. Dark brown, dense, slightly moist to moist. Contains minor medium stiff, low plasticity clay, ironstone, roadbase and slag gravels, glass and metal (nails, pins and sheet metal) fragments.	
		2.2			
		2.4			
		2.6			
		2.8			
4.3	BH16_3.0-3.1	3.0		Becoming dark grey/brown and moist to saturated from 3.0 m bgs.	
		3.2			
		3.4			
		3.6			
		3.8			
2.1	BH16_4.0-4.1	4.0	FILL	Clayey Gravelly Sand FILL. Dark grey/brown to black. Contains medium stiff, low to medium plasticity (20%). Slight hydrogen sulphide odour and possible hydrocarbon odour.	4.00
		4.2			
		4.4	SW	SAND. Grey/brown, medium dense, saturated, well sorted.	4.50
		4.6			
		4.8			
3.1	BH16_5.0-5.1	5.0		Borehole terminated at 5.1 m bgs; target depth reached Total Depth: 5.10 m	5.10

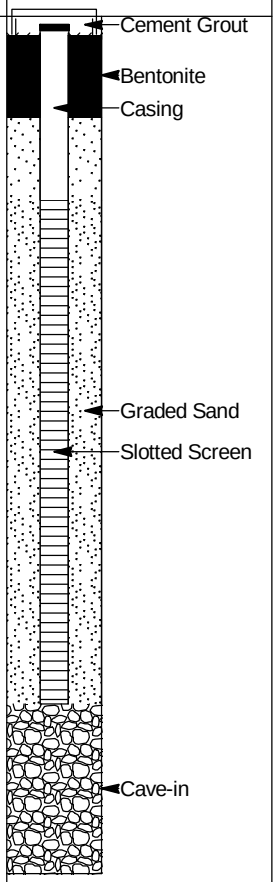


AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000

MONITORING WELL LOG BH17 / MW17

PROJECT NUMBER	60438840	**DATE**	21 & 22 August 2015
PROJECT NAME	Burrows Industrial Estate	**BLANK**	0.0 to 1.091 m bgs
LOCATION	1-3 Burrows Road, Alexandria NSW	**SCREEN**	1.091 to 4.091 m bgs
DRILLING METHOD	Hand Auger / Push-tube / Solid Auger	**GRAVEL PACK**	0.6 to 4.091 m bgs
SAMPLING METHOD	Hand Auger / Push-tube	**SANITARY SEAL/BENTONITE**	0.1 to 0.6 m bgs
SURFACE ELEVATION	4.130 m AHD	**STABILISED WATER LEVEL**	3.061 m BTOC
WELL HEAD/TOC	4.04 m AHD	**GROUND WATER ELEVATION**	0.979 m AHD
LOGGED BY	L. Gibb & K. Pigram	**NORTHING**	6245465.954
COMMENTS		**EASTING**	331700.452

PID (ppm)	SAMPLE NUMBER	DEPTH (m BGS)	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
		0.2	CONCRETE	Concrete Slab	0.19
0.0	BH17_0.2-0.3	0.4	FILL	Silty Sand FILL. Light yellow with black mottling. Contains sandstone and slag gravels, minor ash gravel content.	0.40
		0.6	FILL		
0.2	BH17_0.7-0.8	0.8		Gravelly Sand FILL. Yellow/orange, medium to coarse grained. Contains subangular sandstone gravels (5 mm).	
0.1	BH17_1.0-1.1	1.0			
		1.2	FILL	Becoming red/brown with black mottling from 0.7 m bgs. Contains sandstone gravels, minor slag gravels and rusted metal fragments.	1.10 1.20
		1.4	FILL		
		1.6		Becoming red and grey mottled and coarse grained from 1.0 m bgs. Increase in grey slag and ash gravel content. Contains weathered brick fragments	
15.2	BH17_2.0-2.1	2.0			
		2.2		Silty Sand FILL. Brown mottled with black staining, dense.	
		2.4		Switch to push-tube on Geoprobe from 1.2 m bgs. Completed 22 August 2015.	
		2.6			2.70
		2.8		Sandy Gravel FILL. Dark grey/brown, medium dense to dense, slightly moist to moist. Contains slag, sandstone, ironstone and concrete gravels, minor silt and metal fragments. Slight hydrocarbon odour.	
		3.0			
		3.2		No push-tube recovery from 2.7 to 5.1 m bgs, possible voids or obstructions to push-tube.	
		3.4			
		3.6		Monitoring well installed according to rationale at BH16 / MW16.	
		3.8			
		4.0		Water level measured in borehole with tape measure; encountered at 3.2 m bgs	
		4.2			
		4.4			
		4.6			
		4.8			
		5.0		Borehole terminated at 5.1 m bgs. Total Depth: 5.10 m	5.10



AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000

BOREHOLE_ LOG BH18

PROJECT NUMBER 60438840
PROJECT NAME Burrows Industrial Estate
LOCATION 1-3 Burrows Road, Alexandria NSW
DRILLING METHOD Hand Auger / Push-tube / Solid Auger
SAMPLING METHOD Hand Auger / Push-tube
SURFACE ELEVATION 3.420 m AHD

DATE 29 Aug 15

LOGGED BY K. Pigram
COMMENTS

NORTHING 6245485.266
EASTING 331741.891

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
				0.2		CONCRETE	Concrete Slab	0.21
0.0		BH18_0.25-0.35		0.4		FILL	Gravelly Silty Sand FILL. Dark brown, loose to medium dense, dry to slightly moist. Contains silt (40%), sand (50%) and concrete and ironstone gravels (20%, <10 mm diameter).	
0.0		BH18_0.7-0.8	✳	0.6 0.8			Contains brick/concrete fragments (approx 10 cm diameter) and half bricks, pieces of sheet metal from 0.5 m bgs	
0.1		BH18_1.0-1.1		1.0		FILL	Becoming red/brown from 0.7 m bgs.	0.90
				1.2			Silty Sand FILL. Dark brown/black, loose, dry to slightly moist. Contains minor brick fragments and gravels.	
				1.4		FILL	Switch to push-tube at 1.2 m bgs	1.40
				1.6 1.8			Sandy Gravel FILL. Red/brown, yellow, black, medium dense, slightly moist. Contains ironstone and sandstone gravels (60%).	
0.2		BH18_2.0-2.1	✳	2.0 2.2 2.4 2.6 2.8				
		BH18_3.0-3.1		3.0			Becoming dark grey/brown and saturated from 3.0 m bgs.	
				3.2		SW	SAND. Grey/brown, fine to medium grained, medium dense, saturated.	3.20
		BH18_3.8-3.9		3.4 3.6 3.8				
							Borehole terminated at 3.9 m bgs; target depth reached Total Depth: 3.90 m	3.90

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000

MONITORING WELL LOG BH19 / MW19

PROJECT NUMBER	60438840	**DATE**	21 & 22 August 2015
PROJECT NAME	Burrows Industrial Estate	**BLANK**	0.0 to 0.92 m bgs
LOCATION	1-3 Burrows Road, Alexandria NSW	**SCREEN**	0.92 to 3.92 m bgs
DRILLING METHOD	Hand Auger / Push-tube / Solid Auger	**GRAVEL PACK**	0.5 to 3.92 m bgs
SAMPLING METHOD	Hand Auger / Push-tube	**SANITARY SEAL/BENTONITE**	0.1 to 0.5 m bgs
SURFACE ELEVATION	3.510 m AHD	**STABILISED WATER LEVEL**	2.464 m BTOC
WELL HEAD/TOC	3.44 m AHD	**GROUND WATER ELEVATION**	0.976 m AHD
LOGGED BY	L. Gibb & K. Pigram	**NORTHING**	6245525.412
COMMENTS		**EASTING**	331743.935

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
						ASPHALT	Bitumen Hardstand	0.11	Cement Grout
0.2		BH19_0.11-0.15		0.2		FILL	Silty Gravel FILL. Light grey, moist. Contains roadbase (blue metal) gravels.	0.30	Bentonite
0.4		BH19_0.25-0.30		0.4		FILL	Becoming black from 0.25 m bgs. Contains brick and glass fragments and slag gravels.	0.60	Casing
0.1		BH19_0.6-0.7		0.6		FILL	Hand Auger refusal at 0.3 m bgs, switch to Solid Auger on Geoprobe. Completed on 22 August 2015	1.00	
1.2		BH19_1.0-1.1		1.0		FILL	Gravel FILL. Roadbase gravels with metal fragments.	1.50	
0.6		BH19_1.4-1.5		1.4		FILL	Gravelly Sand FILL. Dark brown, fine to medium grained, loose, dry. Contains minor silt, brick and roadbase gravels (20%) and sand (70%).		Slotted Screen
1.9		BH19_2.0-2.2	✳	2.0			Becoming light grey/brown from 0.7 m bgs.		Graded Sand
				2.4			Hand auger refusal at 0.85 m bgs, possible concrete floater, switch to solid auger.		
				2.6			Sandy Clay FILL. Brown, loose, dry. Contains concrete and sandstone gravels (10%) and minor orange ironstone gravels.	2.90	
0.5		BH19_3.0-3.1		3.0		FILL	Switch to push-tube from 1.1 m bgs.	3.20	
				3.2		SW	Gravelly Sand FILL. Orange/brown, medium to coarse grained, loose to medium dense, slightly moist to moist. Contains ironstone and slag gravels (50%) and sand (50%).		
1.2		BH19_3.8-3.9		3.8			Water level measured in borehole with tape measure - encountered at 2.5 m bgs	3.90	
							Sand FILL. Possible reworked natural. Dark grey brown/black, saturated. Slight hydrogen sulphide odour.		
							SAND. Light grey/brown, medium dense, saturated. Contains organic matter.		
							Borehole terminated at 3.9 m bgs; target depth reached. Total Depth: 3.90 m		

60438840_BORELOGS_20150826.GPJ 28/9/15

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000

BOREHOLE_ LOG BH20

PROJECT NUMBER 60438840
PROJECT NAME Burrows Industrial Estate
LOCATION 1-3 Burrows Road, Alexandria NSW
DRILLING METHOD Hand Auger / Push-tube / Solid Auger
SAMPLING METHOD Hand Auger / Push-tube
SURFACE ELEVATION 3.240 m AHD

DATE 29 Aug 15

LOGGED BY K. Pigram
COMMENTS

NORTHING 6245507.731
EASTING 331767.618

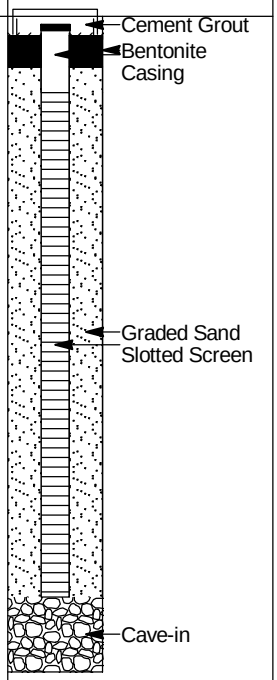
PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
				0.2		CONCRETE	Concrete Slab	0.20
				0.4		FILL	Gravel FILL. Roasbase, dark grey/brown, dense, dry to slightly moist. Contains minor medium stiff, low plasticity clay.	0.40
0.2		BH20_0.5-0.6	✳	0.6		FILL	Gravelly Sand FILL. Brown, loose, slightly moist. Contains medium grained sand and subangular roadbase gravels (20%, <10 mm diameter).	
				0.8			Becoming dark grey/brown and slightly moist from 0.8 m bgs. Contains concrete and terracotta gravels (<1 mm diameter).	
0.4		BH20_1.0-1.1	✳	1.0		FILL	Gravels - sandstone and slag (<10 mm diameter), content increasing to 30% from 0.9 m bgs.	1.00
				1.2			Hand auger refusal at 0.95 m bgs; switch to push-tube.	
				1.4			Sandy Gravel FILL. Red/brown, black, brown, dense, slightly moist. Contains slag and sandstone gravels.	
				1.6				
				1.8				
0.4		BH20_2.0-2.1	✳	2.0 ▽			Becoming dark grey/brown and saturated from 2.0 m bgs. Contains slag gravels (80%)	
				2.2				
				2.4				
				2.6				
				2.8				
				3.0				
				3.2				
				3.4		SW	SAND. Grey/brown, loose to medium dense, saturated. Contains organic matter and trace medium stiff low plasticity clay.	3.40
0.3		BH20_3.5-3.6		3.6				
				3.8				3.90
							Borehole terminated at 3.9 m bgs; target depth reached Total Depth: 3.90 m	

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000

MONITORING WELL LOG BH21 / MW21

PROJECT NUMBER	60438840	**DATE**	21 & 22 August 2015
PROJECT NAME	Burrows Industrial Estate	**BLANK**	0.0 to 0.895 m bgs
LOCATION	1-3 Burrows Road, Alexandria NSW	**SCREEN**	0.895 to 3.895 m bgs
DRILLING METHOD	Hand Auger / Push-tube / Solid Auger	**GRAVEL PACK**	0.5 to 3.895 m bgs
SAMPLING METHOD	Hand Auger / Push-tube	**SANITARY SEAL/BENTONITE**	0.1 to 0.5 m bgs
SURFACE ELEVATION	3.120 m AHD	**STABILISED WATER LEVEL**	2.024 m BTOC
WELL HEAD/TOC	3.04 m AHD	**GROUND WATER ELEVATION**	1.016 m AHD
LOGGED BY	L. Gibb & K. Pigram	**NORTHING**	6245494.973
COMMENTS		**EASTING**	331791.781

PID (ppm)	SAMPLE NUMBER	DEPTH (m BGS)	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
		0.2	CONCRETE	Concrete Slab	0.18
0.2	BH21_0.20-0.25		FILL	Silty Gravel FILL. Moist. Contains roadbase and blue metal gravels.	
0.1	BH21_0.25-0.35	0.4		Becoming yellow from 0.25 m bgs. Contains coarse grained sand and small blue metal gravels (<2 mm).	
0.1	BH21_0.7-0.8	0.6			
		0.8	FILL	Becoming light brown from 0.5 m bgs.	0.80
0.3	BH21_1.0-1.1	1.0		Black staining and strong chemical odour noted from 0.7 m bgs. Contains sandstone gravels, glass fragments and potential bonded ACM fragment.	
		1.2	FILL		1.20
		1.4		Sandy Gravel FILL. Yellow with black mottling. Contains sandstone, concrete and brick gravels.	
		1.6			
		1.8		Black staining and chemical odour noted from 1.0 m bgs.	
		2.0			
		2.2		Switch to push-tube on Geoprobe for continuation at 1.2 m bgs - completed on 22 August 2015.	
		2.4			
		2.6			
0.2	BH21_2.7-2.8	2.8	FILL	No recovery in push-tube from 1.2 to 2.7 m bgs; metal fragment in base of push-tube blocking recovery, assumed FILL.	2.70
2.1	BH21_3.0-3.1	3.0	SW		3.00
		3.2		Sandy Gravel FILL. Brown, loose to medium dense, saturated. Contains minor soft, low plasticity clay (10%), metal fragments and slag gravels (50%), medium grained sand (40%).	
		3.4			
		3.6			
		3.8			
1.3	BH21_3.8-3.9			SAND. Grey/brown, loose to medium dense, saturated. Minor soft, low plasticity clay (10%). Clay content increasing with depth.	3.90
				Borehole terminated at 3.9 m bgs; target depth reached Total Depth: 3.90 m	



AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000

BOREHOLE_ LOG BH22

PROJECT NUMBER 60438840
PROJECT NAME Burrows Industrial Estate
LOCATION 1-3 Burrows Road, Alexandria NSW
DRILLING METHOD Hand Auger / Push-tube / Solid Auger
SAMPLING METHOD Hand Auger / Push-tube
SURFACE ELEVATION 3.370 m AHD

DATE 21 Aug 15

LOGGED BY K. Pigram
COMMENTS

NORTHING 6245435.465
EASTING 331672.77

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
				0.2		CONCRETE	Concrete Slab	0.26
0.1		BH22_0.3-0.4 BH22_0.45	✳ ✳	0.4		FILL	Gravelly Sand FILL. Red/brown and grey/brown, loose to medium dense, dry. Contains ironstone and roadbase gravels.	
				0.6		FILL	Possible ACM fragment collected as bag sample	0.60
0.1		BH22_0.8-0.9	✳	0.8		FILL	Hand auger refusal at 0.6 m bgs; switch to solid auger.	0.80
				1.0			Gravelly Sand FILL. Red/brown and dark grey/brown medium dense, dry. Contains ironstone and roadbase gravels.	
0.1		BH22_1.3-1.4		1.2		FILL		1.30
				1.4			Clayey Sand FILL. Dark brown, medium dense, dry to slightly moist. Contains organic matter (possible peat) and slag (<10 mm) pieces.	
0.1		BH22_1.7-1.8		1.6		FILL	Band of ironstone gravel from 1.1 to 1.3 m bgs	1.70
				1.8			Clay FILL. Light grey, medium plasticity, slightly moist.	
				2.0			Gravelly Sand FILL. Dark brown. Contains sandstone gravels.	
0.1		BH22_2.2-2.3	✳	2.2		FILL	Pocket of low to medium plasticity, saturated clay encountered at 2.1 m bgs.	2.20
				2.4 ▽			Gravel FILL. Slag with minor sand. Grey/brown, saturated.	
				2.6			Water level measured within borehole with tape measure at 2.4 m bgs.	
				2.8			Sandstone boulder, dark brown, dense, slight to moderately weathered, saturated encountered at 2.7 m bgs, minimal push-tube recovery.	
				3.0				
				3.2				
				3.4				
				3.6				
				3.8				3.90
0.1		BH22_3.9-4.0		4.0		FILL	Gravel FILL. Slag with minor sand. Dark grey/brown, saturated.	
				4.2				
				4.4				4.50
26.7		BH22_4.5-4.7	✳	4.6		CL	Sandy CLAY. Light grey with dark grey/brown mottling, saturated, low to medium plasticity. Contains sand (30-40%) and clay (60-70%). Moderate hydrogen sulphide odour noted.	
				4.8				
				5.0				5.10
							Borehole terminated at 5.1 m bgs; target depth reached Total Depth: 5.10 m	

D R A F T

Appendix G

Laboratory