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HICKORY CONSTRUCTION REDFERN PTY LTD & BRIDGE HOUSING LIMITED

Dewatering Management Plan, Groundwater Modelling & Take Assessment

600-660 Elizabeth Street, Redfern (Redfern Place)
NSW

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0	Original	21 June 2024	-
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1. INTRODUCTION

1.1 Background and Purpose

EI Australia (EI) was engaged by Hickory Construction Redfern Pty Ltd & Bridge Housing Limited ('the client') to prepare a Dewatering Management Plan, Groundwater Modelling & Take Assessment (DMP) for 600-660 Elizabeth Street, Redfern (Redfern Place) in New South Wales (henceforth referred to as 'the site').

This report accompanies a detailed State Significant Development Application (SSDA) that seeks approval for a mixed-use development at 600-660 Elizabeth Street, Redfern (Redfern Place), as shown in **Figure A1** of **Appendix A**. The development proposes four buildings comprising community facilities, commercial/office, affordable/social/specialist disability housing apartments and new public links and landscaping.

The project site comprises Lot 1 in DP 1249145. It has an area of approximately 10,850 m^2. Part of the site currently accommodates the existing Police Citizens Youth Club (PCYC) (to be demolished and replaced). The remaining portion of the site is vacant with remnant vegetation. The present site layout is illustrated in **Figure A2, Appendix A**.

The SSDA seeks approval for redevelopment of the site, including:

- Demolition of existing buildings;
- Tree removal;
- Bulk earthworks including excavation;
- Construction of a community facility building known as Building S1;
- Construction of two residential flat buildings (known as Buildings S2 and S3) up to 14 and 10 storeys respectively, for social and affordable housing;
- Construction of a five-storey mixed use building (known as Building S4) comprising commercial uses on the ground level and social and specialist disability housing above;
- Construction of one basement level below Buildings S2, S3 and part of S4 with vehicle access from Kettle Street; and
- Site-wide landscaping and public domain works including north-south and east-west pedestrian through-site link.

For a detailed project description, please refer to the Environmental Impact Statement prepared by Ethos Urban.

This purpose of this report is twofold, as follows:

1 To address the Secretary's Environmental Assessment Requirements (SEARs), which are listed in **Table 1-1**, in support of the SSDA; and

2 To provide a dewatering management plan, which describes baseline groundwater conditions, quantifies construction groundwater take volumes and provides strategies for mitigating potential adverse impacts on neighbouring properties and infrastructure, local groundwater users and the environment.

Table 1-1 Secretary's Environmental Assessment Requirements

SEARS Requirement	Relevant Section of Report
13.0 Ground and Water Conditions 1. *Assess potential impacts on soil resources and related infrastructure and riparian lands on and near the site, including soil erosion, salinity and acid sulfate soils.* 2. *Provide a Surface and Groundwater Impact Assessment that assesses potential impacts on:* a. *surface water resources (quality and quantity) including related infrastructure, hydrology, dependent ecosystems, drainage lines, downstream assets and watercourses.* b. *groundwater resources in accordance with the Groundwater Guidelines.*	Groundwater resources / use – **Section 2.4** Downstream surface water receptors – **Section 2.5** Groundwater dependent ecosystems – **Section 2.6** Soil salinity – **Section 2.7** Acid sulfate soils (See SEARS 17.0) – **Section 2.8** Soil erosion – **Section 2.9** Construction dewatering groundwater take in ML/year – **Section 4.2** Potential impact to any surrounding properties via drawdown induced ground settlement – **Section 4.6** Discharge water quality for temporary disposal to municipal storm water system during construction dewatering phase – **Section 5.2** Consideration of the Aquifer Interference Policy / Groundwater Dependent Ecosystems – **Section 7.1**

1.2 Report Objectives

As the proposed basement will intercept the shallow groundwater system, temporary site groundwater dewatering is required to enable basement construction. In view of this, the objectives of this report are to:

- Describe the conceptual hydrogeological model for the site and summarise baseline groundwater conditions, including pre-dewatering groundwater depth and groundwater quality;
- Describe the dewatering methodology, groundwater treatment requirements, monitoring and reporting procedures to be employed during temporary dewatering activities for basement construction;
- Provide effective management and contingency procedures for ensuring that the discharge of extracted groundwater does not pose unacceptable risks to the receiving environment, in compliance with the *Protection of the Environment Operations Act 1997*; and
- Provide relevant information on anticipated groundwater impacts, with reference to the NSW Aquifer Interference policy to properly inform the regulatory approval process.

This DMP will also form the basis for Council approval for connection and discharge to the municipal stormwater system and water supply works (dewatering licence) approval by WaterNSW.

It is also noted that WaterNSW may not fully assess the dewatering license application until Council issues a stormwater discharge permit. To facilitate the approval process however, this DMP is issued concurrently to WaterNSW, Department of Climate Change, Energy, the Environment and Water (DCCEEW), Department of Planning, Housing and Infrastructure (DPHI) and Council.

1.3 Scope of Work

With reference to the above report objectives, the following works were undertaken:

- A desktop study including:
  - Review of the development proposal and proposed shoring/dewatering designs;
  - Review of geological, landscape and acid sulfate soils (ASS) risk maps for the area;
  - Review Council DA consent and WaterNSW requirements to determine the generic and site specific conditions placed on the development relevant to the dewatering process;
  - A search of government records for previously installed registered bores located within a 500m radius of the site to review local groundwater usage;
  - Review of previous environmental and geotechnical investigation reports to identify potential onsite and offsite sources of contamination that may impact on dewatering discharge water quality;
  - Review of existing reports and laboratory analytical data obtained during previous groundwater monitoring events (GME) to characterise baseline groundwater quality;
  - Review of Groundwater Take Assessment (GTA) findings based on computer modelling for the assessment of groundwater inflow volumes, predicted drawdown effects and drawdown-induced ground settlement in response to construction dewatering; and
- Data analysis and report preparation.

1.4 Regulatory Framework

The following regulatory framework and guidelines were considered during the preparation of this report:

Table 1-2 Regulatory Framework

NSW Legislation and Regulatory Instruments	Requirements
Contaminated Land Management Act 1997 (CLM Act)	Promotes the effective management of contaminated land in NSW by setting out the roles and responsibilities of the NSW EPA and its rules.
Environmental Planning and Assessment Act 1979 (EP&A Act)	The EP&A Act stipulates the regulations and gives rise to state environmental planning policy (SEPP) to assist regulators with the protection of human and environmental health.
Protection of the Environment Operations Act 1997 (POEO Act)	The objective of the *POEO Act* is to achieve the protection, restoration and enhancement of the quality of the environment.
Water Management Act 2000,Water Act 1912 (WM Act) and *Water Management (General) Regulation 2018 – Schedule 4*	Protects the health of rivers, streams and groundwater systems and gives rise to Water Sharing Plans and quality objectives for catchments within the state of NSW. Manages aquifer interference activities which involve: ▪ The penetration of an aquifer; ▪ The interference of water in an aquifer; ▪ The obstruction of water flow or taking of water from an aquifer when carrying out prescribed activities; and ▪ Part 1 of Schedule 4, Section 17A also specifies that a water access licence exemption is applicable when taking groundwater from the Botany Sands aquifer for excavation purposes.

NSW Legislation and Regulatory Instruments	Requirements
NSW Aquifer Interference Policy (2012)	Details the scope of aquifer interference activities, minimal impact assessment and provides specific guidance on the licensing and approval requirements for activities that interfere with aquifers.
City of Sydney Council Plans and Policies	Provides controls and guidelines for development in the area. ▪ *Sydney Local Environmental Plan 2012*.
Relevant Guidelines	▪ ANZG (2018) *Guidelines for Fresh and Marine Water Quality;* ▪ NHMRC (2022) *Australian Drinking Water Guidelines;* ▪ NHMRC (2008) *Guidelines for Managing Risks in Recreational Water;* ▪ NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination* (March 2007); and ▪ NSW EPA (2020) *Guidelines for Consultants Reporting on Contaminated Land.* ▪ NSW Gov. (2022) *Groundwater assessment toolbox for major projects in NSW - Overview document.* ▪ NSW Gov. (2022) *Guidelines for Groundwater Documentation for SSD/SSI Projects, Technical guideline.* ▪ NSW Gov. (2022) *Minimum Groundwater Modelling Requirements for SSD/SSI Projects, Technical guideline.* ▪ NSW Gov. (2022) *Minimum requirements for building site groundwater investigations and reporting*, DPIE, Information for developers and consultants

2. SITE DESCRIPTION

2.1 Property Identification, Location and Physical Setting

Site identification details and associated information are summarised in **Table 2-1**. Site locality and assessment area are provided in **Appendix A**.

Table 2-1 Site Identification, Location, Zoning and Soil Profile

Attribute	Description
Street Address	600-660 Elizabeth Street, Redfern NSWNSW
Location Description	Located 2.4km south of Sydney CBD, the site is rectangular in shape and occupied by a grassed reserve in its northern part and a brick building and recreational (sporting) facilities in the south.
Lot and DP	Lot 1 in DP 1249145
Site Area	Approximately 10,850 m^2. (Source: http://maps.six.nsw.gov.au).
Site Coordinates	Northern-eastern corner of site (GDA2020-MGA56): ▪ Easting: 334288.581; ▪ Northing: 6248056.932. (Source: http://maps.six.nsw.gov.au)
Local Government Authority	City of Sydney Council
Current Zoning	R1 – General residential (Sydney Local Environmental Plan (LEP) 2012)
Current Land Uses	Northern area – parkland; and Southern Area – Police and Community Youth Clubs (PCYC) building and sporting facilities.
Typical Soil Profile	The general site lithology encountered during the previous investigations was a layer of fill (down to 1.5 mBGL), overlying natural clay / sand soils.

2.2 Surrounding Land Use

The site is situated within a residential area, as described in **Table 2-2**.

Table 2-2 Local Land Uses

Direction Relative to Site	Land Use Description
North	Kettle Street, followed by residential brick buildings.
South	Phillip Street, followed by commercial premise and residential properties.
East	Walker Street, followed by residential properties.
West	Elizabeth Street, followed by Redfern oval.

2.3 Regional Setting

A description of the regional setting, including ground surface topography, hydrogeology, acid sulphate soil conditions and soil landscape, is summarised in **Table 2-3**.

Table 2-3 Regional Setting Information

Attribute	Description
Topography	The site elevation is approximately 30 mAHD and is predominantly flat (EMM, 2020).
Site Drainage	Site drainage is likely to be consistent with the general slope of the site. It includes pit and pipe drainage systems, leading to the municipal stormwater system in Elizabeth Street.
Regional Geology	Information on regional sub-surface conditions, referenced from the Department of Mineral Resources Geological Map Sydney 1:100,000 Geological Series Sheet 9130 (DMR 1983) indicates the site to be underlain by Cainozoic Holocene (Qhd) dune deposits, which typically comprise medium to fine-grained "marine" sand with podsols. The dune deposits are underlain by Hawkesbury Sandstone, which forms the regional bedrock and typically comprises medium to coarse-grained quartz sandstone, with very minor shale and laminate lenses.
Soil Landscape	The Soil Conservation Service of NSW Sydney 1:100,000 Soil Landscapes Series Sheet 9130 (2nd Edition) indicates the residual landscape is likely to be the Tuggerah (tg) aeolian landscape. This landscape type typically comprises gently undulating to rolling coastal dune fields. Soils are generally deep (> 2.0 m), with podzols on dunes and humus podzol intergrades on swales. These soils are noted to be highly permeable and are associated with permanently high water tables. They also present a very high erosion hazard.
Acid Sulfate Soil (ASS) Risk	In accordance with the Sydney Local Environmental Plan 2012 Acid Sulfate Soils Map – Sheet ASS_010, the site falls within a category classified as Class 5, which do not typically contain Acid Sulfate Soils (ASS). With reference to the *Botany Bay Acid Sulfate Soil Risk Map* (1:25,000 scale, Murphy, 1997), the subject land lies within the map class description of '*No Known Occurrence*.' In such cases, ASSs are not known or expected to occur and "land management activities are not likely to be affected by ASS materials". Based on previous investigation findings (as described in **Section 3.1**), the risk of ASS or potential ASS (PASS) presence at the site was considered to be high, and further ASS assessment was therefore considered warranted. An Acid Sulfate Soil Management Plan (ASSMP) was prepared for the subject site (EI, 2023). Any Acid Sulfate Soil (ASS) or Potential Acid Sulfate Soil (PASS) material encountered during the bulk excavation or dewatering works should be managed in accordance with the ASSMP.
Nearest Water Feature	Sheas Creek, located 1.08 km to the south-west of the site.
Groundwater depth and flow direction	Groundwater depths encountered during previous onsite investigations ranged between 1.2 and 2.1 mBGL. Groundwater flow direction was inferred (on the basis of surveyed well data) to be in a south-westerly direction, towards Sheas Creek.

2.4 Local Groundwater Use

An online search for groundwater bores registered with WaterNSW was conducted by EI on 24/4/2024 (Ref. https://realtimedata.waternsw.com.au/water.stm). The search identified one registered water supply bore (identified as GW071907) within a 500m radius of the site, as summarised in **Table 2-4**.

Table 2-4 Summary of Registered Groundwater Bores within 500m of the site

Bore No.	Drilled Date (Bore Depth in mBGL)	SWL (m BGL)	Authorised Bore Purpose	Distance in relation to Site
GW071907	15/05/2008 (180)	11.6	Recreation	180 m west

The bore location plan and archived bore record is attached in **Appendix F.**

The archived data showed that bore GW071907 was drilled in 2008 and located at Redfern Park approximately 170 m west of the site and draws groundwater from four water bearing zones within the sandstone bedrock at depths of between 24m and the total depth of 180m BGL. As the bore was authorised for “recreation” and is located within Redfern Park, it was assumed to be an irrigation water supply bore.

2.5 Potential Environmental Receptors

It is proposed that during construction, the extracted groundwater will be pumped through treatment (if required – refer to **Section 5.4**) and then discharged into the local municipal stormwater system. Stormwater is expected to drain into Sheas Creek (approximately 1.08 km south west of the site). Sheas Creek ultimately flows into Alexandra Canal, which in turn flows to Cooks River.

Sheas Creek, Alexandra Canal and Cooks River are deemed to be subject to tidal influences and are therefore deemed to be marine water ecosystems for discharge water quality considerations, as described in **Section 5.2**.

2.6 Groundwater Dependent Ecosystems

A search of the NSW Water Sharing Plan for the Greater Metropolitan Region groundwater Sources 2011 – Schedule 4 was conducted on 30 April 2024. Sheas Creek and Alexandra Canal were not listed as high priority groundwater dependent ecosystems on Table D in Schedule 4 of the plan.

This information was used in the minimal harm assessment considerations under the NSW Aquifer Interference Policy, as described in **Section 7.1** of this DMP.

2.7 Soil Salinity

Soil salinity was assessed and reported by EI in a report titled *Additional Geotechnical Investigation* (Ref. EI Report E25947.G04, dated 15 March 2023). Electrical conductivity (EC) was tested as an indicator of salinity and was reported for what was identified as a marine soil layer of the coastal Tuggerah Formation.

The samples tested comprised light and light medium clay and clay/peat soils at between 350 and 410 µS/cm (0.35 – 0.41 dS/m) at bore locations BH501 and BH502M, at depths between 1.5 and 3.45 mBGL. The EC values were subsequently corrected for soil texture using a factor of 8 (as recommended under DLWC 2002, Site Investigations for Urban Salinity), producing an ECe value range of 2.8 to 3.3 dS/m.

The ECe range indicated the material to be excavated from the clayey/peaty soil layer may be classed as *slightly saline* soils. While this finding does not necessarily trigger the need for salinity resistant construction materials to be incorporated into the design, it would be prudent to lime with gypsum for the management of potential acid sulfate soils (PASS), as this would by default also ameliorate the slightly saline soil conditions.

Underlying sands sampled at BH504M from a depth of 4.5 to 4.95 mBGL showed an EC of 0.018 dS/m, which converted to an ECe value of 0.3 dS/m after correction for soil texture, indicating non-saline soils at depth.

2.8 Acid Sulfate Soils

As documented in the previous EI report titled *Additional Site Investigation* (Ref. EI Report E25947.E03_Rev0, dated 31 March 2023), the top of the natural soils ranged generally between 0.9 and 1.8 m BGL across the assumed basement footprint area and comprised peaty, sandy clay soils, which are characterised as potential acid sulfate soils (PASS).

Basement excavation will therefore require appropriate management of excavated soils, in accordance with a site-specific Acid Sulfate Soil Management Plan (ASSMP). The treatment of acid sulfate soils (ASS) and associated potential groundwater impacts is addressed in the previously issued ASSMP (Ref. EI Report E25947.E14_Rev1), dated 27 February 2024.

2.9 Soil Erosion

As the site will be largely covered by building structures and landscaping with underlying, constructed basement car parking facilities, pedestrian walkways and drainage control, erosive dispersion is not a significant risk for the proposed development.

The following measures are also considered relevant for minimising erosion in proposed landscaped areas with vegetation:

- Areas of established vegetation should be maintained (where possible). In areas of deep soil, mulch should be used or salt tolerant plants should be planted to use the groundwater source and reduce infiltration.
- Landscaping plans apply to ‘waterwise’ gardening principles. However, procedures designed to encourage excessive infiltration through the soil should be avoided. In certain landscaping situations, infiltration measures to be incorporated may include a sub-surface drain and liner when rapid infiltration to groundwater is likely to occur.
- Irrigation systems should be properly installed to avoid leakage and smart sprinkler systems should be considered.
- Watering of open space should be kept to a minimum.
- Over-watering must be avoided.

3. GROUNDWATER CONDITIONS

3.1 Previous Investigations

The following previous reports were used to gain an understanding of hydrogeological conditions at the site:

- AECOM (2018) *Draft - Phase 1 Environmental Site Assessment and Geotechnical Desktop Study*, Ref. 60568920_Phase1 ESA & Geotech Desktop_20180522_B, 22 May 2018;
- Douglas Partners (2020) *Geotechnical Investigation*, Ref. 99510.00, 16 January 2020;
- EI (2023a) *Additional Geotechnical Investigation*, 600-660 Elizabeth Street, Redfern NSW, Reference E25947.G04_Rev0, 15 March 2023;
- EI (2023b) *Additional Site Investigation*, 600-660 Elizabeth Street, Redfern NSW, Reference E25947.E03_Rev0, 31 March 2023;
- EI (2023c) *Groundwater Monitoring Report No.1*, 600-660 Elizabeth Street, Redfern NSW, Reference E25947.G11.01_Rev0, 15 November 2023;
- EI (2024a) *Acid Sulfate Soils Management Plan*, 600-660 Elizabeth Street, Redfern NSW, Reference E25947.E14_Rev1, 27 February 2024;
- EI (2024b) *Groundwater Monitoring Report No.2*, 600-660 Elizabeth Street, Redfern NSW, Reference E25947.G11.02_Rev0, 3 April 2024;
- EI (2024c) *Groundwater Take Assessment*, 600-660 Elizabeth Street, Redfern NSW, Reference E25947.G12_Rev3, 21 June 2024 (the GTA report);
- EMM (2020) *Stage 2 Contamination Assessment*, Ref. J190730 RP1, 29 May 2020; and

For the purposes of this DMP, baseline groundwater quality data was sourced from EI (2023b), and a Groundwater Monitoring Event (GME) performed by EI on 1 March 2023.

The GTA report (EI, 2024c) was prepared by EI's geotechnical engineering group and is attached in **Appendix D**. It provides details of the proposed excavation and site-specific findings based on groundwater modelling, including predicted water level drawdowns, expected groundwater inflow and discharge volumes, and drawdown-induced ground settlement rates at varying distances from the basement excavation. This report incorporates relevant information and findings that were reported in more detail in the GTA.

3.2 Conceptual Hydrogeological Model

Based on a review of published hydrogeological data and previous geotechnical and environmental investigations undertaken at the site, the Conceptual Hydrogeological Model is outlined as follows:

- The sub-soil profile comprises:
  - Topsoil / Fill sands (fine to coarse grained, poorly compacted), dry to wet; over
  - Peat / Organic Clay (medium to high plasticity, generally very soft consistency), between 1.6 m and 3.8 m BGL, moist to wet; overlying
  - Alluvial Sand (fine to medium grained, very loose to medium density) with Peat layers, and Peaty Clay, between 3.8 m and 13.4 m BGL, moist to wet; overlying

  - Residual Soils (medium to high plasticity Clays, firm to stiff consistency, with trace gravels, grading into weathered Sandstone with depth), moist; overlying
  - Sandstone bedrock (medium to high strength, medium weathered) encountered at a minimum depth of 14.4 m BGL at bore BH303. It was noted that sandstone was encountered at 24.0 m BGL at Redfern Park, approximately 180 m west of the site, at the site of a deep irrigation bore, as described in **Section 2.4**.

- Water table conditions existed at the site with standing water levels (SWLs) ranging between 1.18 and 3.5 m BGL, as measured within monitoring wells located inside and close to the proposed basement excavation footprint area, as shown in **Table 3.1**;
- Hydraulic conductivities were detailed in the GTA report for the various strata, with specific values of 1.0 x 10^{-4} m/s for the alluvial sand (with peaty clay) aquifer and 1.0 x 10^{-7} m/s for the underlying residual clay layer; and
- Shallow groundwater flow direction in the vicinity of the site is anticipated to be southwest, towards Sheas Creek, which is approximately 1.08 km from the site and flows to the tidally influenced Alexandra Canal.

Monitoring well logs for EI bores are presented in **Appendix E**. More detailed reviews of baseline groundwater depth variations and groundwater quality across the site are addressed in **Sections 3.3** and **3.4**, respectively.

3.3 Groundwater Depth

EI conducted groundwater monitoring events (GME) on 1 March 2023, 2 March 2023 and 27 October 2023, as summarised in the GTA report (EI, 2024c) in **Appendix D**. A summary of groundwater level measurements for monitoring locations outside and within the proposed basement excavation footprint area are presented in **Table 3-1**. Monitoring well locations are illustrated in **Figure 2**, **Appendix A**.

Table 3-1 Summary of Groundwater Depth Measurements

Monitoring Well ID	Well location relative to basement	Measurement Date	SWL [1] (m BGL)	Groundwater RL [2] (m AHD)
BH301 (DP)	Outside	4-Dec-19	3.50	27.50
BH302 (DP)	Inside	2-Nov-19	1.20	28.90
BH303 (DP)	Inside	3-Dec-19	3.50	26.60
CPT304A (DP)	Outside	9-Dec-19	1.60	29.00
CPT305 (DP)	Outside	9-Dec-19	1.50	29.20
CPT306 (DP)	Inside	9-Dec-19	1.70	28.70
CPT307 (DP)	Outside	9-Dec-19	1.40	29.00
CPT308 (DP)	Inside	9-Dec-19	1.40	28.60
CPT309 (DP)	Outside	9-Dec-19	1.70	28.40
MW11 (EMM) MW11 (EI)	Inside	2-Dec-19 1-Mar-23	1.39 1.27	28.90 29.02
MW20 (EMM) MW20 (EI)	Outside	2-Dec-19 1-Mar-23	2.00 1.60	28.55 28.95
MW21 (EMM) MW21 (EI)	Inside	2-Dec-19 1-Mar-23	1.60 1.59	29.54 29.55

BH502M (EI)	Outside	1-Mar-23	1.54	28.56
		2-Mar-23	1.55	28.55
		27-Oct-23	1.51	28.59
BH504M (EI)	Outside	1-Mar-23	2.19	28.61
		2-Mar-23	2.21	28.59
		27-Oct-23	2.10	28.70
BH505M (EI)	Inside	1-Mar-23	1.18	29.32
		2-Mar-23	1.18	29.32
		27-Oct-23	1.24	29.26

Note 1 SWL (m BGL) – measured standing water level in metres below ground level.
Note 2 Groundwater RL – depth to groundwater in m AHD.

Over 12 months of continuous groundwater level monitoring was also conducted on the wells BH502M, BH504M and BH505M from 2 March 2023 to 7 March 2024. The data showed that inside the basement footprint area at BH505M, groundwater fluctuated between a maximum water level of RL 29.44 m and a minimum of RL 29.09 m AHD for this monitoring period. The monitoring data showed that groundwater depth was above the proposed BEL of RL 28.4 m AHD within the proposed basement footprint area.

3.4 Baseline Groundwater Quality Assessment

3.4.1 Monitoring Well Locations

Data from a total of six existing monitoring wells (specifically BH502M, BH504M, BH505M, MW11, MW20 and MW21) were used to characterise pre-dewatering groundwater quality. Well locations are illustrated in **Figure 2**.

3.4.2 Test Parameters

A GME was undertaken on 1 March 2023 involving groundwater sampling from the six monitoring wells listed above, followed by laboratory testing to characterise baseline groundwater quality. The following groundwater quality parameters were analysed at a NATA-registered environmental laboratory:

- Dissolved priority metals (aluminium, arsenic, cadmium, total chromium, copper, lead, mercury, nickel and zinc);
- Total Recoverable Hydrocarbons (TRHs);
- Oil & Grease;
- Benzene, Toluene, Ethylbenzene and Xylenes (BTEX);
- Polycyclic Aromatic Hydrocarbons including benzo(α)pyrene and naphthalene (PAHs);
- Total Cyanide;
- Total Phenols;
- pH;
- Hardness; and
- Turbidity.

It is understood that additional water quality parameters are required under DPIE (2022), which will be tested during an additional pre-dewatering monitoring event, as described in **Section 5.3**.

3.4.3 Field Observations and Water Quality Testing

The water quality parameters dissolved oxygen (DO), pH, electrical conductivity (EC), Temperature and Reduction/Oxidation potential (Redox), were measured in the field and recorded immediately prior to sampling, as summarised in **Table 3-2**. The groundwater samples were then evaluated on the basis of odour and visual signs of contamination, and descriptions were recorded. The following observations were noted:

- All groundwater samples were observed to be pale brown to brown in colour, with low to high turbidity;
- Hydrocarbon odours, sheens or visual evidence of contamination were generally not detected during well purging or groundwater sampling, except for a weak sulphur smell observed at well location MW21;
- Low EC ranging from 294 to 635 µS/cm was measured, which indicated fresh water in terms of water salinity;
- Sub-neutral to slightly acidic groundwater pH conditions (pH 4.87 – 5.13); and
- Oxidised water (Redox 103.9 to 121 mV) indicating shallow groundwater influenced by recharge from rainfall events.

Table 3-2 Groundwater Field Data (GME date: 1 March 2023)

Well ID	SWL (mBGL)	Groundwater RL (mAHD)	Temperature (°C)	EC (µS/cm)	Redox [1] (mV)	DO (mg/L)	pH (units)	Comments
MW11	1.27	29.03	19.86	294	103.9	0	5.13	Brown, low to medium turbidity, no odour, no sheen
MW20	1.42	29.02	22.18	344	111.9	0.48	5.01	Light brown, low to medium turbidity, no odour, no sheen
MW21	1.54	29.62	24.60	635	121	1.08	4.89	Dark brown, medium to high turbidity, no sheen with weak sulphur smell.
BH502M	1.69	28.49	23.20	337	113	0.34	4.99	Light brown, low to medium turbidity, no odour, no sheen
BH504M	2.17	28.58	19.96	319	117.9	0.25	4.87	Light brown, low to medium turbidity, no odour, no sheen
BH505M	1.25	28.99	20.32	314	115.1	0.03	4.92	Light brown, low to medium turbidity, no odour, no sheen

Notes:
[1] Field Redox (mV) readings adjusted to Standard Hydrogen Electrode by adding field electrode potential (205mV).

SWL – Standing Water Level below ground level (mBGL)
Groundwater RL – depth to groundwater relative to Australian Height Datum, based on extrapolated wellhead elevations from spot levels on Site Survey (see **Appendix C**)
EC – groundwater electrical conductivity measured onsite using portable EC meter in units of µS/cm (micro Siemens per centimetre).
Redox – Reduction Oxidation Potential, measured in units of mV (millivolt)
DO – Dissolved Oxygen in units of milligrams per litre (mg/L)

3.4.4 Laboratory Analytical Results

A summary of analytical results for baseline groundwater samples assessed against the adopted water quality discharge criteria, is presented in **Table B1** and **Table B2** (**Appendix B**). Laboratory documentation is attached in **Appendix G**.

Laboratory analytical results for groundwater samples collected during the March 2023 GME were assessed against the water discharge criteria detailed in **Section 5**. The criteria were based on the default guideline values (DGVs) for marine ecosystems as published in ANZG (2018) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, or appropriate alternative criteria (in the absence of ANZG criteria), as tabulated in **Section 5.2**.

Results showed compliant concentrations with the proposed discharge water quality criteria in most samples, with the following exceptions:

- Laboratory pH results ranged between 5.9 and 6.3, which was generally consistent with the field water quality results (**Table 3-2**) and showed more acidic groundwater than that required in accordance with the discharge criteria (i.e. required pH range 6.5 – 8.4) ;
- Turbidity at monitoring well MW21 (770 NTU) was above the adopted water quality criterion (10 NTU); and
- Aluminium (range 110 – 170 µg/L) was above the DGV (80 µg/L) at monitoring wells MW21 and BH502M.

3.4.5 Water Treatment Requirements

Construction Phase Dewatering

The baseline groundwater quality data indicates water treatment is required in relation to:

- pH to increase water pH to between 6.5 and 8.4;
- Aluminium to lower concentrations to below the corresponding discharge criteria; and
- Turbidity to ensure it is maintained below 10 NTU.
- Potential water treatment options include pumping the water through a sediment settlement tank, where the following could be implemented:
- pH correction via the addition of sodium hydroxide solution;
- Addition of flocculent/coagulant for settlement of suspended particles and suspended aluminium as a precipitate, which would lower turbidity and lower dissolved aluminium concentrations; and
- Adjustment of the flow rate to allow sufficient residence time for flocculation/coagulation and settlement to take place.

While the above provides basic guidance of treatment options, a water treatment specialist should be engaged to advise on appropriate water treatment technologies for site specific conditions. It would be appropriate to engage the water treatment specialist early to allow sufficient time for the design of the water treatment system, prior to the start of dewatering.

A further GME is recommended before commencement of construction dewatering to verify water quality parameters. In addition, testing of treated water quality is required prior to discharge to confirm that water treatment procedures are effectively achieving compliant discharge water quality. Further details on water quality monitoring and management are provided in **Sections 5.3** and **5.4**.

Operational Phase Dewatering

As the basement will be constructed as a tanked structure, there will be no operational dewatering.

4. DEWATERING METHODOLOGY

4.1 Excavation and Shoring

As stated in **Section 1.2**, the proposed development will include a single-level basement, with a BEL of RL 27.47 mAHD, and locally deeper excavations for footings, service trenches, crane pads and lift overrun pits

With reference to the GTA report, a sheet pile wall (about 380m in total perimeter length) is proposed to be installed along the entire basement perimeter. In order to evaluate the effects on groundwater take and associated hydraulic impacts, however, three different shoring embedment scenarios were modelled, as follows:

a) A perimeter sheet pile wall socketed 3m below the BEL (i.e. to RL 24.47 mAHD);

b) A perimeter sheet pile wall socketed 6m below the BEL (i.e. to RL 21.47 mAHD); and

c) A perimeter sheet pile wall socketed 0.5m into the residual clay, which is 10.87 m below the BEL (i.e. to RL 16.6 mAHD).

The assessment did not assess the overall stability and embedment depth of the shoring system. Once final designs are made available, the GTA and DMP reports should be reviewed and revised accordingly, if warranted.

4.2 Groundwater Take and Relevant Water Access Exemptions

4.2.1 Modelled Groundwater Take Volumes

As described in the GTA report (EI, 2024c), groundwater seepage analysis for flow through and beneath the shoring wall during construction was undertaken using the software package SEEP/W. SEEP/W is a finite element groundwater mathematical model used to estimate the seepage rate of water entering the excavation through and beneath the shoring wall, thereby providing an estimate of the total volume of groundwater to be extracted during basement construction.

In order to model the effects of the shoring system options outlined in **Section 4.1**, i.e. options (a), (b) and (c), it was assumed that:

- Substrata were horizontal laterally continuous, with permeability values as presented in Table 1 of the GTA report;
- The sheet pile wall is assumed to be impermeable;
- Temporary dewatering will be undertaken within the basement retaining system perimeter to 1.0 m below BEL, i.e. to approximate depth RL 26.47 m;
- An external design groundwater level of RL 29.5 m was assumed to be constant at 65 m away, outside of the shoring wall;
- A “No-Flow” boundary is defined along the symmetric line (the centre of the excavation), at 15 m from the perimeter shoring wall; and
- The shoring walls surrounding the basement excavation has a total length of about 380 m.

Based on the above assumptions, groundwater take is expected to be:

- 460.6 ML/year, based on an estimated inflow rate into the excavation of 3.32 m^3/day, for the sheet pile wall installed 3 m below the BEL;
- 387.7 ML/year, based on an estimated inflow rate into the excavation of 2.80 m^3/day, for the sheet pile wall installed 6 m below the BEL; and

- 2.3 ML/year, based on an estimated inflow rate into the excavation of 0.02 m^3/day, for the sheet pile wall installed 0.5 m into the residual clay stratum.

4.2.2 Water Access Licence Exemption

As the site is underlain by the Botany Sands aquifer, the extraction of groundwater for site dewatering purposes is covered by a water access licence (WAL) exemption. This is described in *Section 17A Taking groundwater for excavation* in *Part 1 – Access licence exemption* under Schedule 4 of the NSW *Water Management (General) Regulation 2018.* In accordance with this exemption a WAL is not required for the groundwater take for temporary construction dewatering.

4.3 Dewatering Level and Drawdown Monitoring

As described in the GTA report, temporary dewatering would be undertaken to achieve drawdown of the water table to 1.0 m below BEL, to an approximate depth of RL 26.47 m AHD, while the design groundwater level (ambient groundwater level) is at RL 29.5 m AHD. Dewatering therefore will aim to lower the water table by 3.03 m. Based on the SEEP/W groundwater modelling results the following drawdowns are predicted at a point immediately outside the shoring wall:

- For a 3 m socket design, the expected water level drawdown would be 2.2 m;
- For a 6 m socket design, the expected water level drawdown would be 1.6 m; and
- For a sheet pile wall installed 0.5 m into the residual Clay, the drawdown would be negligible.

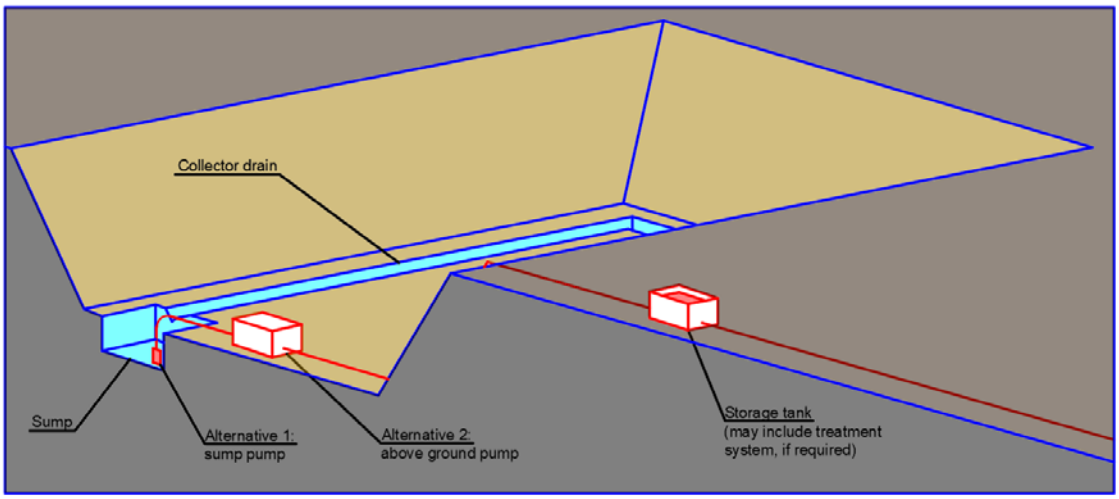
Drawdown-induced ground settlement is discussed further in **Section 4.6**.

Groundwater depth may be monitored during the construction dewatering period, either continuously using data loggers installed in selected monitoring wells, or periodically with the use of an electric water contact meter during each discharge monitoring event, as described in **Section 5.3**.

4.4 Dewatering Method

Dewatering of saturated sandy aquifers is typically achieved using a perimeter network of spear point wells that are manifolded via a pumping arrangement that directs extracted groundwater to a centralised water treatment system. Lower yielding aquifers may involve a sump and pump system to control water seepage entering the excavation during basement construction, as illustrated in the example layout in **Figure 4-1**.

Figure 4-1 Hypothetical layout of a Sump and Pump seepage collection system



4.4.1 Construction Phase

During construction, groundwater would initially be pumped into a sediment settlement vessel (basin, or equivalent) for water treatment prior to discharge from site. The preferred vessel type will require capacity to accommodate the rate of groundwater seepage (i.e. estimated to be up to 3.32 m^3/day, see **Section 4.2**).

Groundwater treatment will be undertaken either in the vessel, or via a water treatment system installed close to the vessel prior to discharge.

It is envisaged that the pumping system will operate on a full-time basis (as required) for the approved construction dewatering period, to control seepage during basement construction and provided that compliant water quality is maintained, as specified in **Section 5.2**. The preferred water disposal option is by discharge to the stormwater system, subject to consent authority approval.

4.4.2 Operational Phase

As the basement will be designed as a tanked structure for the life of the development, zero groundwater take is expected during the operational (post-construction) phase of the development.

4.5 Discharge Flow and Volume Monitoring

The volume of water discharged must be monitored by a calibrated flow meter (or equivalent alternative means) that is integrated as part of the dewatering system for the complete duration of the temporary construction dewatering period. The flow meter will therefore display cumulative volume discharged at any stage during dewatering, which will be documented as part of the dewatering monitoring records.

Flow monitoring data will be documented by a suitably trained site official under the supervision of the Site Manager. Tabulated records should be maintained on site and made available to the Environmental Consultant for inclusion in the routine monitoring event reports.

These records will be used to calculate the actual groundwater volume discharged from the site and will be included in the final Dewatering Completion Report (as described in **Section 5.3.3**) to be issued to Council and WaterNSW after the completion of construction dewatering activities.

In regards to the drainage and disposal of seepage waters entering the basement, the Client must provide details for the proposed disposal connection to the stormwater system, preferably in the form of a drawing, for consent authority review.

4.6 Potential Drawdown-Induced Impacts

A review of potential adverse effects of dewatering on neighbouring properties and groundwater dependent ecosystems was undertaken, as summarised in **Table 4-1.**

Table 4-1 Assessment of Potential Dewatering Effects

Attribute	Description
Proximity of Groundwater Dependent Ecosystems (GDEs)	No known groundwater dependent ecosystems are documented within 1km radius of the site [(1)].
Water supply losses by neighbouring groundwater users	As described in **Section 2.4** a review of registered bores within a 500 m radius of the site identified one deep irrigation supply bore approximately 170 m west of the site. The existing bore is significantly deeper and down hydraulic gradient in relation to the proposed basement. In addition, the existing bore is located beyond the assessed radius-of-influence of anticipated drawdown, which was modelled to be zero drawdown at 65 m distance from the shoring was, as documented in the GTA report (**Appendix D**). In view of these findings water supply losses at the existing bore are considered unlikely.

Attribute	Description
Potential subsidence of neighbouring structures	As documented in the GTA report, drawdown-induced ground settlement in the order of 18.5mm to 14.4mm for the 3m and 6m socket design respectively, were predicted using PLAXIS 2D modelling. Ground settlement levels between 10mm and 50mm are categorised as a 'slight' risk of damage risk due to dewatering (Cashman and Preene, 2001). As stated in the GTA report, "It would be prudent for potential risks to neighbouring structures to be assessed by a qualified and experienced structural engineer."
Mounding of water up gradient of structure	As per the GTA (**Appendix D**),based on the predicted settlements in the order of 18.5mm to 14.4mm for the 3m and 6m socket design respectively, buildings experiencing settlements greater than 10mm and less than 50mm are considered to be in a 'sight' risk category of damage risk due to dewatering as per Cashman and Preene (2001). The risk to neighbouring structures must be assessed by the structural engineer.

Note 1 Based on a search of Schedule 4 in NSW Water Sharing Plan for the Greater Metropolitan Region groundwater sources 2011.

It would also be prudent to undertake a dilapidation survey on any nearby structures. The dilapidation survey should be completed by a suitably qualified geotechnical engineer before the start of the construction works and following the completion of construction.

5. WATER QUALITY MANAGEMENT

5.1 Responsibility

The Principal Contractor or Site Manager, appointed by the client for the construction works, will be responsible for implementing the procedures for water quality management as described in this DMP.

5.2 Discharge Water Quality Guidelines

In accordance with statutory requirements for site dewatering operations, discharged waters must comply with the ANZG (2018) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, or relevant default criteria where the ANZG (2018) guidelines do not provide values. This requirement is in compliance with the *Protection of the Environment Operations Act 1997*.

The nearest, primary receiving water body is Sheas Creek, due to tidal influences and its urban-industrial setting is considered a slightly to moderately disturbed marine ecosystem (**Section 2.3**). Therefore, the ANZG (2018) *95% Marine Default Guideline Values* (*DGVs)* and 99% *DGVs* for bio-accumulative toxicants are adopted as the Discharge Water Criteria (DWC).

For water quality parameters that are not currently addressed by the ANZG marine DGVs, relevant alternative criteria have been adopted as the default DWC, as detailed in **Table 5-1**. The listed parameters and their respective criteria are applicable for the assessment of water quality to confirm suitability for discharge to the storm water system.

Table 5-1 Discharge Water Criteria

Analyte	Discharge Water Criteria (µg/L) [1]
Metals	
Aluminium	80 [3]
Arsenic ^{III}	94 [3]
Arsenic ^{V}	42 [3]
Cadmium	0.7 [1]
Chromium ^{III}	27
Chromium ^{VI}	4.4
Copper	13 [2]
Lead	4.4
Mercury (total)	0.1 [1]
Nickel	70
Zinc	80 [2]
Petroleum Hydrocarbons	
Oil and grease	*No visible sheens, surface films or oil and grease* [4]
Volatile TPH ($C_6 – C_9$)	*If TPH is detected analysis for BTEX and PAH is required*
Semi-volatile to heavy TPH ($C_{10} – C_{40}$)	
Monocyclic Aromatic Hydrocarbons (BTEX)	
Benzene	700

Analyte	Discharge Water Criteria (µg/L) [1]
Toluene	180
Ethylbenzene	80
o - xylene	350 [3]
p - xylene	250 [3]
m - xylene	75
Polycyclic Aromatic Hydrocarbons (PAH)	
Benzo(a)pyrene	0.1 [1]
Naphthalene	70
Other Organics	
Cyanide	4
Phenol	400
Physiochemical Parameters	
pH (pH units)	6.5 to 8.4 [5]
Turbidity (NTU)	10 [6]

Note 1 Discharge water criteria are the ANZG (2018) *95% Default Guideline Values (DGVs)* for the protection of slightly to moderately disturbed marine ecosystems, with the *99% DGVs* applied for the bio-accumulative parameters *benzo(a)pyrene*, *cadmium* and *mercury*, unless otherwise indicated.

Note 2 For the metals copper and zinc, which are commonly present as regional background components in groundwater at concentrations above the ANZG 2018 95% Marine DGVs, discharge water criteria are set at one order of magnitude higher than the ANZG 2018 DGV.

Note 3 The ANZG (2018) *90% Freshwater DGVs* for typical slightly - moderately disturbed freshwater ecosystems are applied for the indicated parameters, in the absence of *marine* water criteria.

Note 4 NHMRC (2008) No Detectable Oil & Grease - OG test must find no visible film or sheen at the water surface and No detectable hydrocarbon odours, based on aesthetic aspects, as described in NHMRC (2008) *Guidelines for managing risks in recreational water*, Section 10.2.2.

Note 5 In the absence of ANZG (2018) criteria for pH, alternative criteria from ANZECC / ARMCANZ (2000), Table 3.2.2 *Default trigger values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystems. Adopted pH range is between lower limit for Lowland River and upper limit for Marine settings*.

Note 6 In the absence of ANZG 2018 criteria in relation to Turbidity, the ANZECC & ARMCANZ 2000 Table 3.3.3 *upper default trigger value for estuarine and marine ecosystems* is applied.

As described in **Section 3.4**, water quality conditions outside of the DWC have been detected in relation to aluminium, turbidity and pH. Extracted groundwater should therefore be treated to achieve compliant levels prior to stormwater discharge, while monitoring of all parameters should continue regularly, as described in **Section 5.3**.

An additional round of groundwater quality assessment should be undertaken prior to commencement of construction dewatering to verify groundwater concentrations and water treatment requirements.

5.3 Additional Pre-dewatering Monitoring Event

An additional round of baseline groundwater quality assessment will be undertaken prior to commencement of construction dewatering to verify groundwater concentrations and water treatment requirements. Laboratory analysis of groundwater samples must include the analytical parameters listed in **Section 3.4.2**, the field test parameters indicated in **Section 3.4.3**, plus the following additional parameters:

- Alkalinity (bicarbonate, carbonate, hydroxide and total);

- Extended suite of dissolved metals: antimony (Sb), barium (Ba), beryllium (Be), boron (B), cobalt (Co), copper (Cu), iron (Fe), lithium (Li), manganese (Mn), molybdenum (Mo), selenium (Se), silver (Ag), strontium (Sr), uranium (U) and vanadium (V);
- Silica (dissolved SiO2);
- Ammonia, Nitrite, Nitrate, TKN and Total Nitrogen;
- Total Phosphorus;
- Major anions: Sulphate (SO_4), chloride, carbonates (CO_3), bromide (Br) and Fluoride (F);
- Major cations: Calcium (Ca), magnesium (Mg), sodium (Na) and potassium (K);
- Cation/anion balance (as a percentage);
- Total Organic Carbon (TOC);
- Sodium absorption ration (SAR);
- Microbiological organisms: Faecal coliforms, faecal streptococci Escherichia coli;
- Oil and Grease; and

  Perfluoroalkyl and polyfluoroalkyl substances (PFAS), if required by NSW EPA, EPA-accredited Site Auditor, or deemed relevant by appointed environmental consultant.

The Discharge Water Criteria Table 5-1 will require revision to address the additional parameters tested during the pre-dewatering monitoring event.

5.4 Discharge Water Quality Monitoring

5.4.1 Visual Monitoring

Visual inspections of the dewatering measures and equipment should occur regularly (daily where possible) by the Site Manager and/or Dewatering Contractor, to ensure:

- The effective operation of all dewatering and water treatment equipment, including:
  - Confirmation that no short-circuiting of water is occurring around baffles and filter media within sediment retention tanks;
  - Confirmation that appropriate quantities of chemical product are available for use by the dosing system (if applicable).
- No petrochemical sheens are visible on the water surface and no detectable hydrocarbon odours are being generated by the treated groundwater or sediment; and
- No green, blue or extremely clear effluent is observable, potentially indicating high levels of dissolved aluminium (if used in the treatment process).

The Site Manager must keep a record of all visual observations, as well as treatment system information and operational readings, such as filter media changeover events, flow rates, pressures, water meter readings (if used), to enable the calculation of the groundwater extraction/discharge volumes following the completion of the dewatering activities.

5.4.2 Sample Collection and Analysis

Dewatering Quality Assessment

On-going sample analysis must continue for the duration of the dewatering activities, to establish that the treatment system (if required) is functioning as intended, and to confirm the quality of discharge water is acceptable for release into receiving water bodies (Shears Creek).

Sample collection should be completed by a suitably qualified environmental scientist or equivalent, with the subsequent analyses performed by a reputable environmental laboratory using NATA-

registered analytical methods. The analytical program is to include the parameters of concern, as identified by the *Pre-Dewatering Groundwater Quality Assessment*. These are listed in **Table 5-1** in **Section 5.2**. Additional water quality parameters may be added to the priority test suite, should daily monitoring records indicate that this is warranted.

The following activities are to be implemented for the on-going monitoring program:

- **Trial-Run Period:** Prior to the discharge of any extracted groundwater, a trial run will be completed as follows:
  - Initial groundwater pumped from the site will be diverted into the excavation, to infiltrate site strata and re-enter the underlying groundwater aquifer, thus allowing a reduction in suspended sediments, which are expected in the initial pump-out waters;
  - Samples of the treated groundwater will be collected and laboratory analysed for the water quality parameters of concern; and
  - After confirmation that the water quality complies with criteria, the extracted groundwater will be directed to the municipal storm water system.

  Bi-weekly (twice per week) sampling frequency will occur during the trial-run period. As a minimum, two samples will be collected before and after the treatment of the extracted groundwater. The analytical results will be compared to each other, as well as to the DWC, to assess the performance of the water treatment system. The results of each sampling event will be recorded, to establish chemical concentration trends (if any).

  Bi-weekly sampling should be maintained for a minimum of two weeks following commencement of the dewatering treatment, unless stated otherwise by the Environmental Consultant. Sampling for trial run purposes will cease once the target parameters in treated water stabilise (i.e. consecutive tests are within ± 10% of the observed results) and contaminant concentrations are within the adopted discharge criteria for three consecutive sampling events. The trial-run period may be extended if stabilisation is not observed, or if the treated water does not satisfy the adopted criteria (**Table 5-1**).

  The Dewatering Contractor / Water Treatment Specialist should seek advice from the Environmental Consultant regarding termination of the trial-run period. During the trial-run period, all collected groundwater seepage (including treated water) should be retained on-site and stored in appropriate bulk containers. No collected groundwater should be discharged until it is proven to meet the adopted criteria.

- **Discharge Monitoring Period (Weekly to Monthly):** After the Trial-Run Period, and subject to consent authority approval, treated water may be discharged to the receiving water bodies. A weekly sampling frequency will be adopted for four weeks. The sampling program will involve the collection of one system discharge (i.e. treated) sample (as a minimum), to be analysed for the target parameters of concern, to confirm the system is functioning as intended.

  After four weeks, the weekly sampling frequency may be extended to fortnightly monitoring for a month and then monthly for the remaining duration of construction phase dewatering, provided the analytical monitoring results indicate the treated water quality consistently meets the adopted criteria. If this is not achieved, contingency measures must be implemented, with monitoring frequency going back to weekly until consistency in the discharged water results is re-established.

Dewatering contingency measures are detailed in **Section 6.5** (**Table 6-1**) and should be implemented where groundwater results exceed or are predicted to exceed the adopted criteria for any one monitoring event. Any changes to the sampling frequency are to be determined by the appointed environmental consultant.

All laboratory analytical results for the water samples must be retained, to be made available upon request by Council and/or WaterNSW. The Site Manager and Dewatering Contractor / Water Treatment Specialist should seek advice from the Environmental Consultant prior to deviating from

any of the above monitoring requirements, to ensure the quality of discharged groundwater is not compromised.

5.4.3 Reporting of Water Quality Results

Dewatering management procedures and monitoring results will be reviewed by the appointed Environmental Consultant to ensure that the treatment procedures are effective, and that the discharge waters are in compliance with the adopted DWC (**Table 5-1**). Discharge water quality reporting will be required as follows:

- Interim Monitoring Reports will be prepared upon receipt of laboratory data for each round of water quality monitoring for the discharged waters. The interim reports will detail the sampling method and procedure, groundwater level gauging results and will provide a comparison of historic and current results obtained from the site, against the adopted criteria, with corrective actions and recommendations based on the results, where required.
- Following completion of construction dewatering activities, a Construction Dewatering Completion Report (CDCR) will be prepared by the appointed Environmental Consultant, and must include copies of all analytical results and interim monitoring reports issued during the dewatering period. A clear statement will be made regarding the overall quality of groundwater discharged in comparison to the acceptable water quality standards. The CDCR will be submitted to Council and WaterNSW.

5.4.4 Reporting of Other Information

The Site Manager must keep records of cumulative discharge volume and treatment methods and treatment chemicals applied to the water discharge, if any. In addition, any periods of dewatering stoppage should also be recorded.

5.5 Water Treatment

5.5.1 Treatment System Design

Treatment is required based on the pre-dewatering quality assessment (**Section 3.3**). EI suggests that the selection and design of the preferred treatment system is made by the Dewatering Contractor / Water Treatment Specialist, in collaboration with the appointed Environmental Consultant. Alternative and/or additional water treatment options will be implemented, if necessary, depending on which parameters are found to exceed the DWC.

Assessment of groundwater should be undertaken just before commencement of construction to verify groundwater parameters and if proposed treatment is still required or should be modified.

The design and installation of the preferred system should consider:

- A treatment tank with minimum capacity capable of containing the expected inflow for the basement (as described in **Section 4.4.1**);
- Water filtration to reduce fine particulates;
- If applicable, automated in-line chemical dosing systems for the addition of buffering solutions and/or coagulants for the adjustment of pH and other parameters, which may be required as described in **Section 6.5** *Dewatering Contingencies*;
- Groundwater treatment to reduce concentrations of contaminants exceeding the DWC (if required) to below the values presented in **Table 5-1**;
- Spare retention tank(s) (if required) to provide additional residence time and sedimentation, in the case that non-compliant water quality is identified during routine monitoring, triggering temporary redirection and storage while adjustments to the water treatment system are being implemented; and
- A means of monitoring flow rate to enable the accurate determination of total discharge volume.

The above information is provided for guidance purposes. A water treatment specialist should be engaged to advise on appropriate technologies for the treatment of all parameters.

The water treatment system should be installed, tested and operational prior to the commencement of dewatering, to ensure that only treated water meeting the adopted quality criteria is discharged to the receiving water bodies.

5.5.2 Treatment System Maintenance

The groundwater treatment system(s) must be regularly maintained by the Dewatering Contractor / Water Treatment Specialist. Maintenance must include (if applicable):

- Regular cleaning and or replacement of the geo-fabric/particle filters within the retention tanks;
- Media changeover (e.g. granular activated carbon – GAC) whenever breakthrough conditions are met; and
- Regular removal of sediment from the retention tanks by an appropriately-licensed waste contractor.

6. SITE MANAGEMENT CONTROLS

6.1 Deviations from this Plan

The Site Manager should seek advice from the Environmental Consultant whenever deviation from the agreed monitoring program is considered. To ensure the monitoring data set and the early warning objectives of the DMP are not compromised, variations will only be considered where technical justification exists, and any deviations that may be accepted will be documented within the corresponding reports, and must include all justifications for the variation accepted.

Should deviations from the DWC be considered technically justifiable, approval from Council and/or WaterNSW must be obtained before alternative discharge criteria are applied.

6.2 Contact Details for Key Personnel

Once the relevant personnel have been appointed, their names and contact information must be clearly displayed on-site, within the site office. An example format is as follows:

Site Manager	Name: To be confirmed Company: To be confirmed	Mobile phone: To be confirmed Email: To be confirmed
Dewatering Contractor	Name: To be confirmed Company: To be confirmed	Mobile phone: To be confirmed Email: To be confirmed
Water Treatment Specialist	Name: To be confirmed Company: To be confirmed	Mobile phone: To be confirmed Email: To be confirmed
Environmental Consultant (Water Quality Expert)	Name: To be confirmed Company: To be confirmed	Mobile phone: To be confirmed Email: To be confirmed

6.3 Summary of Specific Activities

The appointed contractors and/or Site Manager will be responsible for ensuring that the following activities (requirements) are undertaken during the dewatering program:

- Maintain erosion and sediment control measures in a functioning condition, until all earthwork activities are completed.
- Perform daily visual inspection of the recharge well(s), stormwater diversions and sediment / erosion control devices, ensuring they are operating effectively and at full capacity.
- Implement appropriate remedial measures where any controls or devices are not functioning effectively or are inappropriate.
- Collate records and comments on the condition of existing erosion and run-off controls (drains, silt fences, catch drains etc.), dewatering procedures and test results, and any site instructions issued to sub-contractors to undertake remedial works.
- Maintain rainfall data (to be filed on site).
- Confirm water quality parameters meet the relevant discharge limits, by disclosing supporting documentation upon request.
- Reporting any incidents of poor drainage or uncontrolled discharge.
- Recording all daily inspection reports, environmental incidents and controlled discharge volumes, which may be reviewed during any environmental audit performed on the site.

6.4 Vibration, Noise, and Odour Management

The following vibration, noise and odour risks must not occur during dewatering:

- Excessive vibration and noise levels associated with site plant / dewatering equipment; and
- Odours released from collected groundwater, which may pose a risk to human health and/or the aesthetic condition of the environment.

It is the responsibility of the Site Manager to ensure appropriate management of vibration, noise and odour during dewatering operations. Appropriate management methodologies include:

- Undertaking dilapidation surveys of neighbouring buildings, in accordance with potential for impacts in final design type.
- All sub-contractors to work only within defined hours set by the DA conditions.
- All reasonable steps shall be taken to muffle and acoustically baffle all plant and equipment. Noise and vibration levels generated by site works must be within the limits set by the DA conditions, the site specific environmental management plan and the Protection of Environmental Operation Act 1997.
- Give consideration to noise emitted by plant/equipment prior to its selection/mobilisation to site.
- Schedule the use of noisy equipment at the least-sensitive time of day.
- Situate noisy equipment at the greatest distance from the noise-sensitive area, or orient the equipment so that noise emissions are directed away from sensitive areas, to achieve the maximum attenuation of noise.
- Where there are several noisy pieces of equipment, schedule operations to minimise cumulative impacts.
- Keep equipment well maintained.
- Ensure engine shrouds (acoustic linings) are installed (where feasible).

6.5 Dewatering Contingencies

Contingent actions for scenarios that may arise during dewatering are detailed in **Table 6-1**.

Table 6-1 Mitigation Measures for Potential Dewatering Issues

Anticipated Problems	Corrective Actions
Water Quality Criteria Non-compliance	
Performance Criteria Exceedance Laboratory analytical report for any monitoring event reveals that the quality of treated discharge water does not satisfy the adopted discharge performance criteria detailed in **Table 5-1**, **Section 5.2**.	**VERY IMPORTANT:** Immediate action must be taken to halt the release of water into Council's stormwater system, where water quality is found not to meet the discharge criteria detailed in **Section 5.2**, **Table 5-1**. Discharge to the stormwater system must be suspended to enable the following procedure to be implemented: 1) Discharge water will be redirected to the spare retention basin; 2) A water sample will then be collected and sent to the laboratory for confirmation analysis for the non-compliant parameter(s) on an express (24hr) results turn-around basis; 3) Should the analytical result for the confirmation sample show that the previously non-compliant parameter(s) is/are now meet the adopted discharge water quality performance criteria, the treated water outlet may be redirected to the stormwater system; however

Anticipated Problems	Corrective Actions
	4) Should the analytical result for the confirmation sample show that the discharge water quality is confirmed not to comply with the discharge criteria, then the Water Treatment Specialist will be directed to modify the water treatment system accordingly to achieve compliant discharge water quality and a new treated water sample will be collected; 5) After laboratory confirmation that the revised treated water quality complies with the discharge criteria, the extracted groundwater may be re-directed to the stormwater discharge point; and 6) The frequency of treated discharge water quality monitoring will be returned to weekly, until such time that three consecutive compliant laboratory reports for weekly monitoring events are achieved, at which stage fortnightly monitoring may be reinstated. **Note:** It may be necessary to have collected waters removed by a licensed wastewater contractor, should retained quantities exceed the onsite capacity for temporary storage.
Visible & Olfactory Impacts Visual and / or olfactory anomalies (e.g. change in water colour, turbidity, odour, presence of oil / grease) are observed in extracted groundwater.	Similar to the above procedure (Steps 1 to 6) treated water will be redirected to the spare retention basin, while the treatment system is adjusted to manage the observed water quality issues. It may be necessary to have collected waters removed by a licensed wastewater contractor, should retained quantities exceed the onsite capacity for temporary storage. The contractor is to seek advice from a suitably experienced environmental consultant in regard to the additional assessment and treatment that may be required for any observed changes to water appearance or detectable odours.
Repeated Criteria Exceedances After three performance criteria non-compliances for discharge water quality	Retain extracted water onsite in spare retention basin(s) and appropriate bulk containers, until it can be removed by a licensed waste contractor. Determine an alternative discharge method, if necessary, updating the DMP accordingly.
Groundwater Take Non-compliance	
Excessive Extraction Daily discharge rate is greater than expected and it is apparent that the projected total groundwater extraction volume will be exceeded	Advise the appointed environmental consultant who will review the reasons for the increased dewatering rate. If reduction in dewatering rate cannot be implemented, WaterNSW should be contacted to review options, which may include a combination of: • Temporary retention of tail water onsite in appropriate bulk containers for subsequent removal by a licensed waste contractor; • Aquifer re-injection after obtaining regulatory approval; and/or • Fast-tracking of construction works to complete dewatering sooner than the scheduled timeframe.
Drawdown Settlement Risk	
Excessive Water Level Drawdown Monitoring indicates that groundwater levels are approaching the maximum predicted drawdown (MPD) level at one or more monitoring bore location	As described in **Section 4.3** dewatering will aim to achieve a lowering of the water table by 2.1 m below the design groundwater level of 29.5 m AHD. This is referred to as the Maximum Predicted Drawdown (MPD) level. **Alert Level:** While groundwater drawdown is less than (<) 80% of the MPD, dewatering and excavation works may be continued. Monitoring should continue to be carried out at the nominated intervals and water level monitoring reports forwarded to the relevant stakeholders.

Anticipated Problems	Corrective Actions
	Alarm Level: Should groundwater drawdown in any monitoring well reach a level that is greater than (>) 80% but <100% of the MPD, the contractor undertaking the monitoring must notify the Site Manager, geotechnical engineer, structural engineer and all relevant stakeholders. The frequency of ongoing water level monitoring events is to be increased to 24 hour intervals (i.e. daily monitoring) until notified otherwise by the appointed geotechnical engineer. **Action Level:** Should groundwater drawdown in any monitoring well reach a level that is >100% of the MPD, appropriate action to modify excavation strategy and implement dewatering controls must be actioned as follows: • Gradually reduce dewatering rate over a 5-day period and daily monitoring should be continued until drawdown is reduced to *Alert Level*. • Should daily monitoring show a continuing rise in groundwater level, dewatering pumping rate may be increased, but drawdown must not be permitted to exceed 100% of the MPD. • The client, geotechnical engineer, structural engineer and relevant stakeholders (including the property owner(s) that may be affected), should be notified and revisions to the dewatering approach for localised deeper works (e.g. localised pumping around lift pits and other deeper construction features), must be defined and implemented to manage potential settlement risk in order to safeguard neighbouring buildings/structures.
System Performance Issues	
Dewatering system failures	Ensure that spare equipment parts (where practical) are on hand. Ensure that the failed equipment can be serviced by site personnel or an appointed contractor who can rapidly report to site when needed.
Power outages	Ensure that a backup generator is readily available. In this event, an assessment across the site and surrounding sites should also be completed in order to identify whether any other lights and electrical equipment are working so to identify if the issue is site specific or if it is across a whole area. In addition to having the back-up generator running, the contractor should also seek advice from an electrician in regard to the additional assessment and repairs that may be required.
Unexpected contaminants found during monitoring	Contact the appointed water quality expert and assess against relevant criteria. If contaminant is found to exceed the adopted criteria, follow the corrective actions corresponding to “Performance Criteria Exceedance” above. Expand Discharge Water Criteria accordingly.
Chemical/ fuel spill and leaks from machinery	Stop earthworks, notify site project manager. Use accessible soil or appropriate absorbent material to absorb the spill (if practicable). Stockpile the impacted material in a secure location, on builder’s plastic to avoid cross contamination. Inspect groundwater and note any visual and/or changes. The contractor should also seek advice from environmental consultant in regard to the additional assessment and treatment that may be required.
Excessive rainfall	Ensure sediment and surface water controls are in place and functioning as intended, as per the designs provided in the site specific Soil and Water Management Plan. Any non-conformance is

Anticipated Problems	Corrective Actions
	to be documented and rectified. The capacity of the dewatering system to dispose larger volumes of water should be evaluated and if required, a temporary system should be utilised following correspondence with Council / WaterNSW and the environmental consultant.
Excessive Noise	Identify the source and isolate if possible. Modify the actions of the source or erect temporary noise barriers if required.
Impacts on the stability of adjacent structures	Contractor to seek advice from qualified professional (such as a geotechnical engineer and/or structural consultant) in regards to the additional assessment and monitoring that may be required.
Complaint Management	Notify Client, Project Managers and Environmental Consultant (if required) following complaint. Report complaint as per management procedures. Implement control measures to address reason of complaint (if possible). Notify complainant of results of remedial actions.
Excessive Organic Odours / Vapours	In accordance with Council's Contaminated Land Policy, no nuisance odours are to be detected at any site boundary during the dewatering stage. Should odour emissions be detected at a site boundary, the following measures will be implemented: 1) Stop work, to allow odour to subside. 2) Monitor ambient air across the site and boundaries with a portable photo-ionisation detector (PID). 3) Implement control measures, including respirators for on-site workers, use of odour suppressants and wetting down of excavated material. 4) Notify the occupants of adjoining premises regarding odour issues. Notification should be in writing, providing the contact details of the responsible site personnel. 5) Record logs for volatile emissions and odours.

7. MINIMAL HARM ASSESSMENT

7.1 Consideration of NSW Aquifer Interference Policy

As described above the design groundwater level is RL 29.5 m AHD, which is 3.03 m above the proposed temporary dewatering level of RL 26.47 m AHD, subject to water table variations in response to high rainfall events. The predicted water level drawdown immediately outside the shoring wall will be around 2.2 m under a 3 m socket below the BEL (Option A), 1.6 m under a 6 m socket (Option B) below the BEL. With reference to the groundwater modelling results (**Appendix D**), zero drawdown in groundwater levels is expected at 65 m distance from the shoring wall under either socket depth scenario. Option A is predicted to produce inflows of 460.6 ML/year, while Option B is estimated to produce 387.7 ML/year (**Section 4.2**).

Under shoring Option C the sheet pile perimeter wall will be socketed at least 0.5 m into the residual clay layer (to RL 16.6m AHD). Inflow to the excavation during basement construction under this scenario will be minimised, with a modelled groundwater take volume of 2.3 ML over a 12 month construction period.

7.1.1 Groundwater source category

Under the NSW 2012 Aquifer Interference Policy (the 'NSW AIP') *highly productive groundwater* is defined as a groundwater source that:

a) has total dissolved solids of less than 1,500 mg/L; and

b) contains water supply works that can yield water at a rate greater than 5 L/sec.

The construction phase dewatering will extract groundwater primarily from the Botany Aquifer, which has been characterised low salinity groundwater in the vicinity of the site in the order of less than 412 mg/L TDS (based on the EC values presented in **Section 3.4.2**). Since sheet piling will occur prior to the commencement of excavation, seepage will be restricted to inflow rates of between 14.61 and 12.29 L/sec for Options A and B, or 0.07 L/sec for shoring Option C.

The groundwater source scenario would therefore be deemed to fit the description of a "highly productive source" under shoring Options A or B, and a *"less productive groundwater source"* under Option C, as defined under Section 3.2.1 *Aquifer impact assessment* of the NSW AIP.

7.1.2 Minimal impact considerations

In accordance with the NSW AIP Table 1 *"If the predicted impacts are less than the Level 1 minimal impact considerations, then these impacts will be considered as acceptable."*

Shoring Options A and B

Options Table 1 *Minimal Impact Considerations for Aquifer Interference Activities* of the NSW AIP shows that for *Highly Productive Groundwater Sources* in alluvial water sources that are under water table conditions, the following minimal impact considerations are applicable:

Drawdown (Level 1 considerations)

- *Less than or equal to 10% cumulative variation in the water table, 40m from any:*
  - *a) high priority groundwater dependent ecosystem; or*
  - *b) high priority culturally significant site;*
  - *listed in the schedule of the relevant water sharing plan.*

or

- *A maximum of a 2m decline cumulatively at any water supply work.*

Water Quality (Level 1 considerations)

a) *Any change in groundwater quality should not lower the beneficial use category of the groundwater source beyond 40m from the activity; and.*

b) *No increase of more than 1% per activity in long-term average salinity in a highly connected surface water source at the nearest point to the activity.*

c) *No mining activity to be below the natural ground surface within 200m laterally from the top of high bank or 100m vertically beneath (or the three dimensional extent of the alluvial material - whichever is the lesser distance) of a highly connected surface water source that is defined as a "reliable water supply".*

d) *Not more than 10% cumulatively of the three dimensional extent of the alluvial material in this water source to be excavated by mining activities beyond 200m laterally from the top of high bank and 100m vertically beneath a highly connected surface water source that is defined as a "reliable water supply".*

Notwithstanding the fact that the soil materials are not alluvial in origin, site dewatering under the Option A and B shoring scenarios would comply with the Level 1 minimal impact considerations for the following reasons:

- The cumulative variation in water table will not exceed 2.2 m which is less than 10% of the baseline groundwater level at RL 29.5 m AHD; and
- The site is not less than 40m from any documented high priority groundwater dependent ecosystem or a high priority culturally significant site.

Shoring Option C

Options Table 1 *Minimal Impact Considerations for Aquifer Interference Activities* of the NSW AIP shows that for *Less Productive Groundwater Sources* in alluvial water sources that are under water table conditions, the following minimal impact considerations are applicable:

Drawdown (Level 1 considerations)

- *Less than or equal to 10% cumulative variation in the water table, 40m from any:*

  c) *high priority groundwater dependent ecosystem; or*

  d) *high priority culturally significant site;*

  listed in the schedule of the relevant water sharing plan.

or

- *A maximum of a 2m decline cumulatively at any water supply work unless make good provisions should apply.*

Water Quality (Level 1 considerations)

a) *Any change in groundwater quality should not lower the beneficial use category of the groundwater source beyond 40m from the activity; and.*

b) *No increase of more than 1% per activity in long-term average salinity in a highly connected surface water source at the nearest point to the activity.*

c) *No mining activity to be below the natural ground surface within 200m laterally from the top of high bank or 100m vertically beneath (or the three dimensional extent of the alluvial material - whichever is the lesser distance) of a highly connected surface water source that is defined as a "reliable water supply".*

Notwithstanding the fact that the soil materials are not alluvial in origin, site dewatering under the Option C shoring scenario would comply with the Level 1 minimal impact considerations for the following reasons:

- The cumulative variation in water table will not exceed 2.2 m which is less than 10% of the baseline groundwater level at RL 29.5 m AHD; and
- The site is not less than 40m from any documented high priority groundwater dependent ecosystem or a high priority culturally significant site.

In addition, the proposed construction dewatering is unlikely to adversely impact existing groundwater users because:

- Treated water quality and cumulative water take will be monitored and documented for the duration of site dewatering, to ensure there is no deterioration in groundwater quality; and
- The deep irrigation bore at Redfern Park, approximately 170 m west of the site, draws groundwater from the fractured bedrock at depths of between 24.5 and 154 m BGL, which is significantly deeper that the predicted drawdown from temporary dewatering.

7.2 Assessment Inputs

The inputs for assessing the potential impacts of dewatering on the groundwater system are summarised in **Table 7-1**.

Table 7-1 Assessment inputs summary

Assessment Items	Comments
1. Estimated water take volume	As detailed in Section 4.2, the water take volume during basement construction is calculated as: ▪ 460.6 ML/year**,** with the sheet pile wall installed 3 m below the BEL; ▪ 387.7 ML/year**,** with the sheet pile wall installed 6 m below the BEL; ▪ 2.3 ML/year**,** with the sheet pile wall installed 0.5 m into residual clay.
2. Suitability of volume estimation	Use of SEEP/W (a finite element computer model), implemented by experienced Geotechnical Engineer and reviewed by Senior Geotechnical Engineer (see also the GTA report in **Appendix D**).
3. Ground elevation across the site	The site elevation is approximately 30m AHD and is predominantly flat, as described in **Section 2.3**.
4. Geotechnical ground characterisation	Refer to GTA report in **Appendix D** and bore logs in **Appendix E**.
5. Water level measurements	Groundwater levels were measured at depths from 28.39m AHD (minimum) to 29.44m AHD (maximum), as detailed in **Appendix D**. Periodic groundwater level gauging will be conducted at monitoring well(s) during basement construction, as described in **Section 4.3**.
6. Required water level draw down and potential impacts	The GTA stated that, based on the predicted settlements in the order of 18.5mm to 14.4mm for the 3m and 6m socket design respectively, buildings experiencing settlements greater than 10mm and less than 50mm are considered to be in a 'sight' risk category of damage risk due to dewatering. The assessment of the settlement and its effects on neighbouring properties must be completed by the structural engineer. The sheet pile wall installed into the residual clay option effectively reduces the dewatering volumes and groundwater drawdown due to the dewatering. However the feasibility of installing sheet piles to this depth must be considered, as described in **Section 4.6**.
7. Works proposed for dewatering	A sump-and-pump system during construction phase only, as described in **Section 4.4**.
8. The base level of the aquifer	Refer to **Section 3.3**

Assessment Items	Comments
9. Excavation footprint dimensions	Refer to basement plan included in **Appendix C**.
10. Hydraulic conductivity of lithological units	Detailed in Table 1 of the GTA report in **Appendix D**.
11. Anticipated duration of dewatering	Anticipated construction dewatering period is 365 days (**Section 4.2** and **Appendix D**). Site dewatering will not be taking place during the operational phase of project (**Section 4**).
12. Depth of piling embedment beneath bulk excavation	Refer to **Section 4.1** – embedment depth will be provided with final design and detailed shoring plans.

8. DEWATERING MANAGEMENT SUMMARY

The requirements of this Dewatering Management Plan are summarised in **Table 8-1.**

Table 8-1 Dewatering Management Summary

Item	Requirement / Procedure
Objective of DMP	Ensure that the proposed dewatering operations do not impact on the quality of the receiving surface waters (i.e. at the point of groundwater discharge). Where necessary, groundwater will be treated to achieve an acceptable water quality prior to discharge: ▪ *See **Section 3** for groundwater conditions.* ▪ *See **Section 5.2** for groundwater quality discharge requirements.* ▪ *See **Section 5.4** for groundwater treatment options.* Provide comment on groundwater level changes that occur during dewatering: ▪ *See **Section 4** for summary of groundwater take assessment and dewatering drawdown impacts.* *Refer to **Appendix D** for groundwater take assessment model.*
Person Responsible for Implementation of DMP	The Site Manager will be responsible for ensuring the implementation of appropriate treatment of extracted groundwater, as outlined in this document.
Operation Policy	To ensure that all extracted groundwater from dewatering is effectively treated prior to discharge to the receiving water bodies.
Pre-Dewatering Groundwater Assessment	As set out in **Section 3.4**, representative samples were collected prior to dewatering and tested for the identified potential contaminants, to provide baseline groundwater quality data and review the proposed discharge water quality requirements.
Discharge Water Quality Criteria	All groundwater to be discharged into the local stormwater network is to meet (at the very least) the criteria outlined in **Table 5-1**, **Section 5.2**.
Implementation Strategy	All extracted groundwater will be monitored and treated (where necessary). On-going testing to be performed to confirm water quality meets the adopted Discharge Water Criteria prior to release into the storm water network, which discharges to receiving water bodies. Additional treatment / wastewater disposal to be undertaken if the DWC values are not met.
Monitoring Requirements	As specified in **Section 5.3**: ▪ 1. Initial Assessment = Prior to dewatering ▪ 2. Trial-run period = Twice per week* ▪ 3. Discharge monitoring period = Weekly for a month to fortnightly for a month then monthly* ** provided the analytical results indicate treated water quality meets the adopted criteria, or risks are considered to be significantly low. Should analytical results exceed the adopted discharge criteria, contingencies listed in **Section 6.5** must be followed.*
Auditing	The appointed environmental consultant (water quality expert) will undertake weekly audits during the Trial-Run Period (if required), and monthly audits during the Monitoring Period, to ensure that all

Item	Requirement / Procedure
	discharges to receiving water bodies comply with the criteria specified in **Section 5.2**.
Reporting	The contractor responsible for dewatering will keep records of all monitoring and laboratory test results, as well as quantities of treatment agents applied during the dewatering process. All records should be made available for inspection onsite during the construction phase.
Corrective Actions	As specified in the contingency measures, outlined in **Section 6.5**.

9. STATEMENT OF LIMITATIONS

This plan has been prepared for the exclusive use of Hickory Construction Redfern Pty Ltd & Bridge Housing Limited, whom is the only intended beneficiary of EI's work. The scope of work completed for the purpose of this plan is limited to that agreed with Hickory Construction Redfern Pty Ltd & Bridge Housing Limited.

No other party should rely on the document without the prior written consent of EI, and EI undertakes no duty, or accepts any responsibility or liability, to any third party who purports to rely upon this document without EI's approval.

EI has used a degree of care and skill ordinarily exercised in drafting similar plans by reputable members of the environmental industry in Australia, as at the date of this document. No other warranty, expressed or implied, is made or intended. Each section must be read in conjunction with the whole of this plan, including its appendices.

EI's professional opinions are reasonable and based on its judgment, experience, training and results from analytical data. EI may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified by EI.

EI's professional opinions contained in this document are subject to modification if additional information is obtained through further investigation or observations. In some cases, further testing and analysis may be required, which may result in a further report with different conclusions.

Should you have any queries regarding this plan, please do not hesitate to contact EI.

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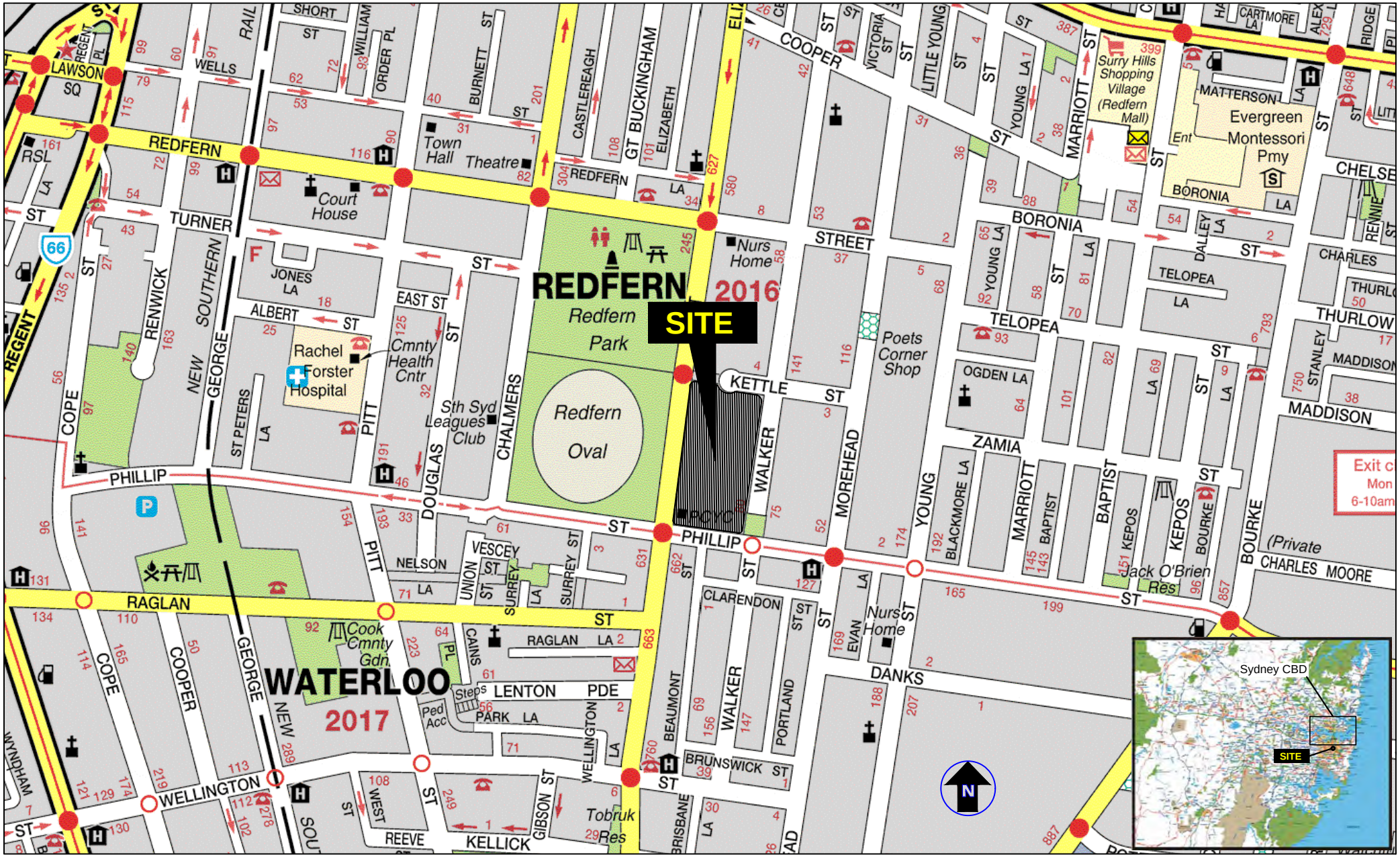
ABBREVIATIONS

AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment Conservation Council
ANZG	Australian and New Zealand Governments
ASS	Acid Sulfate Soils
BEL	Bulk Excavation Level
BGL/BEGL	Below Ground Level existing at the time of the referenced bore or excavation
BEGL	Below Existing Ground Level
BTEX	Benzene, Toluene, Ethyl benzene, Xylene
DMP	Dewatering Management Plan
DP	Deposited Plan
DWC	Discharge Water Criteria
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DPHI	Department of Planning, Housing and Infrastructure
DPE	Department of Planning and Environment
EC	Electrical Conductivity
GME	Groundwater Monitoring Event
GTA	Groundwater Take Assessment
km	Kilometres
LEP	Local Environmental Plan
LOR	Limit of Reporting (limit of reporting for respective analytical method)
m	metres
ML	Megalitres
mg/L	Milligrams per litre
MPD	Maximum predicted drawdown (the target groundwater level during site dewatering)
µg/L	Micrograms per litre
µS/cm	Microsiemens per Centimetre
NA	Not Applicable
NATA	National Association of Testing Authorities
NC	No Criterion
NTU	Nepholemetric Turbidity Units
OCP	Organochlorine Pesticides
OPP	Organophosphate Pesticides
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
pH	Potential Hydrogen (a measure of the acidity or basicity of an aqueous solution)
PID	Photo-Ionisation Detector
PQL	Practical Quantitation Limit (quantitative limit for respective analytical method)
RL	Reduced Level
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
TPH	Total Petroleum Hydrocarbons (superseded term equivalent to TRH)
TRH	Total Recoverable Hydrocarbons (non-specific analysis of organic compounds)

Appendix A – Figures

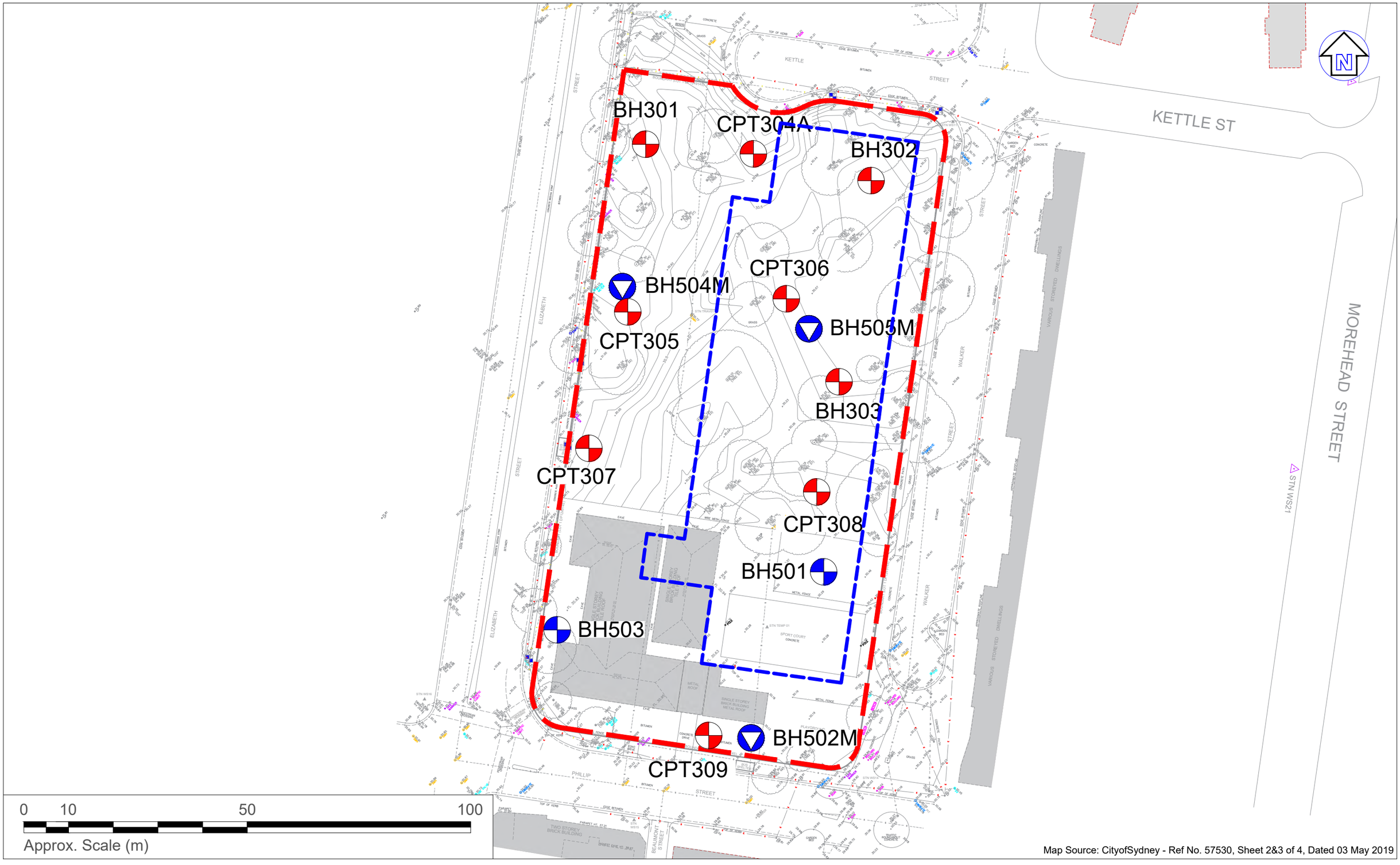


eiaustralia Contamination | Remediation | Geotechnical Suite 6.01, 55 Miller Street, PYRMONT 2009 Ph (02) 9516 0722 Fax (02) 9518 5088	Drawn:	A.N.	**Hickory Construction Pty Ltd** Dewatering Management Plan 600-660 Elizabeth Street, Redfern NSW Site Locality Plan
	Approved:	NK	
	Date:	10-3-23	
	Scale:	Not To Scale	

Figure:

A1

Project: E25947.E16



Map Source: CityofSydney - Ref No. 57530, Sheet 2&3 of 4, Dated 03 May 2019

LEGEND (All Locations are Approximate)

- Site boundary
- Basement boundary
- Borehole location (EI Australia, 2023)
- Monitoring well location (EI Australia, 2023)
- Previous borehole/CPT location (DP, 2020)

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Hickory Construction Redfern Pty Ltd
Dewatering Management Plan
600-660 Elizabeth Street, Redfern NSW

Monitoring Well Location Plan

Figure: A2

Project: E25947.E16

Appendix B – Tables

Table B1 – Laboratory and Field Physicochemical Results

E25947.E16 - Redfern

Sample Identification	Date Sampled	Physicochemical Properties					
		Electrical Conductivity[1] (µS/cm)	Redox[1] (mV)	DO[1] (mg/L)	pH	Turbidity NTU	Hardness (mg/$CaCO_3$/L)
Previous Investigation - (EMM,2019)							
MW11_191218	18/12/2019	NA	NA	NA	NA	NA	NA
QC104_191218		NA	NA	NA	NA	NA	NA
MW20_191218		NA	NA	NA	NA	NA	NA
MW21_191218		NA	NA	NA	NA	NA	NA
QC204_191218		NA	NA	NA	NA	NA	NA
Groundwater Site Investigation - (EI, 2023)							
GW_BH502M	1/03/2023	337	113	0.34	6.3	12	160
GW_BH504M		319	117.9	0.25	6.1	26	77
GW_BH505M		314	115.1	0.03	6.2	24	56
GW-MW11		294	103.9	0	6.1	21	100
GW-MW20		344	111.9	0.48	5.9	19	59
GW-MW21		635	121	1.08	6	770	220
Guidelines							
Water Quality Criteria					6.5 - 8.4	10	

Notes:

All values are in the units shown

Water quality criteria are based on the ANZG (2018) marine water DGVs for 95% protection level, or relevant default guidelines, where ANZG Marine DGVs are not currently available, as explained in the footnotes to **Table 5-1**, in **Section 5** of the DMP.

Highlighted value does not meet the adopted Criteria

Criteria values not currently available

1 Field water quality testing, as explained in the footnotes to **Table 3-2**, in **Section 3** of the DMP.

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Table B2 - Summary of Laboratory Analytical Results

E25947.E16 - Redfern

Sample Identification	Date Sampled	Metals										BTEX						PAHs		TRH		Oil & Grease (mg/L)	Total Cyanide	Total Phenols
		Al	As	Cd	Total Cr	Cu	Pb	Ni	Zn	Hg	Fe	Benzene	Toluene	Ethylbenzene	m-Xylene	p-Xylene	o-Xylene	Benzo(a)pyrene	Naphthalene	Volatile TRH (C_6 -<C_{10})	Semi-volatile (C_{10}-C_{40})			
Previous Investigation - (EMM,2019)																								
MW11_191218	18/12/2019	NA	<1	<0.1	<1	1	1	<1	8	<0.1	NA	<1	<2	<2	<2		<2	<0.5	<1	<20	<100	NA	<2	NA
QC104_191218		NA	<1	<0.1	<1	<1	<1	<1	<5	<0.1	NA	<1	<2	<2	<2		<2	NA	<5	<20	<100	NA	NA	NA
MW20_191218		NA	<1	<0.1	2	2	3	2	17	<0.1	NA	<1	<2	<2	<2		<2	<0.5	<1	<20	<100	NA	<2	NA
MW21_191218		NA	10	<0.1	2	<1	2	1	6	<0.1	NA	<1	<2	<2	<2		<2	<0.5	<1	<20	<100	NA	<2	NA
QC204_191218		NA	<50	<10	<10	<10	<30	<20	<20	<0.5	NA	<1	<1	<1	<2		<1	NA	<1	<10	NA	NA	NA	NA
Groundwater Site Investigation - (EI, 2023)																								
GW_BH502M	1/03/2023	170	3	<0.1	<1	<1	1	<1	17	<0.1	3000	<0.5	<0.5	<0.5	<1		<0.5	<0.1	<0.1	<40	<320	<5	<4	<50
GW_BH504M		71	<1	<0.1	<1	1	<1	1	7	<0.1	2200	<0.5	<0.5	<0.5	<1		<0.5	<0.1	<0.1	<40	<320	<5	<4	<50
GW_BH505M		11	3	<0.1	<1	2	<1	1	8	<0.1	9600	<0.5	<0.5	<0.5	<1		<0.5	<0.1	<0.1	<40	<320	<5	<4	<50
GW-MW11		32	<1	<0.1	<1	9	<1	<1	9	<0.1	120	<0.5	<0.5	<0.5	<1		<0.5	<0.1	<0.1	<40	<320	<5	<4	<50
GW-MW20		37	2	<0.1	<1	<1	<1	2	7	<0.1	12000	<0.5	<0.5	<0.5	<1		<0.5	<0.1	<0.1	<40	<320	<5	<4	<50
GW-MW21		110	6	<0.1	<1	1	<1	1	12	<0.1	2500	<0.5	<0.5	<0.5	<1		<0.5	<0.1	<0.1	<40	<320	<5	<4	<50
Guidelines																								
Water Quality Criteria		80 (pH > 6.5)	24 (As III) 13 (As V)	0.7	Cr(III) 27 Cr(VI) 4.4	13	4.4	70	80	0.1		700	180	80	75	250	350	0.1	70	No visible sheen or film on the surface or the water sample		No visible sheen, surface films or Oil & Grease	4	400

Notes:

All values are µg/L unless stated otherwise

Water quality criteria are based on the ANZG, 2018 (Rev. Jan 2024) marine water DGVs for 95% protection level, or relevant default guidelines, where ANZG Marine DGVs are not currently available, as explained in the footnotes to **Table 5-1**, in **Section 5** of the DMP.

Highlighted value does not meet the adopted Criteria

Criteria values not currently available

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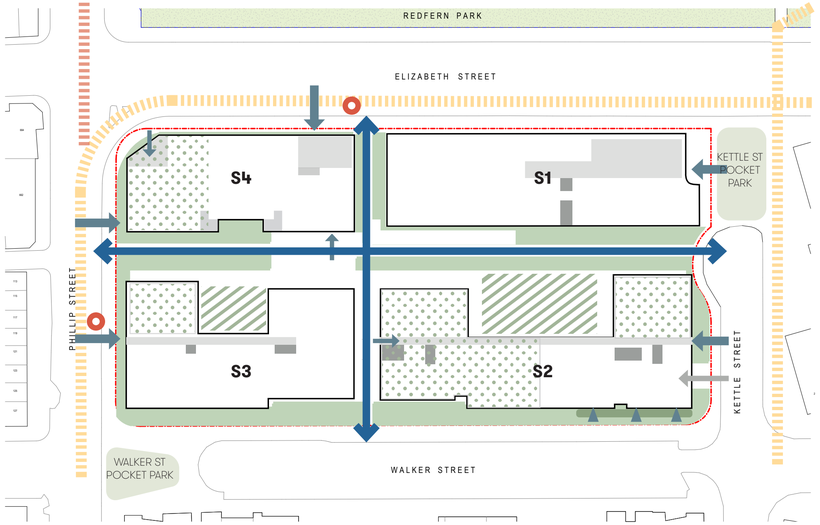
Appendix C – Development Plans and Survey

03 Built Form and Urban Design

SITE PLAN

THE DIAGRAM SHOWS THE PROPOSED MASTERPLAN AND THE HIERARCHY OF LANDSCAPE SPACES INCLUDING:

- Site layout which providing through-site links as recommended in the Design Guide to ensure visual permeability through the site.
- Multiple central courtyard space providing legible landscape spaces for public movement through the site and communal resident use.
- Street facing residential entries for S2, S3 and S4.
- At grade entries into PCYC, Commercial and Community spaces.
- Rooftop communal resident spaces on S2, S3 and S4
- Private terrace entries to S2 Walker St dwelling where required
- Vehicle Entry on Kettle St with basement carparking, waste collection and deliveries.

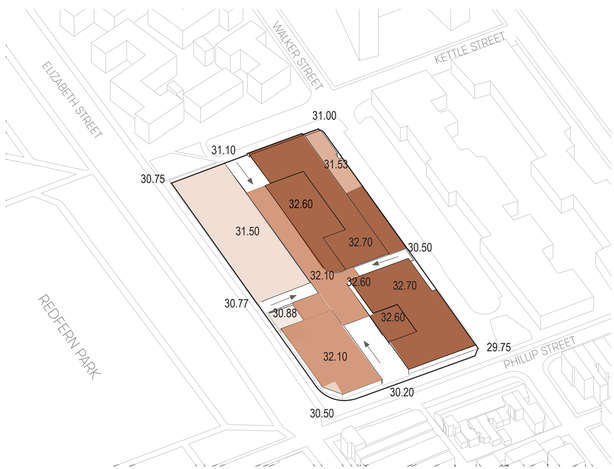


CoS Cycling Priority Street
CoS Pedestrian & Cycle Network
Public Pedestrian Link
Primary Entry
Secondary Entry
Private Entry
Bus Stop
Vehicle Entry
Building Core
Building Circulation
Communal Open Space
Private Open Space
Deep Soil
Rooftop Garden

Scale 1 : 750
0 30m

03 Built Form and Urban Design

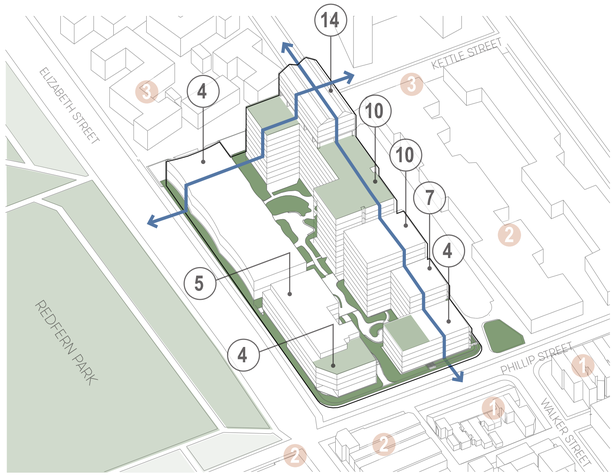
LEVELS AND MASSING



MOVEMENT LEVELS STUDY

- Ground floor residential areas and all connections to the basement set at the 32.70 PMF FPL.
- Commercial and community uses sit between the 1% AEP and PMF as advised by the flooding engineer.
- Central courtyard level set at 32.1 to allow for ease of movement between building levels and the street interfaces.

RL 32.70 / 32.60
RL 32.20 / 32.10
RL 31.90
RL 31.50
RL 30.80



MASSING STUDY

- Overall form steps down from north to south towards the residential scale of Phillip Street
- Overall form steps down from east to west to ensure sun access to Redfern Park.
- Consistent height along Elizabeth and Phillip St responds to the adjacent urban context
- Central landscape between buildings provides public and resident space amenity, with additional communal amenity located on rooftops of S2, S3 and S4.

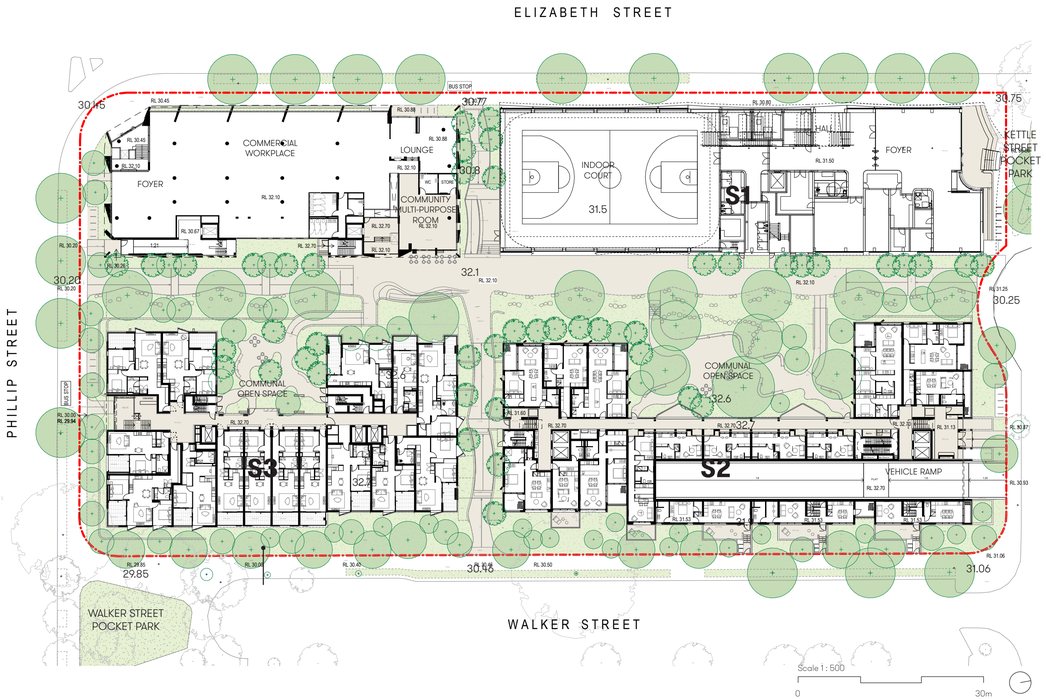
(X) Surrounding Building Heights
(X) Building Height in Storeys

03 Built Form and Urban Design

GROUND PLAN

KEY ELEMENTS IN THE GROUND PLAN INCLUDE:

- Central landscape space sitting 1-1.6m above street level providing access and activation to the internal facades of the development.
- Ramped through site links provide clear and legible pedestrian movement through the site.
- Clear residential entries on Kettle St and Phillip St, and PCYC entry on Kettle St.
- PCYC Multi courts located at southern end of S1 with large areas of glazing to activate the central courtyard space
- Activate entrances on all corners of S4 to activate the through site links and central courtyard space
- Vehicle entry on Kettle St with a long ramp with peak at PMF to access basement.
- Refer to Aspect's design report for further detail on the landscape response.



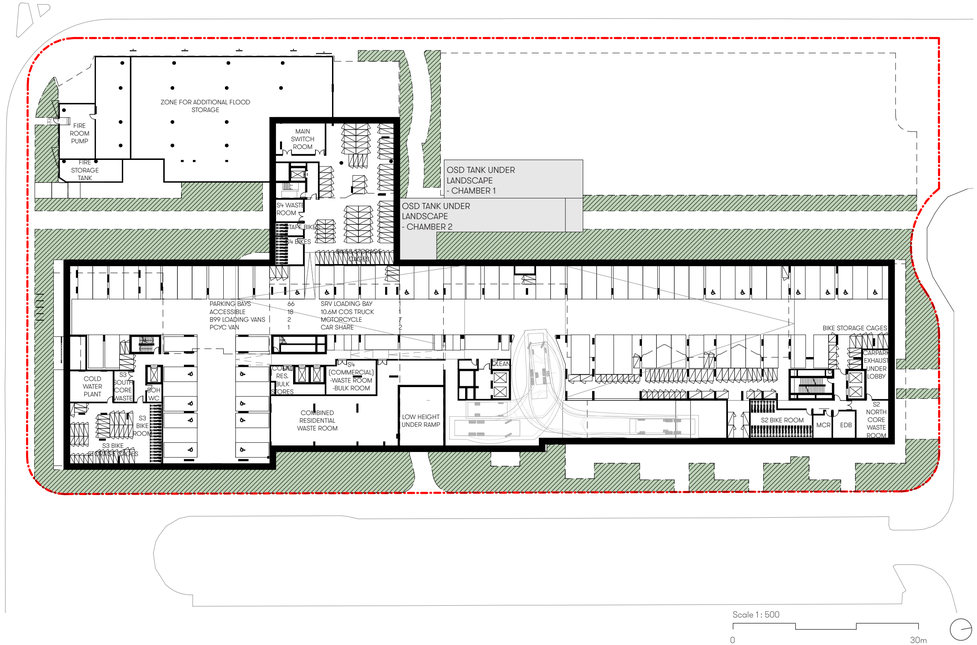
03 Built Form and Urban Design

BASEMENT PLAN

KEY ELEMENTS IN THE BASEMENT PLAN INCLUDE:

- 66 car parking spaces including 18 for adaptable apartments.
- Vehicle entry on Kettle St with a long ramp with peak at PMF to access basement.
- Loading for two trucks (10.6m CoS Waste and SRV) and 3 vans accommodated in basement
- Waste collection in basement with waste rooms provide adjacent to loading area.
- Bicycle storage and/or storage cages provided for every unit, and S1/S4 staff.
- Services located in basement where possible to provide active ground frontages.
- Flood storage located under S4 to mitigate flood impacts of the development
- OSD and Rainwater tanks located under central landscape zone.
- Deep soil target achieved, refer to Aspect report for calculation.

Deep soil



03 Built Form and Urban Design

3D OVERVIEW

The precinct forms a diverse and cohesive village. A variety of architectural expressions provides variety, whilst a considered material palette and a cohesive ground plane establishes commonality between buildings.

Design of all buildings is responsive to site context including the character, scale and grain of existing surrounding buildings.

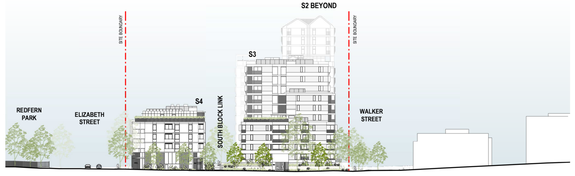
Refer to sections 04, 05, 06 and 07 of the report for detailed descriptions each building.

03 Built Form and Urban Design

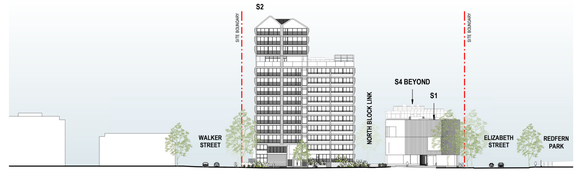
ELEVATIONS

WALKER STREET ELEVATION

ELIZABETH STREET ELEVATION



PHILLIP STREET ELEVATION



KETTLE STREET ELEVATION

Appendix D – Groundwater Take Assessment

21 June 2024
E25947.G12_Rev3

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Groundwater Take Assessment
Proposed Residential Development
600-660 Elizabeth Street, Redfern NSW

1. INTRODUCTION

1.1 Background

At the request of Mr. Daniel Abela on behalf of Hickory Construction Redfern Pty Ltd (the Client), EI Australia (EI) has prepared this Groundwater Take Assessment for 600-660 Elizabeth Street, Redfern NSW (the site).

EI has prepared the following reports for this site:

- Additional Geotechnical Investigation (AGI), referenced E25947.G04, dated 15 March 2023.
- Groundwater Monitoring Report No. 2, referenced E25947.G11.02, dated 3 April 2024.

1.2 Proposed Development

The following documents were used to assist in the preparation of this analysis:

- Geotechnical Investigation Report prepared by Douglas Partners, Project No. 99510.00, dated 16 January 2020;
- Detail and Contour Survey Plan prepared by Public Works Advisory, Plan No. 57530, surveyed April 2018, approved for issue on 3 May 2019;
- Architectural Drawings prepared by Hayball Pty Ltd, Project No. 2610, Drawing No. A02.00, Revision A, dated 19 June 2024; and
- Sketches for Retention and Bulk Earthworks Options1 &2, prepared by BG&E.

Based on the provided documents, EI understands that the proposed development involves the demolition of the existing site structures and the construction of multiple buildings ranging in height from four storeys to fifteen-storeys over a single-level common basement. The Finished Floor Level (FFL) of the lowest part of the basement is proposed to be RL 28.07m AHD. The lowest Bulk Excavation Level (BEL) is assumed to be RL 27.47m AHD to allow for the construction of the basement slab. To achieve the BEL, an estimated of excavation depth of 3.2m Below Existing Ground Level (BEGL) is expected. Locally deeper excavations may be required for footings, service trenches, crane pads, and lift overrun pits

1.3 Assessment Objectives

The objective of this GTA is to provide an estimation of the groundwater take volumes that require pumping out during the construction and operational stage of the development, estimation of the groundwater drawdown as a result of the dewatering, and its associated ground settlements.

2. SITE MODEL

2.1. Subsurface Conditions Permeability

For the purpose of the groundwater take assessment, the conservative subsurface conditions outlined our AGI report have been adopted. Permeability values which were adopted for the assessment of groundwater take volumes are presented in **Table 1**.

Table 1 Summary of Subsurface Conditions and Adopted Design Parameters

Material [1]	Depth to Top of Unit (m BEGL) [2]	Approximate RL of Top of Unit (m AHD) [2]	Adopted Permeability (m/s)	Ky'/Kx'
Topsoil/Fill [3]	0.0	30.5	1.0×10^{-3}	1
Alluvial Peat/ Organic Clay [4]	1.6	28.9	2.0×10^{-5}	1
Alluvial Sand with Peaty Clay Layers [3]	3.8	26.7	1.0×10^{-4}	0.2 [6]
Residual Soil – Clay [3]	13.4	17.1	1.0×10^{-7}	1
Medium to High Strength Sandstone [5]	14.4	16.1	1.0×10^{-8}	0.3

Notes:

1 For more detailed descriptions of subsurface conditions reference should be made to the EI's AGI Report.
2 Depths and levels presented in **Table 1** above are generalised using the most conservative levels from the Geotechnical Investigation across the excavation area for the purpose of groundwater seepage modelling.
3 Permeability values have been correlated for material encountered during the GTA using Look (2014).
4 Permeability value of the Alluvial Peat/ Clay was calculated based on the pump out test carried out by EI.
5 Permeability value has been correlated for Sandstone bedrock encountered during the GTA using Pell (2019).
6 Vertically permeability through interbedded peat/clay layer is assumed to be 20% of the permeability horizontally through sand.

2.2. Groundwater Observations and Rising Head Tests

As part of the GTA scope, EI installed 3 monitoring wells (BH502M, BH504M and BH505M) for groundwater monitoring. EI undertook a Groundwater Monitoring Event (GME) on 1 March 2023 at previously installed monitoring wells by EMM (MW11, MW20 and MW21) and newly installed monitoring wells by EI (BH502M, BH504M and BH505M), and carried out rising head tests on 27 October 2023 within the monitoring wells installed by EI, as summarised in **Table 2**.

EI also noted that DP conducted a GME in 2019 within all the monitoring wells installed by DP (BH301 to BH303, CPT 304A, and CPT 305 to CPT 309). Test results and a summary of the measured groundwater levels is presented for each monitoring well in **Table 3**.

Table 2 Monitoring Well Details and Rising Head Test Results

Monitoring Well	Total Well Depth (m BEGL)	Screen Length (m)	Screened Section	Date of Test	Approximate RL of Groundwater Level (m AHD)	Calculated Permeability (m/s) [3]
BH502M	5.63	3	Alluvial Sand and Residual Clay	27-Oct-23	28.59	6.3×10^{-6}
BH504M	6.10	3	Alluvial Clay and Alluvial Sand	27-Oct-23	28.70	1.6×10^{-5}
BH505M	6.07	3	Alluvial Clay and Alluvial Sand	27-Oct-23	29.26	1.2×10^{-5}

Table 3 Summary of Groundwater Levels

Monitoring Well	Date of Observation	Approximate Depth to Groundwater Level m BEGL)	Approximate RL of Groundwater Level (m AHD)
BH301 (DP)	4-Dec-19	3.50	27.50
BH302 (DP)	2-Nov-19	1.20	28.90
BH303 (DP)	3-Dec-19	3.50	26.60
CPT304A (DP)	9-Dec-19	1.60	29.00
CPT305 (DP)	9-Dec-19	1.50	29.20
CPT306 (DP)	9-Dec-19	1.70	28.70
CPT307 (DP)	9-Dec-19	1.40	29.00
CPT308 (DP)	9-Dec-19	1.40	28.60
CPT309 (DP)	9-Dec-19	1.70	28.40
MW11 (EMM)	2-Dec-19	1.39	28.90
MW11 (EI)	1-Mar-23	1.27	29.02
MW20 (EMM)	2-Dec-19	2.00	28.55
MW20 (EI)	1-Mar-23	1.60	28.95
MW21 (EMM)	2-Dec-19	1.60	29.54
MW21 (EI)	1-Mar-23	1.59	29.55
BH502M (EI)	1-Mar-23	1.54	28.56
	2-Mar-23	1.55	28.55
	27-Oct-23	1.51	28.59
BH504M (EI)	1-Mar-23	2.19	28.61
	2-Mar-23	2.21	28.59
	27-Oct-23	2.10	28.70
BH505M (EI)	1-Mar-23	1.18	29.32
	2-Mar-23	1.18	29.32
	27-Oct-23	1.24	29.26

EI has also completed long-term (over 12 months) of groundwater level monitoring in BH502M, BH504M and BH505M from 2 March 2023 to 7 March 2024. A summary of the groundwater levels is provided in the table below:

Monitoring Well	Lowest Measured Groundwater Level (m AHD)	Highest Measured Groundwater Level (m AHD)
BH502M (EI)	28.39	28.74
BH504M (EI)	28.48	28.86
BH505M (EI)	29.09	29.44

Based on the results of the monitoring a design groundwater level of RL 29.5m has been adopted for assessment of groundwater seepage inflow rates and groundwater take volumes within the excavation. This design groundwater level is based on the highest recorded level during the long-term groundwater monitoring.

2.3. Shoring System

The client has requested to assess the appropriate depth of embedment of shoring walls to control the drawdown affects. For this reasons, EI has considered the below shoring system in the analysis:

- A sheet pile wall (about 380m in total perimeter) installed along the entire basement perimeter.

The sheet pile wall was modelled with variable socket lengths ranging from about 3m to 6m below the BEL (RL of about 24.47 to 21.47 mAHD), and also one that is installed to be socketed at least 0.5m into residual clay (RL 16.6mAHD).

This assessment does not assess the overall stability and embedment depth of the shoring system. Once the designs are updated, this assessment should be revised accordingly.

3. GROUNDWATER TAKE ASSESSMENT

3.1. Groundwater Seepage Volumes During Construction Phase

Groundwater seepage analysis for flow beneath the shoring wall during construction has been undertaken using SEEP/W, a finite element groundwater seepage analysis software package. SEEP/W estimates the seepage rate of water entering the excavation beneath the shoring wall. This model estimates the volume of water which will be required to be dewatered during the construction of the basement and until the dewatering is turned off.

For the purpose of this modelling, it has been assumed that:

- The subsurface conditions were horizontal along the site and a representative **Section A-A** is considered in the analysis running along the shoring wall perimeter. The permeability values presented in **Table 1** in **Section 2.1** were adopted for each unit.
- The sheet pile wall is assumed to be impermeable.
- For the simplicity of this model, temporary dewatering will be undertaken within the basement retaining system perimeter to 1.0m below BEL, about RL 26.47m.
- An external design groundwater level of RL 29.5m was assumed to be constant at 65 m away from the shoring wall.
- A “No-Flow” boundary is defined along the symmetric line (the centre of the excavation), at 15 m from the perimeter shoring wall.
- The shoring walls surrounding the basement excavation has a total length of about 380m.

The SEEP/W results are presented in **Appendix A** to **Appendix C. Table 4** below provides the estimated groundwater inflow rate into the basement.

Table 4 Summary of Analysis Results

	Shoring System	Inflow per m length of perimeter wall (m^3/sec)	Inflow per m length of perimeter wall (m^3/day)	Total Inflow during construction (ML/year)	Maximum Drawdown (m)
Sheet pile wall	3m socket below the BEL	3.84×10^{-5}	3.32	460.6	2.2
	6m socket below the BEL	3.24×10^{-5}	2.80	387.7	1.6
	0.5m into the Residual Clay	1.89×10^{-7}	0.02	2.3	Negligible

3.2. Assessment of Groundwater Take During Operational Phase

A fully tanked/watertight basement solution is to be adopted for the long term management of groundwater. With the use of an appropriate design, it is possible to limit groundwater ingress in a tanked basement to volumes which are negligible during the life of the proposed development.

3.3. Groundwater Drawdown and Drawdown Induced Settlement

EI have completed a settlement analysis using PLAXIS 2D to estimate the potential drawdown-induced settlements as a result of the above predicted drawdown. The predicted drawdown over the zone of influence and settlement is shown in **Table 5**.

It should be noted that the predicted settlement is from **drawdown only** and does not account for any other factors such as deflection of the shoring wall, surcharge loading and other construction factors.

Table 5 Predicted Ground Settlement due to Groundwater Drawdown

Shoring system		Distance from Shoring Wall (m)	Drawdown (m)	Ground settlement (mm)
Sheet pile wall	3m socket below the BEL	0	2.20	18.50
		5	2.00	18.10
		10	1.85	17.00
		20	1.50	14.60
		40	0.90	8.20
		65	0.00	Negligible
	6m socket below the BEL	0	1.60	14.40
		5	1.50	13.90
		10	1.30	13.00
		20	1.10	11.30
		40	0.60	5.40
		65	0.00	Negligible
	0.5m into the Residual Clay	Negligible drawdown and settlement		

The predicted ground settlements immediately outside of the shoring wall ranged between 'negligible' and 18.5mm, as tabulated above. Ground experiencing settlements greater than 10mm and less than 50mm are considered to be a 'slight' risk in regards to category of damage risk due to dewatering, as defined in Cashman and Preene (2021)[1], as shown in the excerpt in **Plate 1**.

Although the PLAXIS 2D modelling provides predicted drawdown-induced ground settlement values, it would be prudent for a thorough assessment of potential risks posed on neighbouring structures to be completed by a qualified and experienced structural engineer.

Risk category[a]	*Maximum settlement (mm)*[b]	*Building tilt*[c]	*Anticipated effects*
Negligible	<10	<1/500	Superficial damage unlikely
Slight	10–50	1/500–1/200	Possible superficial damage; unlikely to have structural significance
Moderate	50–75	1/200–1/50	Expected superficial damage and possible structural damage to buildings; possible damage to rigid pipelines
Severe	75	>1/50	Expected structural damage to buildings and expected damage to rigid pipelines or possible damage to other pipelines

Source: Preene, M., *Proceedings of the Institution of Civil Engineers—Geotechnical Engineering*, 143(4), 177–190, 2000. With permission.

[a] The risk category is to be based on the more severe of the settlement or tilt criteria.
[b] Maximum settlement is based on the nearest edge of the structure to the groundwater control system.
[c] Tilt is based on rigid body rotation, assuming that all of the maximum settlement occurs as differential settlement across the width of the structure or across an element of the structure.

Plate 1 Excerpt from Cashman and Preene (2021)

[1] Cashman and Preene, (2021). Groundwater Lowering in Construction - A Practical Guide to Dewatering - 3rd Edition. CRC Press.

4. CONCLUSIONS AND COMMENTS

Based on the findings of this report and within the limitations of available data, EI concludes that:

- Construction phase groundwater take will be approximately:
  - 460.6 ML/year**,** with the sheet pile wall installed 3m below the BEL;
  - 387.7 ML/year**,** with the sheet pile wall installed 6m below the BEL;
  - 2.3 ML/year**,** with the sheet pile wall installed 0.5m into residual clay;
- EI note that the sheet pile wall installed into the residual clay did effectively reduce the dewatering volumes and groundwater drawdown due to the dewatering. However the feasibility of installing sheet piles to this depth must be considered.
- Operational phase groundwater take will be negligible during lifetime of the building due to the assumed tanked basement design.
- The above estimate is based on the following assumptions:
  - The shoring wall system is an impermeable sheet pile wall;
  - Continuous dewatering in order to maintain the groundwater at 1.0m below BEL during construction;
  - The basement walls and the lowest basement slab will be designed as tanked for the developments lifetime.
  - This assessment does not take into consideration any excavation that may be required for footings, service trenches, lift pits, or crane pads. This additional excavation, if required, is not expected to affect the retention or the dewatering system.
- The expected water level drawdowns at different distances from the shoring wall are shown in **Table 5**. Drawdown induced settlement behind the shoring wall within the soil profile was predicted in the order of 18.5mm to 14.4mm for the 3m and 6m socket design respectively, indicating a ‘slight’ risk category of damage risk resulting from ground settlement due to dewatering, as per Cashman and Preene (2021). It would be prudent for potential risks to neighbouring structures to be assessed by a qualified and experienced structural engineer.

Should any design or construction conditions differ from that adopted in this report; this GTA should be reviewed and updated as required.

5. LIMITATIONS

This report has been prepared for the exclusive use of Hickory Construction Redfern Pty Ltd who is the only intended beneficiary of EI's work. The scope of the inspections carried out for the purpose of this report is limited to those agreed with Hickory Construction Redfern Pty Ltd.

No other party should rely on the document without the prior written consent of EI, and EI undertakes no duty, or accepts any responsibility or liability, to any third party who purports to rely upon this document without EI's approval.

EI has used a degree of care and skill ordinarily exercised in similar tasks by reputable members of the geotechnical industry in Australia as at the date of this document. No other warranty, expressed or implied, is made or intended. Each section of this report must be read in conjunction with the whole of this report, including its appendices and attachments.

The conclusions presented in this report are based on a limited assessment of conditions, with specific locations chosen to be as representative as possible under the given circumstances.

EI's professional opinions are reasonable and based on its professional judgment, experience, training and results from analytical data. EI may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified by EI.

EI's professional opinions contained in this document are subject to modification if additional information is obtained through further investigation, observations, or validation testing and analysis during remedial activities. In some cases, further testing and analysis may be required, which may result in a further report with different conclusions.

6. CLOSURE

Please do not hesitate to contact the undersigned should you have any questions.

For and on behalf of
EI Australia

Author	Technical Reviewer
	
Kaiyu Xu Geotechnical Engineer	Stephen Kim Senior Geotechnical Engineer

Attachments: Figure 1 – SEEP/W Analysed Sections
Appendix A – Sheet pile wall installed 3m below the BEL
Appendix B – Sheet pile wall installed 6m below the BEL
Appendix C – Sheet pile wall installed 0.5m into the residual clay
Important Information

Map Source: CityofSydney - Ref No. 57530, Sheet 2&3 of 4, Dated 03 May 2019

LEGEND (All Locations are Approximate)

- Site boundary
- Basement boundary
- Borehole location (EI Australia, 2023)
- Monitoring well location (EI Australia, 2023)
- Previous borehole/CPT location (DP, 2020)
- SEEP/w Analysed Section

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Date:	20/06/24

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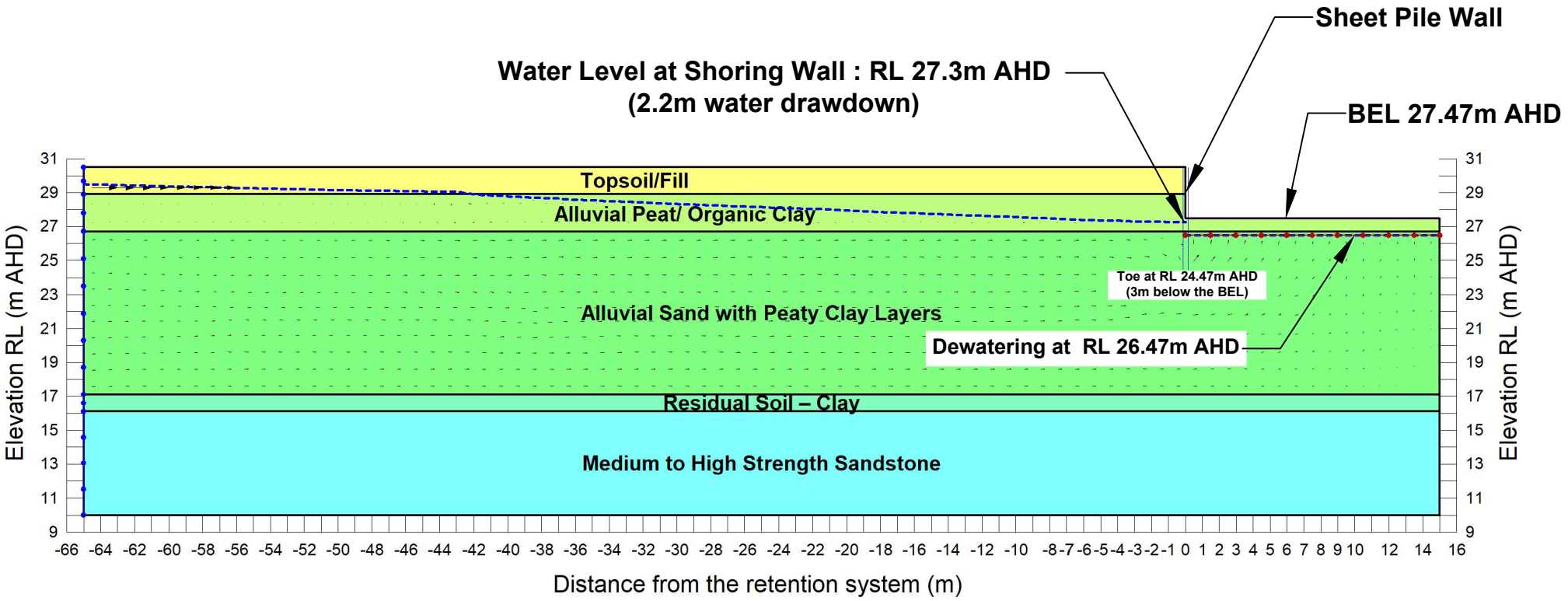
Groundwater Take Assessment
600-660 Elizabeth Street, Redfern NSW

SEEP/w Analysed Section

Figure: 1

Project: E25947.G12_Rev3



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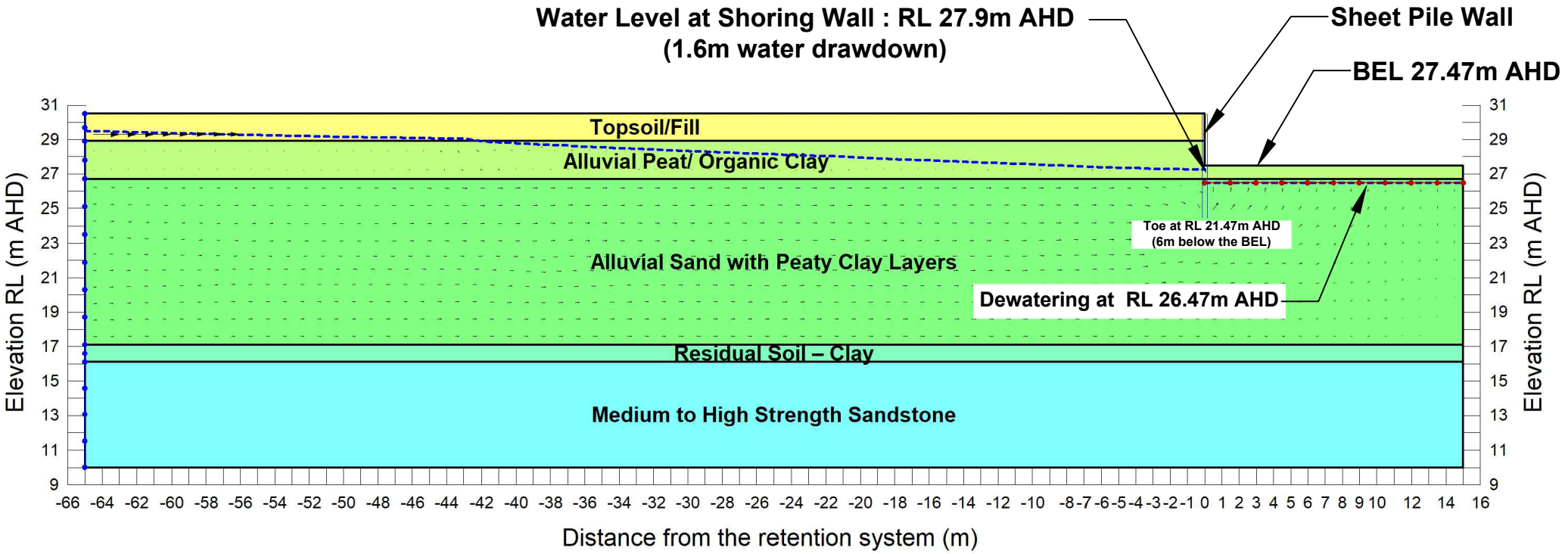
Approx Scale:	As Shown

Hickory Constructions Redfern Pty Ltd
Groundwater Take Assessment
600-660 Elizabeth Street, Redfern, NSW
SEEP/W Model and Results
(Sheet Pile Wall - 3m socket below BEL)

Appendix:
A

Project: E25947.G12_Rev3



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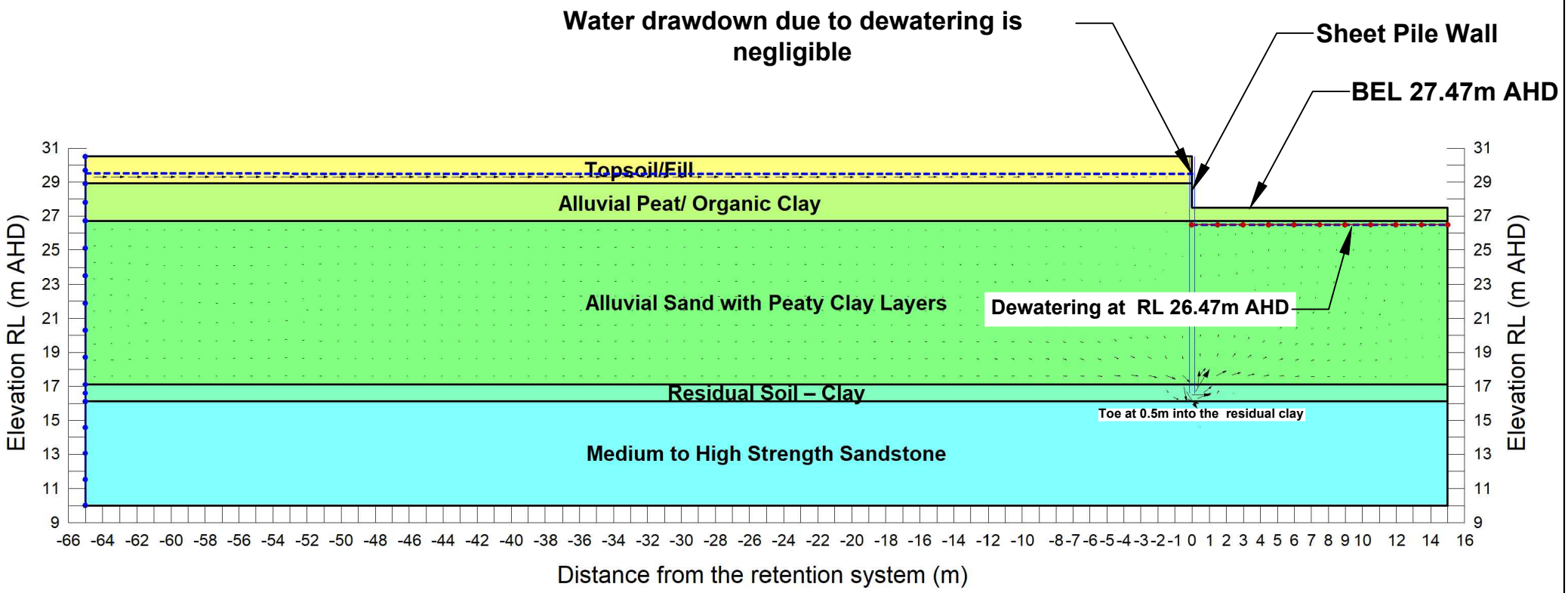
Drawn:	K.X.
Approved:	S.K.
Date:	21-6-24
Approx Scale:	As Shown

Hickory Constructions Redfern Pty Ltd
Groundwater Take Assessment
600-660 Elizabeth Street, Redfern, NSW
SEEP/W Model and Results
(Sheet Pile Wall - 6m socket below BEL)

Appendix:
B

Project: E25947.G12_Rev3



eiaustralia
Contamination | Remediation | Geotechnical
Suite 6.01, 55 Miller Street, PYRMONT 2009
Ph (02) 9516 0722 Fax (02) 9518 5088

Drawn:	K.X.
Approved:	S.K.
Date:	21-6-24
Approx Scale:	As Shown

Hickory Constructions Redfern Pty Ltd
Groundwater Take Assessment
600-660 Elizabeth Street, Redfern, NSW
SEEP/W Model and Results
(Sheet Pile Wall - 0.5m into the residual clay)

Appendix:
C

Project: E25947.G12_Rev3

Important Information

SCOPE OF SERVICES

The geotechnical report ("the report") has been prepared in accordance with the scope of services as set out in the contract, or as otherwise agreed, between the Client And EI Australia ("EI"). The scope of work may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

RELIANCE ON DATA

EI has relied on data provided by the Client and other individuals and organizations, to prepare the report. Such data may include surveys, analyses, designs, maps and plans. EI has not verified the accuracy or completeness of the data except as stated in the report. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations ("conclusions") are based in whole or part on the data, EI will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to EI.

GEOTECHNICAL ENGINEERING

Geotechnical engineering is based extensively on judgment and opinion. It is far less exact than other engineering disciplines. Geotechnical engineering reports are prepared for a specific client, for a specific project and to meet specific needs, and may not be adequate for other clients or other purposes (e.g. a report prepared for a consulting civil engineer may not be adequate for a construction contractor). The report should not be used for other than its intended purpose without seeking additional geotechnical advice. Also, unless further geotechnical advice is obtained, the report cannot be used where the nature and/or details of the proposed development are changed.

LIMITATIONS OF SITE INVESTIGATION

The investigation programme undertaken is a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions. The data derived from the site investigation programme and subsequent laboratory testing are extrapolated across the site to form an inferred geological model, and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Despite investigation, the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies. The engineering logs are the subjective interpretation of subsurface conditions at a particular location and time, made by trained personnel. The actual interface between materials may be more gradual or abrupt than a report indicates.

SUBSURFACE CONDITIONS ARE TIME DEPENDENT

Subsurface conditions can be modified by changing natural forces or man-made influences. The report is based on conditions that existed at the time of subsurface exploration. Construction operations adjacent to the site, and natural events such as floods, or ground water fluctuations, may also affect subsurface conditions, and thus the continuing adequacy of a geotechnical report. EI should be kept appraised of any such events, and should be consulted to determine if any additional tests are necessary.

VERIFICATION OF SITE CONDITIONS

Where ground conditions encountered at the site differ significantly from those anticipated in the report, either due to natural variability of subsurface conditions or construction activities, it is a condition of the report that EI be notified of any variations and be provided with an opportunity to review the recommendations of this report. Recognition of change of soil and rock conditions requires experience and it is recommended that a suitably experienced geotechnical engineer be engaged to visit the site with sufficient frequency to detect if conditions have changed significantly.

REPRODUCTION OF REPORTS

 Where information from the accompanying report is to be included in contract documents or engineering specification for the project, the entire report should be included in order to minimize the likelihood of misinterpretation from logs.

REPORT FOR BENEFIT OF CLIENT

The report has been prepared for the benefit of the Client and no other party. EI assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of EI or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own inquiries and obtain independent advice in relation to such matters.

OTHER LIMITATIONS

EI will not be liable to update or revise the report to take into account any events or emergent circumstances or fact occurring or becoming apparent after the date of the report.

Appendix E – Monitoring Bore Logs

BOREHOLE LOG

BH ID: BH501

Location	600-660 Elizabeth St, Redfern, NSW			**Started**	06 February 2023
Client	Hickory Constructions Redfern Pty Ltd			**Completed**	06 February 2023
Job No.	E25947.G04			**Logged By**	DC/MC **Date** 06 February 2023
Sheets	1 of 3			**Review By**	ML **Date** 08 March 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈30.50 m (AHD)	**Northing**	6247953.52 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	334264.40 (MGA 2020 Zone 56)

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
DT				0.00		30.50	CONCRETE: 250mm thick	-	-	CONCRETE
AD/T		BH501M_0.35-0.45 BH501M_0.50-0.95 SPT 0.50-0.95 7,13,6 N=19		0.25		30.25	FILL: SAND: fine to medium grained, brown, with sub-angular to sub-rounded, fine to medium gravels. Appears variably compacted			FILL
		BH501M_1.00-1.10		1.00		29.50	From 1.00m, with rootlets.	D - M	-	
		BH501M_1.50-1.60 BH501M_1.50-1.95 SPT 1.50-1.95 1,1,1 N=2		1.60		28.90	CLAY: medium plasticity, Organic Clay/Peat: dark brown.	M < PL		MARINE SOIL
				2				M > PL	VS	
		BH501M_3.00-3.45 SPT 3.00-3.45 HW/450 mm N=0		3				W > LL		
				3.80		26.70	SAND: fine to medium grained, brown.			
		BH501M_4.50-4.95 SPT 4.50-4.95 3,5,8 N=13		4					MD	
				5						
WB		BH501M_6.00-6.45 SPT 6.00-6.45 5,1,2 N=3		6				W	VL	
				7						
		BH501M_7.50-7.95 SPT 7.50-7.95 7,16,24 N=40		8					D	
		BH501M_9.00-9.45 SPT 9.00-9.45 5,8,7 N=15		9						
				9.20		21.30	Silty CLAY: high plasticity, grey.	M > PL	St	RESIDUAL SOIL
				10						

BOREHOLE LOG

BH ID: BH501

Location	600-660 Elizabeth St, Redfern, NSW			**Started**	06 February 2023	
Client	Hickory Constructions Redfern Pty Ltd			**Completed**	06 February 2023	
Job No.	E25947.G04			**Logged By**	DC/MC	**Date** 06 February 2023
Sheets	2 of 3			**Review By**	ML	**Date** 08 March 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈30.50 m (AHD)	**Northing**	6247953.52 (MGA 2020 Zone 56)	
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	334264.40 (MGA 2020 Zone 56)	

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
WB		BH501M_10.50-10.95 SPT 10.50-10.95 3,3,5 N=8		11			Silty CLAY: high plasticity, grey.	M > PL	St	RESIDUAL SOIL
		BH501M_11.90-11.95 SPT 11.90-11.95 10/50 mm HB N=R		11.90 11.95		18.60 18.55	SANDSTONE: fine to medium grained, pale grey, very low strength, distinctly weathered. *Log continued on next page.*	-	-	BEDROCK
				13						
				14						
				15						
				16						
				17						
				18						
				19						
				20						

BOREHOLE LOG

BH ID: BH501

Location	600-660 Elizabeth St, Redfern, NSW			**Started**	06 February 2023
Client	Hickory Constructions Redfern Pty Ltd			**Completed**	06 February 2023
Job No.	E25947.G04			**Logged By**	DC/MC **Date** 06 February 2023
Sheets	3 of 3			**Review By**	ML **Date** 08 March 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈30.50 m (AHD)	**Northing**	6247953.52 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	334264.40 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral (VL 0-1, L 0-3, M 1, H 3, VH 10, EH)	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING (30, 100, 300, 1000, 3000)
				10			*Log continued from previous page.*				
				11							
NMLC	90% Water	100	88	12			SANDSTONE: fine to medium grained, pale grey mottled orange, thinly to medium bedded.	SW to FR		12.34: JT 3° PR RO CN	
				13		16.80					
							Terminated at 13.70m. Equipment Failure.				
				14							
				15							
				16							
				17							
				18							
				19							
				20							

BOREHOLE LOG

BH ID: BH502M

Location	600-660 Elizabeth St, Redfern, NSW	**Started**	07 February 2023		
Client	Hickory Constructions Redfern Pty Ltd	**Completed**	07 February 2023		
Job No.	E25947.G04	**Logged By**	DC	**Date**	07 February 2023
Sheets	1 of 3	**Review By**	ML	**Date**	08 March 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈30.10 m (AHD)	**Northing**	6247917.42 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	334247.53 (MGA 2020 Zone 56)

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
D T				0.00		30.10	CONCRETE: 100mm thick	-	-	CONCRETE
AD/T		BH502M_0.50-0.60 BH502M_0.50-0.95 SPT 0.50-0.95 RW/150 mm, 8,14 N=22 BH502M_1.00-1.10		0.10 0.50 1		30.00 29.60	FILL: SAND:fine to medium grained, dark brown with iron staining, angular to sub-angular, fine to medium gravels. From 0.50m, trace rootlets.	D	-	FILL
		BH502M_1.50-1.95 SPT 1.50-1.95 RW/450 mm N=0 BH502M_2.10-2.20		1.50 2		28.60	CLAY: medium plasticity, Organic Clay/Peat: dark brown	M > PL	VS	MARINE SOIL
		BH502M_3.00-3.45 SPT 3.00-3.45 RW/150 mm, 8,4 N=12		3 3.20		26.90	SAND: fine to medium grained, dark brown/pale orange.	W	MD	
		BH502M_4.50-4.95 SPT 4.50-4.95 5,9,11 N=20		4 5 5.00		25.10	Silty CLAY: medium plasticity, medium plasticity, pale grey.	M < PL	St	RESIDUAL SOIL
WB		BH502M_6.00-6.45 SPT 6.00-6.45 RW/300 mm, 13 N=R BH502M_6.10-6.20		6 6.30		23.80	Clayey SAND: fine to medium grained, pale grey (possibly extremely weathered sandstone).	W	MD	
		BH502M_7.50-7.56 SPT 7.50-7.56 8/60 mm HB N=R		7 7.56 7.60		22.54 22.50	SANDSTONE: fine to medium grained, pale grey, very low strength, distinctly weathered. *Log continued on next page.*	-	-	BEDROCK
				8 9 10						

BOREHOLE LOG

BH ID: BH502M

Location	600-660 Elizabeth St, Redfern, NSW			**Started**	07 February 2023	
Client	Hickory Constructions Redfern Pty Ltd			**Completed**	07 February 2023	
Job No.	E25947.G04			**Logged By**	DC	**Date**	07 February 2023
Sheets	2 of 3			**Review By**	ML	**Date**	08 March 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈30.10 m (AHD)	**Northing**	6247917.42 (MGA 2020 Zone 56)	
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	334247.53 (MGA 2020 Zone 56)	

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral (VL 0-1, L 0-3, M 1, H 3, VH 10, EH)	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING (30, 100, 300, 1000, 3000)
				0			*Log continued from previous page.*				
				1							
				2							
				3							
				4							
				5							
				6							
				7							
NMLC	80% Water	100	91	8			SANDSTONE: fine to medium grained, pale grey, thinly to medium bedded.	DW		7.65: JT 5° PR RO CN 7.99-7.93: FS CN 8.18: JT 10° PR SM CN 8.47: JT 5° CU SM CN 8.53: JT 5° PR SM CN 8.71-8.86: CZ CN 8.95: JT 20° UN RO CN 9.06-9.10: FS CN 9.21: JT 3° PR SM CN	
				8.60		21.50	From 8.60m, red/brown.				
				9							
				9.20		20.90	From 9.20m, medium bedded.	FR		9.55: JT 20° PR SM CN	
				10							

BOREHOLE LOG

BH ID: BH502M

Location	600-660 Elizabeth St, Redfern, NSW			**Started**	07 February 2023
Client	Hickory Constructions Redfern Pty Ltd			**Completed**	07 February 2023
Job No.	E25947.G04			**Logged By**	DC **Date** 07 February 2023
Sheets	3 of 3			**Review By**	ML **Date** 08 March 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈30.10 m (AHD)	**Northing**	6247917.42 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	334247.53 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral (VL 0-1, L 0-3, M 1, H 3, VH 10, EH)	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING (30, 100, 300, 1000, 3000)
NMLC	80% Water	100	85	10.00		20.10	SANDSTONE: fine to medium grained, pale grey -orange, medium bedded.	FR	M 1 – H 3	10.09: JT 5° PR RO CN	
				10.38		19.72	From 10.38m, pale grey.			10.96: JT 5° CU RO CN	
				11							
				12						12.74: JT 5° PR SM CN 12.82: JT 5° PR SM CN	
				13		16.45	Terminated at 13.65m. Target Depth Reached.				
				14							
				15							
				16							
				17							
				18							
				19							
				20							

BOREHOLE LOG

BH ID: BH502M

Location	600-660 Elizabeth St, Redfern, NSW			**Started**	07 February 2023
Client	Hickory Constructions Redfern Pty Ltd			**Completed**	07 February 2023
Job No.	E25947.G04			**Logged By**	DC **Date** 07 February 2023
Sheets	1 of 2			**Review By**	ML **Date** 08 March 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈30.10 m (AHD)	**Northing**	6247917.42 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	334247.53 (MGA 2020 Zone 56)

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION
		0.00	30.10	CONCRETE: 100mm thick	-
		0.10	30.00	FILL: SAND: fine to medium grained, dark brown with iron staining, angular to sub-angular, fine to medium gravels.	
	BH502M_0.50-0.60 BH502M_0.50-0.95 SPT 0.50-0.95 RW/150 mm, 8,14 N=22 BH502M_1.00-1.10	0.50	29.60	From 0.50m, trace rootlets.	D
▼	BH502M_1.50-1.95 SPT 1.50-1.95 RW/450 mm N=0	1.50	28.60	CLAY: medium plasticity, Organic Clay/Peat: dark brown	
▷	BH502M_2.10-2.20				M > PL
	BH502M_3.00-3.45 SPT 3.00-3.45 RW/150 mm, 8,4 N=12	3.20	26.90	SAND: fine to medium grained, dark brown/pale orange.	
					W
	BH502M_4.50-4.95 SPT 4.50-4.95 5,9,11 N=20	5.00	25.10	Silty CLAY: medium plasticity, pale grey.	
					M < PL
	BH502M_6.00-6.45 SPT 6.00-6.45 RW/300 mm, 13 N=R BH502M_6.10-6.20	6.30	23.80	Clayey SAND: fine to medium grained, pale grey (possibly extremely weathered sandstone).	
					W
	BH502M_7.50-7.56 SPT 7.50-7.56 8/60 mm HB N=R	7.56	22.54	SANDSTONE: fine to medium grained, pale grey, very low strength, distinctly weathered.	-
80% Water		7.60	22.50	SANDSTONE: fine to medium grained, pale grey, thinly to medium bedded.	
		8.60	21.50	From 8.60m, red/brown.	
		9.20	20.90	From 9.20m, medium bedded.	

BACKFILL DETAILS	STANDPIPE DETAILS
Steel Cover at Surface	Well Stickup =-0.05m (RL 30.05m)
Grout 0.00m - 2.00m	
	0.05m - 3.0m PVC casing (50mm Ø)
Bentonite 2.00m - 2.50m	
Sand 2.50m - 6.00m	
	3.0m - 6.0m PVC screen (50mm Ø)
Cuttings	

BOREHOLE LOG

BH ID: BH502M

Location	600-660 Elizabeth St, Redfern, NSW			**Started**	07 February 2023	
Client	Hickory Constructions Redfern Pty Ltd			**Completed**	07 February 2023	
Job No.	E25947.G04			**Logged By**	DC	**Date**	07 February 2023
Sheets	2 of 2			**Review By**	ML	**Date**	08 March 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈30.10 m (AHD)	**Northing**	6247917.42 (MGA 2020 Zone 56)		
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	334247.53 (MGA 2020 Zone 56)		

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
80% Water		10.00		20.10	SANDSTONE: fine to medium grained, pale grey - orange, medium bedded.		6.00m - 13.65m	
		10.38		19.72	From 10.38m, pale grey.			
		16.45			Terminated at 13.65m. Target Depth Reached.			

BOREHOLE LOG

BH ID: BH503

Location	600-660 Elizabeth St, Redfern, NSW			**Started**	08 February 2023	
Client	Hickory Constructions Redfern Pty Ltd			**Completed**	08 February 2023	
Job No.	E25947.G04			**Logged By**	DC	**Date** 08 February 2023
Sheets	1 of 3			**Review By**	ML	**Date** 08 March 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈30.50 m (AHD)	**Northing**	6247943.44 (MGA 2020 Zone 56)	
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	334203.29 (MGA 2020 Zone 56)	

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
AD/T		BH503M_0.40-0.50 BH503M_0.50-0.95 SPT 0.50-0.95 3,3,3 N=6 BH503_0.90-1.00		0.00		30.50	FILL: SAND: fine to medium grained, brown, gravel trace fine to medium, sub-angular to rounded gravels.	D	-	FILL
	▽	BH503M_1.50-1.95 BH503_1.50-1.60 SPT 1.50-1.95 HW/150 mm, 1,1 N=2		1.60		28.90	CLAY: medium plasticity, Organic Clay/Peat: dark brown, rootlets	M > PL	VS to St	MARINE SOIL
WB		BH503M_3.00-3.45 SPT 3.00-3.45 HW/150 mm, 7,6 N=13		3.30		27.20	SAND: fine to medium grained, dark grey.	M	L	
		BH503M_4.50-4.95 SPT 4.50-4.95 3,2,3 N=5		4.85		25.65	Sandy CLAY: low plasticity, pale grey, sand is fine to medium grained.	M > PL	St to VSt	RESIDUAL SOIL
		BH503_6.00-6.45 SPT 6.00-6.45 1,5,11 N=16								
		BH503_7.50-7.8 SPT 7.50-7.80 11,23/150 mm HB N=R		7.70		22.80	SANDSTONE: fine to medium grained, pale gray.	-	-	BEDROCK
				7.80		22.70	*Log continued on next page.*			

BOREHOLE LOG

BH ID: BH503

Location	600-660 Elizabeth St, Redfern, NSW			**Started**	08 February 2023	
Client	Hickory Constructions Redfern Pty Ltd			**Completed**	08 February 2023	
Job No.	E25947.G04			**Logged By**	DC	**Date**	08 February 2023
Sheets	2 of 3			**Review By**	ML	**Date**	08 March 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈30.50 m (AHD)	**Northing**	6247943.44 (MGA 2020 Zone 56)	
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	334203.29 (MGA 2020 Zone 56)	

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral (VL 0-1, L 0-3, M 1, H 3, VH 10, EH)	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING (30, 100, 300, 1000, 3000)
				0			*Log continued from previous page.*				
NMLC	0% Water	100	90	8			SANDSTONE: fine to medium grained, pale gray.	SW		7.89: JT 5° PR RO CN 8.10: JT 3° PR SM CN 8.23: JT 85° PR RO CN 8.32: JT 5° PR RO CN 8.34: JT 5° CU RO CN 8.36: JT 5° PR RO CN 8.41: JT 5° PR RO CN 8.66: JT 5° PR RO CN 9.25: JT 10° PR RO Clay VN 9.51: JT 5° PR RO Clay VN 9.75: JT 5° PR RO CN 9.79: JT 5° PR RO CN	

BOREHOLE LOG

BH ID: BH503

Location	600-660 Elizabeth St, Redfern, NSW			**Started**	08 February 2023
Client	Hickory Constructions Redfern Pty Ltd			**Completed**	08 February 2023
Job No.	E25947.G04			**Logged By**	DC **Date** 08 February 2023
Sheets	3 of 3			**Review By**	ML **Date** 08 March 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈30.50 m (AHD)	**Northing**	6247943.44 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	334203.29 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral (VL 0-1, L 0-3, M 1, H 3, VH 10, EH)	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING (30, 100, 300, 1000, 3000)
NMLC	0% Water			10		20.50	SANDSTONE: fine to medium grained, pale gray.	SW			
				10.79		19.71	From 10.79m, pale brown-orange			10.61: JT 5° UN RO CN	
		99	97	11				DW		11.05-11.19: XWZ VN	
				12		18.50	From 12.00m, pale red-purple.			11.48: JT 20° PR RO CN 11.53: JT 10° PR RO CN 11.56: JT 5° PR RO CN 11.60: JT 10° CU RO CN 11.69: JT 15° UN RO CN 11.75: JT 5° PR RO CN 11.79: JT 5° PR RO CN 11.88: JT 10° PR RO CN 12.47-12.78: SZ CN	
		100	95	12.00				SW		12.91: JT 5° PR RO Fe SN 12.94: JT 5° PR RO Fe SN 13.00: JT 80° PR RO CN	
				13		16.68	Terminated at 13.82m. Target Depth Reached.				
				14							
				15							
				16							
				17							
				18							
				19							
				20							

BOREHOLE LOG

BH ID: BH504M

Location	600-660 Elizabeth St, Redfern, NSW	**Started**	08 February 2023		
Client	Hickory Constructions Redfern Pty Ltd	**Completed**	08 February 2023		
Job No.	E25947.G04	**Logged By**	DC	**Date**	08 February 2023
Sheets	1 of 3	**Review By**	ML	**Date**	08 March 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈30.80 m (AHD)	**Northing**	6248017.62 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	334218.86 (MGA 2020 Zone 56)

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
AD/T		BH504_0.50-0.95 SPT 0.50-0.95 2,5,6 N=11		0.00		30.80	FILL: SAND: fine to medium grained, dark brown.	D	-	FILL
		BH504_1.50-1.95 SPT 1.50-1.95 HW/300 mm, 1 N=1		1						
	▼			1.80		29.00	CLAY: medium plasticity, Organic Clay/Peta: dark brown, rootlets.	M < PL	VS	MARINE SOIL
		SPT 3.00-3.45 HW/450 mm N=0		2						
	▽			3						
WB				3.50		27.30	SAND: fine to medium grained, brown-pale orange.	M	MD	
		BH504_4.50-4.95 SPT 4.50-4.95 9,14,16 N=30		4						
				5						
		BH504_6.00-6.45 SPT 6.00-6.45 6,7,4 N=11		6						
				7						
		BH504_7.50-7.95 SPT 7.50-7.95 5,8,15 N=23		8						
				9						
		BH504_9.00-9.45 SPT 9.00-9.45 2,3,3 N=6		9.10		21.70	Silty CLAY: medium plasticity, grey	W < PL	F - VSt	RESIDUAL SOIL
				10						

BOREHOLE LOG

BH ID: BH504M

Location	600-660 Elizabeth St, Redfern, NSW			**Started**	08 February 2023	
Client	Hickory Constructions Redfern Pty Ltd			**Completed**	08 February 2023	
Job No.	E25947.G04			**Logged By**	DC	**Date** 08 February 2023
Sheets	2 of 3			**Review By**	ML	**Date** 08 March 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈30.80 m (AHD)	**Northing**	6248017.62 (MGA 2020 Zone 56)	
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	334218.86 (MGA 2020 Zone 56)	

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
WB		BH504_10.50-10.95 SPT 10.50-10.95 5,5,12 N=17		11			Silty CLAY: medium plasticity, grey	W < PL	F - VSt	RESIDUAL SOIL
		BH504_12.00-12.45 SPT 12.00-12.45 4,8,8 N=16		11.90 12		18.90	Gravelly CLAY: low plasticity, mottled orange / red-grey, with iron staining, gravels trace, gravels are angular to sub-angular	M < PL	VSt	
				12.90 13		17.90	*Log continued on next page.*			
				14						
				15						
				16						
				17						
				18						
				19						
				20						

BOREHOLE LOG

BH ID: BH504M

Location	600-660 Elizabeth St, Redfern, NSW			**Started**	08 February 2023
Client	Hickory Constructions Redfern Pty Ltd			**Completed**	08 February 2023
Job No.	E25947.G04			**Logged By**	DC **Date** 08 February 2023
Sheets	3 of 3			**Review By**	ML **Date** 08 March 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈30.80 m (AHD)	**Northing**	6248017.62 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	334218.86 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING
				10			*Log continued from previous page.*				
				11							
				12							
NMLC	80% Water	75		13			SANDSTONE: medium grained, red mottled orange, thinly bedded	MW			
				13.30		17.50	From 13.30m, red/orange to gray				
		100	87	14				MW		13.78: JT 5° PR RO CN 13.92: JT 5° UN RO Clay VN 14.13: JT 10° PR RO VN	
	70% Water	100	63	14.73		16.07	From 14.73m, red/orange-gray, thinly bedded	SW		14.67: JT 10° CU RO CN 14.89: JT 10° PR RO CN	
				15.00		15.80	From 15.00m, red-gray, thinly to medium bedded			14.93: JT 5° PR RO VN	
		100		16				FR			
		0	0	16.44		14.36	From 16.44m, to 16.54m, Core lost				
	80% Water			16.54		14.26	From 16.54m, purple-pale red, medium bedded				
		100		17				FR		17.10-17.19: V SM Clay VN	
				18						18.04: JT 40° PR RO CN 18.17: JT 10° PR RO CN 18.41-18.50: XWZ	
				19		11.80	Terminated at 19.00m. Target Depth Reached.				
				20							

This log should be read in conjunction with EI Australia's accompanying explanatory notes.

BOREHOLE LOG

BH ID: BH504M

Location	600-660 Elizabeth St, Redfern, NSW	**Started**	08 February 2023
Client	Hickory Constructions Redfern Pty Ltd	**Completed**	08 February 2023
Job No.	E25947.G04	**Logged By**	DC **Date** 08 February 2023
Sheets	1 of 2	**Review By**	ML **Date** 08 March 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈30.80 m (AHD)
Plant	Comacchio Geo 205	**Inclination**	90°
Northing	6248017.62 (MGA 2020 Zone 56)		
Easting	334218.86 (MGA 2020 Zone 56)		

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION
	BH504_0.50-0.95 SPT 0.50-0.95 2,5,6 N=11	0.00	30.80	FILL: SAND: fine to medium grained, dark brown.	D
	BH504_1.50-1.95 SPT 1.50-1.95 HW/300 mm, 1 N=1	1.80	29.00	CLAY: medium plasticity, Organic Clay/Peta: dark brown, rootlets.	M < PL
	SPT 3.00-3.45 HW/450 mm N=0	3.50	27.30	SAND: fine to medium grained, brown-pale orange.	
	BH504_4.50-4.95 SPT 4.50-4.95 9,14,16 N=30				
	BH504_6.00-6.45 SPT 6.00-6.45 6,7,4 N=11				M
	BH504_7.50-7.95 SPT 7.50-7.95 5,8,15 N=23				
	BH504_9.00-9.45 SPT 9.00-9.45 2,3,3 N=6	9.10	21.70	Silty CLAY: medium plasticity, grey	W < PL

BACKFILL DETAILS

Steel Cover at Surface

Grout
0.00m - 2.00m

Bentonite
2.00m - 2.50m

Sand
2.50m - 6.00m

STANDPIPE DETAILS

Well Stickup =-0.09m
(RL 30.71m)

0.09m - 3.0m
PVC casing (50mm Ø)

3.0m - 6.0m
PVC screen (50mm Ø)

BOREHOLE LOG

BH ID: BH504M

Location	600-660 Elizabeth St, Redfern, NSW			**Started**	08 February 2023	
Client	Hickory Constructions Redfern Pty Ltd			**Completed**	08 February 2023	
Job No.	E25947.G04			**Logged By**	DC	**Date**	08 February 2023
Sheets	2 of 2			**Review By**	ML	**Date**	08 March 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈30.80 m (AHD)	**Northing**	6248017.6200 (MGA 2020 Zone 56)	
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	334218.8600 (MGA 2020 Zone 56)	

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
	BH504_10.50-10.95 SPT 10.50-10.95 5,5,12 N=17	11		Silty CLAY: medium plasticity, grey	W < PL		
	BH504_12.00-12.45 SPT 12.00-12.45 4,8,8 N=16	11.90 12	18.90	Gravelly CLAY: low plasticity, mottled orange / red-grey, with iron staining, gravels trace, gravels are angular to sub-angular	M < PL	Cuttings 6.00m - 19.00m	
80% Water		12.90 13	17.90	SANDSTONE: medium grained, red mottled orange, thinly bedded			
		13.30	17.50	From 13.30m, red/orange to gray			
		14					
70% Wate		14.73	16.07	From 14.73m, red/orange-gray, thinly bedded			
		15 15.00	15.80	From 15.00m, red-gray, thinly to medium bedded			
80% Water		16					
		16.44	14.36	From 16.44m, to 16.54m, Core lost			
		16.54	14.26	From 16.54m, purple-pale red, medium bedded			
		17					
		18					
		19	11.80	Terminated at 19.00m. Target Depth Reached.			
		20					

BOREHOLE LOG

BH ID: BH505M

Location	600-660 Elizabeth St, Redfern, NSW			**Started**	09 February 2023	
Client	Hickory Constructions Redfern Pty Ltd			**Completed**	09 February 2023	
Job No.	E25947.G04			**Logged By**	DC	**Date** 09 February 2023
Sheets	1 of 3			**Review By**	ML	**Date** 08 March 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈30.50 m (AHD)	**Northing**	6248010.01 (MGA 2020 Zone 56)	
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	334264.02 (MGA 2020 Zone 56)	

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
AD/T				0.00 0.50 1		30.50 30.00	FILL: Sandy : fine to medium grained, brown, trace fine to medium, angular to sub-angular gravels From 0.50m, trace rootlets	D		FILL
WB	▼			1.50 2 3 4 5 6 7 8 9 10		29.00	:	-	-	Ground conditions not observed, inferred sand / clay

BOREHOLE LOG

BH ID: BH505M

Location	600-660 Elizabeth St, Redfern, NSW	**Started**	09 February 2023		
Client	Hickory Constructions Redfern Pty Ltd	**Completed**	09 February 2023		
Job No.	E25947.G04	**Logged By**	DC	**Date**	09 February 2023
Sheets	2 of 3	**Review By**	ML	**Date**	08 March 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈30.50 m (AHD)	**Northing**	6248010.01 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	334264.02 (MGA 2020 Zone 56)

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
WB				11 12 12.90 13 14 15 16 17 18 19 20		17.60	: *Log continued on next page.*	-	-	

BOREHOLE LOG

BH ID: BH505M

Location	600-660 Elizabeth St, Redfern, NSW			**Started**	09 February 2023
Client	Hickory Constructions Redfern Pty Ltd			**Completed**	09 February 2023
Job No.	E25947.G04			**Logged By**	DC **Date** 09 February 2023
Sheets	3 of 3			**Review By**	ML **Date** 08 March 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈30.50 m (AHD)	**Northing**	6248010.01 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	334264.02 (MGA 2020 Zone 56)

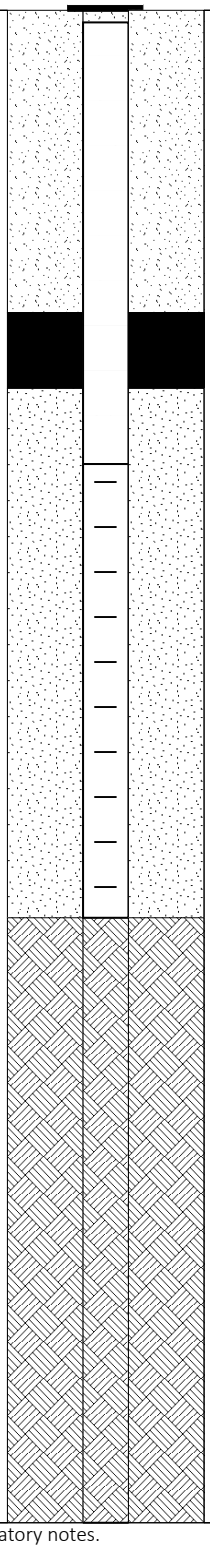
METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral (VL 0-1, L 0-3, M 1, H 3, VH 10, EH)	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING (30, 100, 300, 1000, 3000)
				10			*Log continued from previous page.*				
				11							
				12							
NMLC	100% Water	100		13			SANDSTONE: medium grained, orange, thinly to medium bedded	FR			
				13.30		17.20	From 13.30m, red/orange				
	90% Water	93	61	14				FR		14.27: JT 2° PR RO CN 14.51: JT PR RO Clay VN	
				14.79		15.71	From 14.79m, pale brown-orange, medium bedded				
		100		15						15.47: JT 5° PR RO CN	
				16						15.88: JT 5° PR RO CN 16.06-16.15: XWZ CN	
				17				FR		17.15: JT 5° PR RO Clay VN 17.46: JT 5° PR RO Clay VN	
	90%	100	95	17.81		12.69	From 17.81m, pale gray/pale pink			17.90: JT 5° PR RO CN	
				18						18.22-18.24: XWS RO Clay VN 18.39: JT 10° PR RO VN	
				19				FR			
				19.30		11.20	Terminated at 19.30m. Target Depth Reached.				
				20							

BOREHOLE LOG

BH ID: BH505M

Location	600-660 Elizabeth St, Redfern, NSW			**Started**	09 February 2023	
Client	Hickory Constructions Redfern Pty Ltd			**Completed**	09 February 2023	
Job No.	E25947.G04			**Logged By**	DC	**Date** 09 February 2023
Sheets	1 of 2			**Review By**	ML	**Date** 08 March 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈30.50 m (AHD)	**Northing**	6248010.01 (MGA 2020 Zone 56)	
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	334264.02 (MGA 2020 Zone 56)	

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
▼		0.00		30.50	FILL: Sandy : fine to medium grained, brown, trace fine to medium, angular to sub-angular gravels	D	Steel Cover at Surface Grout 0.00m - 2.00m Bentonite 2.00m - 2.50m Sand 2.50m - 6.00m	Well Stickup =-0.08m (RL 30.42m) 0.08m - 3.0m PVC casing (50mm Ø) 3.0m - 6.0m PVC screen (50mm Ø)
		0.50		30.00	From 0.50m, trace rootlets			
		1.50		29.00	:	-		



BOREHOLE LOG

BH ID: BH505M

Location	600-660 Elizabeth St, Redfern, NSW			**Started**	09 February 2023	
Client	Hickory Constructions Redfern Pty Ltd			**Completed**	09 February 2023	
Job No.	E25947.G04			**Logged By**	DC	**Date** 09 February 2023
Sheets	2 of 2			**Review By**	ML	**Date** 08 March 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈30.50 m (AHD)	**Northing**	6248010.01 (MGA 2020 Zone 56)	
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	334264.02 (MGA 2020 Zone 56)	

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
		11		:	-		
		12				Cuttings 6.00m - 19.30m	
100% Water		12.90	17.60	SANDSTONE: medium grained, orange, thinly to medium bedded			
		13.30	17.20	From 13.30m, red/orange			
90% Water		14					
		14.79	15.71	From 14.79m, pale brown-orange, medium bedded			
		15					
		16					
		17					
90%		17.81	12.69	From 17.81m, pale gray/pale pink			
		18					
		19					
			11.20	Terminated at 19.30m. Target Depth Reached.			
		20					

BOREHOLE LOG

CLIENT: EMM Consulting Pty Limited
PROJECT: Proposed Mixed Use Development
LOCATION: 600-660 Elizabeth Street, Redfern

SURFACE LEVEL: 31.1
EASTING: 334226
NORTHING: 6248046
DIP/AZIMUTH: 90°/--

BORE No: BH301
PROJECT No: 99510.00
DATE: 4/12/2019
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
31	0.0	FILL/SAND: fine to medium grained, pale brown, trace gravel, wet							A			
	0.3	FILL/SAND: fine to medium grained, dark grey, trace gravel and brick fragments, wet							A			
	0.6	FILL/SAND: fine to medium grained, pale brown, trace clay, wet							A			
30	1								S			2,4,2 N = 6 last spt number in peat layer
	1.3	PEAT: dark grey, with organics and wood fragments, wet, soft, alluvial										
29	2											
	2.7	SAND (SP):fine to medium grained, pale brown, with interbedded peat bands, wet, medium dense, alluvial										
28	3					▼						
27	4								S			2,9,15 N = 24
26	5											
25	6											
	6.8	PEATY CLAY: soft										
24	7	Sandy CLAY (CH): medium to high plasticity, grey, trace rootlets, w>LL							S			0,0,0 N = 0
23	8											
22	9											
	9.2	Silty CLAY (CH): high plasticity, grey, with sand, w>LL, possibly residual										

RIG: Rig4 **DRILLER:** BG Drilling **LOGGED:** RB **CASING:** HW to 11.5 m

TYPE OF BORING: Solid Flight Augering to 3.5 m, Rotary Drilling to 13.1 m, NMLC coing to 19.0 m

WATER OBSERVATIONS: 3.5 m

REMARKS: *Probably affected by drilling method

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: EMM Consulting Pty Limited
PROJECT: Proposed Mixed Use Development
LOCATION: 600-660 Elizabeth Street, Redfern

SURFACE LEVEL: 31.1
EASTING: 334226
NORTHING: 6248046
DIP/AZIMUTH: 90°/--

BORE No: BH301
PROJECT No: 99510.00
DATE: 4/12/2019
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
21		Silty CLAY (CH): high plasticity, grey, with sand, w>LL, possibly residual *(continued)*							S			0,0,0 N = 0 suspect results*
20	11											
19	12											
	12.3	Silty CLAY (CH): high plasticity, grey, with sand, w>LL, very stiff, residual							S			7,10,14 N = 24
18	13											
	13.1	SANDSTONE: fine to medium grained, red brown pale brown and grey, high strength then medium to high strength and then high strength, highly weathered then moderately weathered, slightly fractured, Hawksebury sandstone						13.37m: J, 60°, pl, ro, cln 13.48m: B, 0°, pl, cly vn, fe	C	100	91	PL(D) = 0.2 PL(D) = 1.2 PL(D) = 1.3
17	14											
16	15							14.79-14.82m: Cs,30mm 15.13m: B, 5°, cu, fe, tight 15.17m: B, 15°, cu, fe, tight 15.41m: B, 10°, cu, fe, tight				PL(D) = 0.6 PL(D) = 1.2 PL(D) = 1.2
15	16							15.96-16.03: Ds, 70mm 16.12m: J, 30°, pl, fe, cly vn				
14	17							16.72m: B, 0°, pl, fe, tight 16.91m: B, 0°, pl, cly 4mm	C	100	89	PL(D) = 1.3
13	18							17.44-17.47m: Cs, 30mm 17.67-17.70m: Cs, 30mm 17.99-18.03m: Cs, 30mm				PL(D) = 1 PL(D) = 1
12	19							18.72-18.75m: Cs, 30mm 18.75m: J, 60°, pl, fe 18.79m: B, 15°, pl, fe, cly 2mm				PL(D) = 1.5
	19.0	Bore discontinued at 19.0m										

RIG: Rig4 **DRILLER:** BG Drilling **LOGGED:** RB **CASING:** HW to 11.5 m

TYPE OF BORING: Solid Flight Augering to 3.5 m, Rotary Drilling to 13.1 m, NMLC coing to 19.0 m

WATER OBSERVATIONS: 3.5 m

REMARKS: *Probably affected by drilling method

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: EMM Consulting Pty Limited
PROJECT: Proposed Mixed Use Development
LOCATION: 600-660 Elizabeth Street, Redfern

SURFACE LEVEL: 30.5
EASTING: 334276
NORTHING: 6248038
DIP/AZIMUTH: 90°/--

BORE No: BH302
PROJECT No: 99510.00
DATE: 2/12/2019
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
30	0	FILL/Silty SAND: fine to medium grained, dark brown, with fine gravel and trace rootlets and brick fragments, wet							A			
									A			
	1								A			5,7,5
	1.1	FILL: SAND (SP): fine to medium grained, dark brown and grey, wet, medium dense, alluvial							S			N = 12
29	1.4	PEAT: dark grey, with organics and timber, wet, soft, alluvial				▼						last spt number in peat layer
	2	1.6 m: w>LL										
28	2.65	SAND (SP):fine to medium grained, pale brown, with interbedded soft to firm peat bands, wet, medium dense, alluvial							S			1,5,6 N = 11
	3											
27												
	4								S			3,7,8 N = 15
26												
	5											
25		5.7 to 5.8 m: Peat band							S			4,3,9 N = 12
	6											
24	6.7	PEATY CLAY/SAND: interbedded soft peaty clay and loose sand										
	7								S			3,0,0 N = 0
23												
	8											
22	8.65	Silty CLAY (CH): high plasticity, grey, trace sand, w>LL, soft, possibly residual							S			3,2,2 N = 4
	9											
21												
	10.0											

RIG: Rig4 **DRILLER:** BG Drilling **LOGGED:** ZH/RB **CASING:** HW to 4.4 m

TYPE OF BORING: Solid Flight Augering to 4.5 m, Rotary Drilling to 11.64 m, NMLC coing to 17.83 m

WATER OBSERVATIONS: 1.6 m

REMARKS: *Probably affected by drilling method
No Sample recovered from SPT at depth 11.5 m - 11.55 m.

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: EMM Consulting Pty Limited
PROJECT: Proposed Mixed Use Development
LOCATION: 600-660 Elizabeth Street, Redfern

SURFACE LEVEL: 30.5
EASTING: 334276
NORTHING: 6248038
DIP/AZIMUTH: 90°/--

BORE No: BH302
PROJECT No: 99510.00
DATE: 2/12/2019
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
20		Sandy CLAY (CH): medium to high plasticity, grey, with sand, w>LL, possibly residual							S			0,0,0 N = 0 suspect result*
19	11											
	11.64								S			6/50 refusal
18	12	SANDSTONE: fine to medium grained, red brown, brown then grey, high then medium to high strength with some very low to extremely low strength clay bands, highly weathered then moderately weathered then fresh, slightly fractured, Hawksebury sandstone						11.78m: B, 0°, pl, ro, fe stn				PL(A) = 2 PL(A) = 1.2
17	13								C	100	100	
16	14							13.7m: B, 5°, un, ro, cly vnr				PL(A) = 0.8
15	15							14.4m: B, 0°, cly 5mm, fe				PL(A) = 1.1 PL(A) = 1
14	16							15.39m: Cs, 20mm	C	100	99	PL(A) = 1.4
13	17							17.24m: Cs, 20mm 17.27m: Cs, 20mm	C	100	99	PL(A) = 0.9 PL(A) = 1.1
	17.83	Bore discontinued at 17.83m										PL(A) = 1.2
12	18											
11	19											

RIG: Rig4 **DRILLER:** BG Drilling **LOGGED:** ZH/RB **CASING:** HW to 4.4 m

TYPE OF BORING: Solid Flight Augering to 4.5 m, Rotary Drilling to 11.64 m, NMLC coing to 17.83 m

WATER OBSERVATIONS: 1.6 m

REMARKS: *Probably affected by drilling method
No Sample recovered from SPT at depth 11.5 m - 11.55 m.

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: EMM Consulting Pty Limited
PROJECT: Proposed Mixed Use Development
LOCATION: 600-660 Elizabeth Street, Redfern

SURFACE LEVEL: 30.1
EASTING: 334269.1
NORTHING: 6247994.1
DIP/AZIMUTH: 90°/--

BORE No: BH303
PROJECT No: 99510.00
DATE: 2 - 3/12/2019
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
30	0.3	FILL/Silty SAND: fine to medium grained, dark brown, with gravel, rootlets and brick fragments, wet							A			
		FILL/SAND: fine to medium grained, pale brown, wet brick fragments							A			
29	1.1								A			
	1.2	SAND (SP): fine to medium grained, pale brown, wet, loose, alluvial							S			2,2,2 N = 4
		PEAT: dark grey, with organics and timber, wet, very soft, alluvial										
28	2								S			0,0,0 N = 0
27	3											
	3.4	SAND (SP): fine to medium grained, pale brown, with interbedded peat bands, w>LL, loose to medium dense, alluvial				▼						
26	4								S			0,2,3 N = 5
25	5											
	5.8	PEATY CLAY/SAND: interbedded soft peaty clay and loose sand							S			5,3,8 N = 11
24	6											
23	7								S			4,4,3 N = 7
	7.0	SAND (SP): fine to medium grained, pale brown, with interbedded peat bands, w>LL, loose to medium dense, alluvial 7.5m: becoming dense										
22	8											
									S			8,13,7 N = 20
21	9											
	9.8	See description over page										

RIG: Rig4 **DRILLER:** BG Drilling **LOGGED:** RB **CASING:** HW to 13 m

TYPE OF BORING: Solid Flight Augering to 3.5 m, Rotary Drilling to 14.0 m, NMLC coing to 25.65 m

WATER OBSERVATIONS: 3.5 m

REMARKS: *Probably affected by drilling method

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: EMM Consulting Pty Limited
PROJECT: Proposed Mixed Use Development
LOCATION: 600-660 Elizabeth Street, Redfern

SURFACE LEVEL: 30.1
EASTING: 334269.1
NORTHING: 6247994.1
DIP/AZIMUTH: 90°/--

BORE No: BH303
PROJECT No: 99510.00
DATE: 2 - 3/12/2019
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
20	10.1	Silty CLAY (CH): high plasticity, grey, w>LL, possibly residual *(continued)*							S			10,0,0 N = 0 suspect results*
19	11	Silty CLAY (CH): medium to high plasticity, grey, with sand, w>LL, possibly residual										
		11.5 m: trace sand							S			0,0,3 N = 3 suspect results*
18	12	12.5 m: Apparently stiff										
17	13 13.0	Silty CLAY (CH): high plasticity, red brown and grey, with sand and ironstone gravel, w>LL, very stiff, residual							S			4,8,12 N = 20
16	14 14.0	SANDSTONE: fine to medium grained, red brown pale brown and grey, medium to high strength, highly weathered then moderately weathered, unbroken, Hawksebury sandstone										PL(A) = 1.1 PL(A) = 1.4 PL(A) = 0.9
15	15							15.02m: B, 5°, pl, cly 5-7mm	C	100	100	PL(A) = 1.6
14	16											
13	16.65 17	SANDSTONE: fine to medium grained, red brown pale brown and grey, medium to high strength, moderately weathered to fresh, fractured, with extremely low strength clay seams, Hawksebury sandstone						16.65m: 16.65-16.67m: Cs, 20mm 16.87m: B, 0°, un, cly 4mm				PL(A) = 0.9
12	18							17.35m: 17.35-17.37m: Cs, 20mm 17.44m: B, 0°, pl, cly vn, fe 17.48m: B, 30°, pl, cly vn, fe 17.53m: J, 30°, un, fe 17.71m: B, 20°, pl, cly 2mm, fe 17.97m: B, 20°, pl, cly vn, fe	C	100	82	PL(A) = 0.6 PL(A) = 1.1
11	19							18.05m: 18.05-18.07m: Cs, 20mm 18.45m: B, 15°, un, cly vn 18.53m: J, 45°, pl, ro, cln 18.58m: B, 15°, pl, cly vn 18.72m: 18.72-18.74m:				PL(A) = 1.3

RIG: Rig4 **DRILLER:** BG Drilling **LOGGED:** RB **CASING:** HW to 13 m

TYPE OF BORING: Solid Flight Augering to 3.5 m, Rotary Drilling to 14.0 m, NMLC coing to 25.65 m

WATER OBSERVATIONS: 3.5 m

REMARKS: *Probably affected by drilling method

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: EMM Consulting Pty Limited
PROJECT: Proposed Mixed Use Development
LOCATION: 600-660 Elizabeth Street, Redfern

SURFACE LEVEL: 30.1
EASTING: 334269.1
NORTHING: 6247994.1
DIP/AZIMUTH: 90°/--

BORE No: BH303
PROJECT No: 99510.00
DATE: 2 - 3/12/2019
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
10	21	SANDSTONE: fine to medium grained, red brown pale brown and grey, medium to high strength, moderately weathered to fresh, fractured, with extremely low strength clay seams, Hawksebury sandstone *(continued)*						Cs, 40mm 18.85m: 18.85-18.90: Cs, 50mm 19.45m: B, 0°, pl, cly 8mm 19.65m: Ds, 20mm 20.94m: 20.94-20.97m: Cs, 30mm 21.25m: B, 5°, pl, cbs				PL(A) = 0.6 PL(A) = 1.2
9	22							21.85m: B, 5°, pl, cly 2mm 22.19m: Cs, 10mm 22.4m: B, 10°-20°, un, fe, cly 2mm 22.48m: 22.48-22.51m: Cs, 30mm 22.59m: 22.59-22.62m: Cs, 30mm 22.69m: CORE LOSS: 50mm 22.87m: B, 5°, pl, cly 4mm 23.14m: B, 10°, cu, cly vn 23.68m: B, 0°, pl, cly 7mm 23.72m: B, 0°, pl, cly 6mm 24.52m: 24.52-24.68m: Cs, 160mm 25.2m: 25.20-25.25m: Cs, 50mm	C	98	87	PL(A) = 0.95 PL(A) = 0.6
8	22.74											
7	23											PL(A) = 1.6
6	24								C	100	91	PL(A) = 1.2
5	25											PL(A) = 0.55
4	25.65	Bore discontinued at 25.65m										PL(A) = 2.1
3	26											
2	27											
1	28											
	29											

RIG: Rig4 **DRILLER:** BG Drilling **LOGGED:** RB **CASING:** HW to 13 m

TYPE OF BORING: Solid Flight Augering to 3.5 m, Rotary Drilling to 14.0 m, NMLC coing to 25.65 m

WATER OBSERVATIONS: 3.5 m

REMARKS: *Probably affected by drilling method

SAMPLING & IN SITU TESTING LEGEND

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

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MONITORING WELL MW11

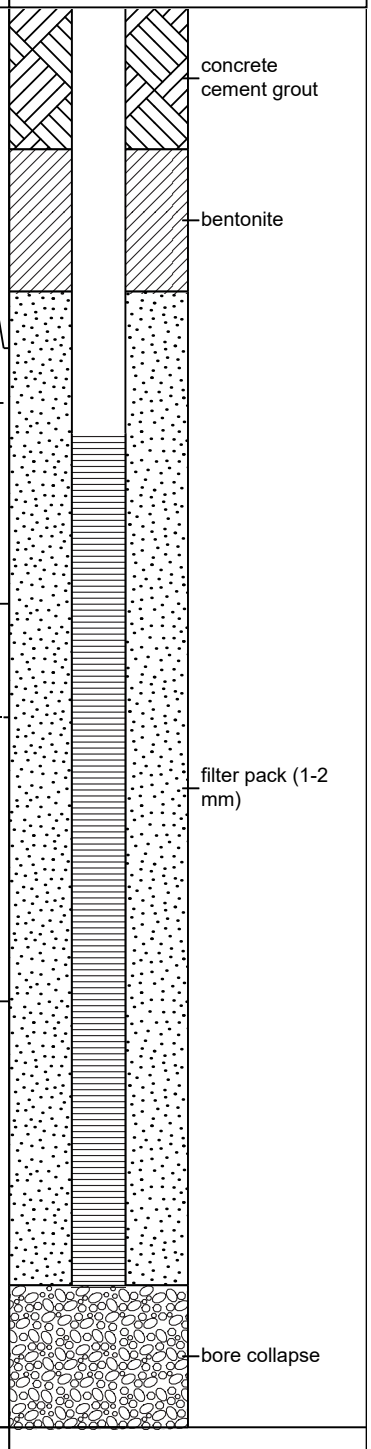
PROJECT NUMBER J190730
PROJECT NAME DSI
CLIENT Land and Housing Corporation
ADDRESS 600-660 Elizabeth Street, Redfern

DRILLING DATE 28/11/19-29/11/19
DRILLING METHOD Hollow-stem auger
DRILLING CONTRACTOR Matrix Drilling
DIAMETER 50 mm
CASING uPVC

COORDINATES E334259.6 N6248055.4
LOGGED BY L Lewis
CHECKED BY A Tennant
SCREEN uPVC Factory Slotted, 1.5 to 4.5 m bgs
SURFACE LEVEL 30.38 mAHD

COMMENTS Top of Pipe - 30.30 mAHD, flush well head

PID (ppm)	Samples	Analysed	Depth (m)	Graphic Log	USCS	Material Description
0.2	MW11_0.1		0.2		SP	FILL: SAND; fine to medium grain, dark brown, trace ceramic and brick fragments, trace organics, loose, dry, no odour or staining.
0.4	MW11_0.5	Y	0.4			
			0.6			
			0.8			
			1			
			1.2			FILL: Clayey SAND; fine to medium grain, dark brown and grey, trace ceramic fragments, medium dense, dry, no odour or staining.
0.4	MW11_1.2		1.4		SC	▽ 1.2 Stabilised water level
			1.6			
			1.8			
			2			
0.5	MW11_2.1		2.2		CL	Sandy CLAY; medium plasticity, black, fine to medium grain sand, soft, dry, no odour or staining.
			2.4			▽ 2.1 Waterstrike
			2.6			
			2.8			
			3			
			3.2			
			3.4			
0.7	MW11_3.5	Y	3.6		SC	Clayey SAND; fine to medium grain, black, no odour or staining.
			3.8			
			4			
			4.2			
			4.4			
			4.6			
			4.8			
1.1	MW11_5.0	Y	5			
			5.2			End of investigation at 5.0 m (target depth).



MONITORING WELL MW20

PROJECT NUMBER J190730
PROJECT NAME DSI
CLIENT Land and Housing Corporation
ADDRESS 600-660 Elizabeth Street, Redfern

DRILLING DATE 28/11/19
DRILLING METHOD Hollow stem auger
DRILLING CONTRACTOR Matrix drilling
DIAMETER 50 mm
CASING uPVC

COORDINATES E334205.2 N6247944.6
LOGGED BY L Lewis
CHECKED BY A Tennant
SCREEN uPVC Factory Slotted, 1.5 to 4.5 m bgs
SURFACE LEVEL 30.64 mAHD

COMMENTS Location at PCYC entrance. Top of pipe - 30.555 mAHD, flush well head.

PID (ppm)	Samples	Analysed	Depth (m)	Graphic Log	USCS	Material Description	Well Diagram
0.5	MW20_0.1		0.2		SP	FILL: SAND; fine to medium grain, grey to brown, with ceramic pipe fragments and glass fragments, very loose, dry, no odour or staining.	concrete cement grout
0.5	MW20_0.5	Y	0.4				
			0.6				bentonite
0.6	MW20_1.0		0.8				
			1				
			1.2				
			1.4			Dense	
			1.6				
			1.8			PEAT; medium plasticity, black, organics (50%), firm, moist, no odour or staining.	
1.0	MW20_1.8	Y	2		Pt	▽2 Stabilised water level	
			2.2			Moist	
			2.4			▽1 Waterstrike, wet	
			2.6				
			2.8				filter pack (1-2 mm)
1.6	MW20_2.8		3				
			3.2				
			3.4				
			3.6			Saturated, sticky	
			3.8				
1.5	MW20_4.0	Y	4				
			4.2				
			4.4				
			4.6			End of investigation at 4.5 m (target depth).	
			4.8				

MONITORING WELL MW21

PROJECT NUMBER J190730
PROJECT NAME DSI
CLIENT Land and Housing Corporation
ADDRESS 600-660 Elizabeth Street, Redfern

DRILLING DATE 29/11/19
DRILLING METHOD Hollow stem auger
DRILLING CONTRACTOR Matrix drilling
DIAMETER 50 mm
CASING uPVC

COORDINATES E334265.8 N6247929.7
LOGGED BY L Lewis
CHECKED BY A Tennant
SCREEN uPVC Factory Slotted, 1.5 to 4.5 m bgs
SURFACE LEVEL 30.215 mAHD

COMMENTS Location at basketball court. Top of pipe - 30.135 m AHD, flush well head.

PID (ppm)	Samples	Analysed	Depth (m)	Graphic Log	USCS	Material Description	Well Diagram
			0.2			Asphalt	concrete cement grout
12.7	MW21_0.3, QC202	Y	0.4		SP	FILL: Gravelly SAND; medium grain, brown, brick and mortar inclusions (30%), angular gravel, dry, loose to medium dense, no odour or staining.	bentonite
			0.6				
			0.8				
			1			▽1 Stabilised water level	
			1.2				
13.7	MW21_1.3. QC103, QC203	Y	1.4		Pt	PEAT; medium plasticity, black, organics (50%), firm, dry to moist, no odour or staining.	
			1.6				
			1.8				
			2				
			2.2				
			2.4			▽2 Waterstrike	
1.8	MW21_2.5		2.6				filter pack (1-2 mm)
			2.8				
			3				
			3.2				
			3.4				
			3.6				
			3.8				
			4				
			4.2				
1.9	MW21_4.4	Y	4.4				
			4.6			End of investigation at 4.4 m (target depth).	
			4.8				

Appendix F – Registered Water Supply Bores

State Overview
State Overview

Rivers and Streams
favourites | search | download sites | find a site
Real Time Data - Rivers And Streams

Daily River Reports
Daily River Reports

Dams
favourites | search | download sites | find a site
Real Time Data - Major Dams

Groundwater (Telemetered data)
favourites | search | download sites | find a site
Real Time Data - Bores

All Groundwater Site details
search | download sites | find a site
search by licence
All Groundwater Map

Meteorology
favourites | search | download sites | find a site
Real Time Data - Weather Stations

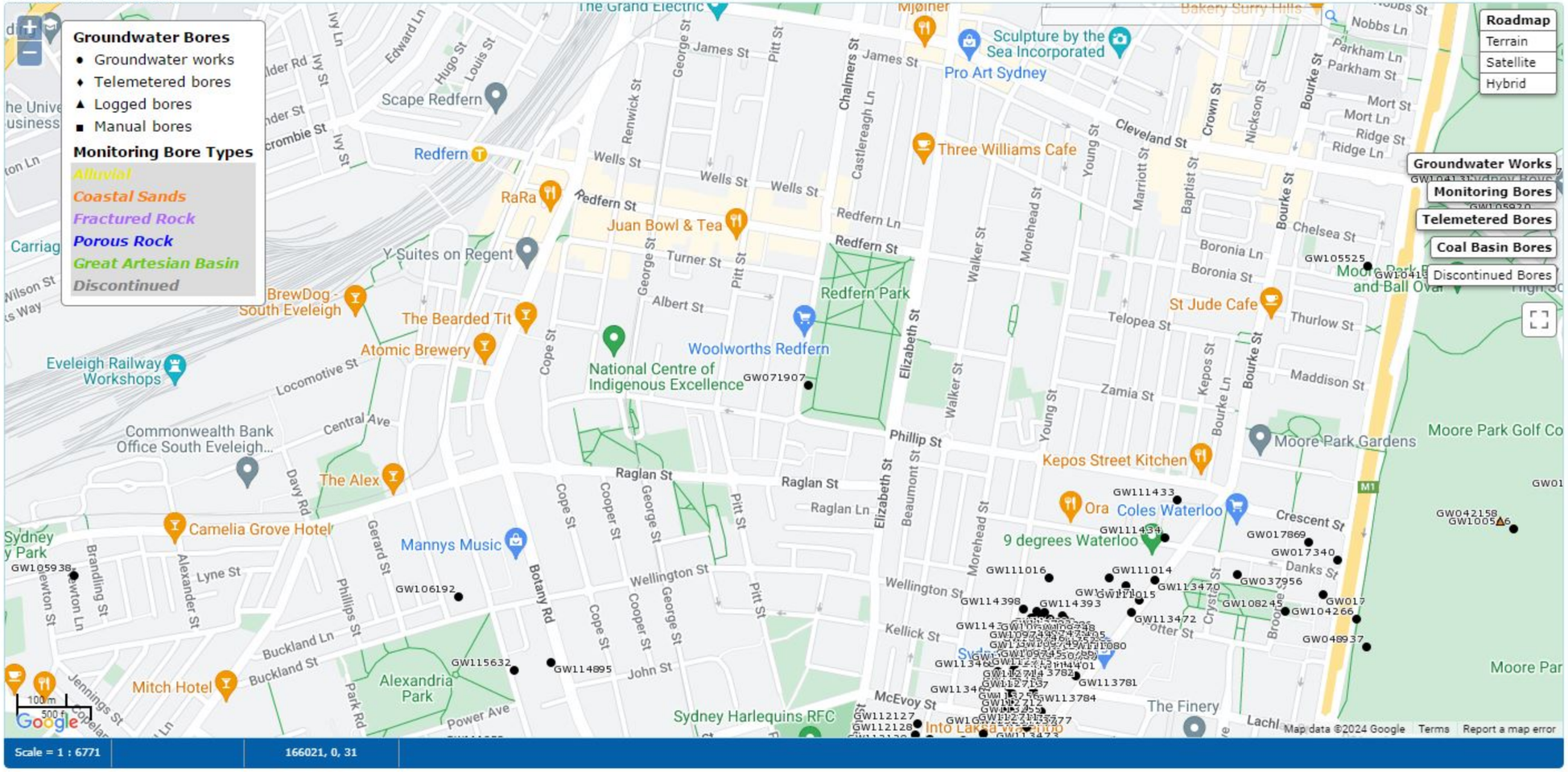
Hunter River Salinity Trading Scheme
Hunter River Salinity Trading Scheme

ALL GROUNDWATER MAP

All data times are Eastern Standard Time

Map | Info

current site: GW111016



Appendix G – Laboratory Documentation

Sheet 1 of 1

Site: 600-660 ELIZABETH ST, REDFERN

Project No: E25QPR

Laboratory: SGS Australia
Unit 16, 33 Maddox Street,
ALEXANDRIA NSW 2015
P: 02 8594 0400 F: 02 8594 0499

Sample ID	Laboratory ID	Container Type	Sampling Date	Sampling Time	Sample Matrix: SOIL	WATER	0.45 µm field filtered	OTHER	Analysis: HM[A] /TRH/BTEX/PAHs OCP/OP/PCB/Asbestos	HM[A] /TRH/BTEX/PAHs	HM[A] /TRH/BTEX	BTEX	[redacted] Phenols, Cyanide	Asbestos	Asbestos Quantification	Excavated Natural Material (ENM) Suite	ENM Suite - Stockpile discrete (TRH/BTEX/PAHs)	ENM Suite - Stockpile composite (HM[A] /pH / EC / Foreign Materials)	Dewatering Suite	pH / [redacted]	sPOCAS	Chromium Reducible Sulfur (CrS)	[redacted] Oil and Grease	pH / CEC (cation exchange)	pH / EC (electrical conductivity)	Sulphate / Chloride	[redacted]	TCLP HM[B] / PAH
GW_BH600M		S, P, 2xVC	1/3/23	AM/PM		X				X			X							X			X					
GW_BH600M										X			X							X			X					
GW_BH600M										X			X							X			X					
GW_MW11										X			X							X			X					
GW_MW20										X			X							X			X					
GW_MW21										X			X							X			X					
GW_QD											X																	
GW_QT											X																	
GW_QR											X																	
GW_QBG		V	V	V																						X		
TB		LAB PREPARED				V						X																
TS		LAB PREPARED				V						X																

(1)

Container Type:
J = solvent washed, acid rinsed, Tefton sealed glass jar
S = solvent washed, acid rinsed glass bottle
P = natural HDPE plastic bottle
VC = glass vial, Tefton Septum
ZLB = Zip-Lock Bag BB = Bulk Bag

eiaustralia
Suite 6.01, 55 Miller Street,
PYRMONT NSW 2009
Ph: 9516 0722
lab@eiaustralia.com.au

COC June 2021 FORM v.5 - SGS

Investigator: I attest that these samples were collected in accordance with standard EI field sampling procedures.

Sampler's Name (EI): GT	Received by (SGS):
Print: GEISIANE TORRES	Print:
Signature: GT	Signature:
Date: 2/3/23	Date:

IMPORTANT:
Please e-mail laboratory results to: lab@eiaustralia.com.au

Report with EI Waste Classification Table ☐

Sampler's Comments:
CC: SHARON LI
PLEASE FORWARD SAMPLE GW_QT TO ENVIROLAB

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

Comments
HM[A] Arsenic (III & V), Cadmium, Chromium (III & VI), Copper, Lead, Mercury, Nickel, Zinc + Al, iron

HM[A] Arsenic, Cadmium, Chromium, Lead, Mercury, Nickel

Dewatering Suite
pH & EC
TDS / TDU
Hardness
Total Cyanide
Metals (Al, As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)
TRH (F1, F2, F3, F4)
BTEX
PAH
Total Phenol

LABORATORY TURNAROUND
☐ Standard
☐ 24 Hours
☐ 48 Hours
☒ 72 Hours
☐ Other____

Job No: 317833
Date Received: 3/3/23
Time Received: 14:30
Received By: D. White
Temp: Cool/Ambient 10°
Cooling: Ice/Icepack
Security: Intact/Broken/None

CHAIN OF CUSTODY RECORD

COC#: SE243914

Owner job:

Ship to: XML	Project Name:	Due date: 7/03/2023 1:50:59 PM
	Client: EI AUSTRALIA 12269923_11762409	Send Results to: AUENVSE
	Sampler Name: GT	
Carrier:	Airbill #:	

Field Sample ID	Client ID	Date sampling	Time	Matrix	# of Containers	Analyses Requested: MA1400	Comments
SE243914.001	GW_BH502M	1/03/2023	0:00:00	Water		X	
SE243914.002	GW_BH504M	1/03/2023	0:00:00	Water		X	
SE243914.003	GW_BH505M	1/03/2023	0:00:00	Water		X	
SE243914.004	GW-MW11	1/03/2023	0:00:00	Water		X	
SE243914.005	GW-MW20	1/03/2023	0:00:00	Water		X	
SE243914.006	GW-MW21	1/03/2023	0:00:00	Water		X	

SGS Melbourne EHS

ME332799 COC
Received: 07 – Mar – 2023

SE243914 SUBCON
Received: 02 – Mar – 2023

Cooler temperature:

Sample Condition Upon Receipt at Laboratory:

Special Instructions/Comments:
Job Booked by: Emily 2/3/23 Job received date: 2/3/23
Loggin Checked by:
surcharge 100/30/15/7.5

#1 Released by: (Sig)	Date:	#2 Released by: (Sig)	Date:	#3 Released by: (Sig)	Date:
Company Name:	Time	Company Name:	Time	Company Name:	Time
#1 Received by: (Sig) Jayden Stolk	Date 7/3	#2 Received by: (Sig)	Date	#3 Received by: (Sig)	Date
Company Name:	Time: 9:30	Company Name:	Time:	Company Name:	Time:

SGS Notting Hill Bottle Map for Water & Soil Samples

Temperature	22°C	Ice Brick	1	Ice		Ice Pack		Esky	1	Bag		Box	1	Bucket	
Name + Date	JS - 9:30 - 7/3														

Bottle Type And Preservation Type

	Sample ID	Tray #	Soil	Water	Oil	1L Unpreserved Plastic	1L HNO3 Preserved Plastic	1L Unpreserved Glass	500mL Unpreserved Plastic	500mL Unpreserved Glass	250mL Unpreserved Plastic Bottle	250mL Unpreserved Plastic Jar	250mL H2SO4 Plastic	250mL Zn acetate & NaOH Plastic	250mL Unpreserved Glass Jar	200mL Unpreserved Glass	150mL Unpreserved Plastic Jar	125mL Unpreserved Plastic Bottle	125mL HNO3 (Filtered) Plastic (Dissolved meta	125mL HNO3 (Unfiltered) Plastic (Total Metals)	125mL NaOH Preserved Plastic Bottle	125mL H2SO4 Plastic	125mL Unpreserved Glass Jar	100mL Unpreserved Glass	70mL Unpreserved Plastic Container	50mL Unpreserved Plastic	40mL Unpreserved Glass vial	40mL Na2S2O3 Glass vial	40mL H2SO4 Glass vial	40mL NH4Cl Glass vial	40mL Diluted HCl Glass vial	10mL Unpreserved Glass	Plastic bag	Number of labels to be printed per sample ID
1	SE243914.001	H13		1														1																1
2	.002	↓		1														1																1
3	.003			1														1																1
4	.004			1														1																1
5	.005			1														1																1
6	.006			1														1																1
7																																		
8																																		
9																																		
10																																		

Comments:

Sheet 1 of 1

Site: 600-660 ELIZABETH ST, REDFERN

Project No: E2SQUP

Laboratory: SGS Australia
Unit 16, 33 Maddox Street,
ALEXANDRIA NSW 2015
P: 02 8594 0400 F: 02 8594 0499

Sample ID	Laboratory ID	Container Type	Sampling Date	Sampling Time	Sample Matrix: SOIL	WATER	0.45 µm field filtered	OTHER	Analysis: HM[A] /TRH/BTEX/PAHs OCP/OP/PCB/Asbestos	HM[A] /TRH/BTEX/PAHs	HM[A] /TRH/BTEX	BTEX	Phenols, Cyanide	Asbestos	Asbestos Quantification	Excavated Natural Material (ENM) Suite	ENM Suite - Stockpile discrete (TRH/BTEX/PAHs)	ENM Suite - Stockpile composite (HM[A] /pH / EC / Foreign Materials)	Dewatering Suite	pH / Turbidity	sPOCAS	Chromium Reducible Sulfur (CrS)	Oil and Grease	pH / CEC (cation exchange)	pH / EC (electrical conductivity)	Sulphate / Chloride	Hold	TCLP HM[B] / PAH
GW_BH601M	1	S,P,3xVC	1/3/23	AM/PM		X				X			X							X			X				
GW_BH601M	2									X			X							X			X				
GW_BH603M	3									X			X							X			X				
GW_MW11	4									X			X							X			X				
GW_MW20	5									X			X							X			X				
GW_MW21	6									X			X							X			X				
GW_QD	7										X																
GW_QT											X																
GW_QR	8										X																
GW_QRQB		V	V	V																					X		
TB	9	LAB PREPARED				V						X															
TS	10	LAB PREPARED										X															

HM[A]: Arsenic, Cadmium, Chromium (III & VI), Copper, Lead, Mercury, Nickel, Zinc + Al, iron

HM[B]: Arsenic, Cadmium, Chromium, Lead, Mercury, Nickel

Dewatering Suite: pH & EC, TDS / TDU, Hardness, Total Cyanide, Metals (Al, As, Cd, Cr, Cu, Pb, Hg, Ni, Zn), TRH (F1, F2, F3, F4), BTEX, PAH, Total Phenol

LABORATORY TURNAROUND

- [ ] Standard
- [ ] 24 Hours
- [ ] 48 Hours
- [X] 72 Hours
- [ ] Other____

Container Type:
J = solvent washed, acid rinsed, Tefton sealed glass jar
S = solvent washed, acid rinsed glass bottle
P = natural HDPE plastic bottle
VC = glass vial, Tefton Septum
ZLB = Zip-Lock Bag BB = Bulk Bag

eiaustralia
Contamination | Remediation | Geotechnical
Suite 6.01, 55 Miller Street,
PYRMONT NSW 2009
Ph: 9516 0722
lab@eiaustralia.com.au

COC June 2021 FORM v.5 - SGS

Investigator: I attest that these samples were collected in accordance with standard EI field sampling procedures.

Report with EI Waste Classification Table ☐

Sampler's Name (EI): GT	Received by (SGS):
Print: GEISIANE TORRES	Print:
Signature: GT	Signature: B. Subaran
Date: 2/3/23	Date: 02/03/23 @1.50

Sampler's Comments:
* CC: SHARON LI
* PLEASE FORWARD SAMPLE GW_QT TO ENVIROLAB

IMPORTANT:
Please e-mail laboratory results to: lab@eiaustralia.com.au

SGS EHS Sydney COC
SE243914

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

CERTIFICATE OF ANALYSIS 317833

Client Details

Client	EI Australia
Attention	Lab Email, Sharon Li
Address	Suite 6.01, 55 Miller Street, Pyrmont, NSW, 2009

Sample Details

Your Reference	**E25947, Redfern**
Number of Samples	1 Water
Date samples received	03/03/2023
Date completed instructions received	03/03/2023

Analysis Details

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

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

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

Report Details

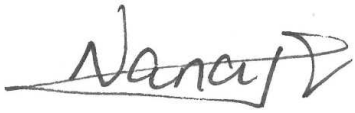
Date results requested by	08/03/2023
Date of Issue	07/03/2023

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

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

Results Approved By
Josh Williams, Organics Supervisor
Kyle Gavrily, Senior Chemist
Loren Bardwell, Development Chemist

Authorised By



Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Water		
Our Reference		317833-1
Your Reference	UNITS	GW-QT
Date Sampled		01/03/2023
Type of sample		Water
Date extracted	-	06/03/2023
Date analysed	-	07/03/2023
TRH C_6 - C_9	µg/L	<10
TRH C_6 - C_{10}	µg/L	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10
Benzene	µg/L	<1
Toluene	µg/L	<1
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	<2
o-xylene	µg/L	<1
Naphthalene	µg/L	<1
Surrogate Dibromofluoromethane	%	127
Surrogate toluene-d8	%	115
Surrogate 4-BFB	%	108

svTRH (C10-C40) in Water		
Our Reference		317833-1
Your Reference	UNITS	GW-QT
Date Sampled		01/03/2023
Type of sample		Water
Date extracted	-	06/03/2023
Date analysed	-	07/03/2023
TRH C_{10} - C_{14}	µg/L	<50
TRH C_{15} - C_{28}	µg/L	<100
TRH C_{29} - C_{36}	µg/L	<100
Total +ve TRH (C10-C36)	µg/L	<50
TRH >C_{10} - C_{16}	µg/L	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50
TRH >C_{16} - C_{34}	µg/L	<100
TRH >C_{34} - C_{40}	µg/L	<100
Total +ve TRH (>C10-C40)	µg/L	<50
Surrogate o-Terphenyl	%	78

HM in water - dissolved		
Our Reference	UNITS	317833-1
Your Reference		GW-QT
Date Sampled		01/03/2023
Type of sample		Water
Date prepared	-	06/03/2023
Date analysed	-	06/03/2023
Arsenic-Dissolved	µg/L	<1
Cadmium-Dissolved	µg/L	<0.1
Chromium-Dissolved	µg/L	<1
Copper-Dissolved	µg/L	2
Lead-Dissolved	µg/L	<1
Mercury-Dissolved	µg/L	<0.05
Nickel-Dissolved	µg/L	<1
Zinc-Dissolved	µg/L	7

Method ID	Methodology Summary
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			06/03/2023	[NT]	[NT]	[NT]	[NT]	06/03/2023	[NT]
Date analysed	-			07/03/2023	[NT]	[NT]	[NT]	[NT]	07/03/2023	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	112	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	112	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	115	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	120	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	112	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	112	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	118	[NT]
Naphthalene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	118	[NT]	[NT]	[NT]	[NT]	110	[NT]
Surrogate toluene-d8	%		Org-023	112	[NT]	[NT]	[NT]	[NT]	106	[NT]
Surrogate 4-BFB	%		Org-023	109	[NT]	[NT]	[NT]	[NT]	117	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			06/03/2023	[NT]	[NT]	[NT]	[NT]	06/03/2023	[NT]
Date analysed	-			07/03/2023	[NT]	[NT]	[NT]	[NT]	07/03/2023	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	81	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	95	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	71	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	81	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	95	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	71	[NT]
Surrogate o-Terphenyl	%		Org-020	66	[NT]	[NT]	[NT]	[NT]	75	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			06/03/2023	[NT]	[NT]	[NT]	[NT]	06/03/2023	[NT]
Date analysed	-			06/03/2023	[NT]	[NT]	[NT]	[NT]	06/03/2023	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	95	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	[NT]	[NT]	[NT]	[NT]	106	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]

Result Definitions

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

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

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

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

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

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

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

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

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

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

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

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

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

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Geisiane Torres
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	Geisiane.Torres @eiaustralia.com.au
Project	**E25947 600-660 Elizabeth St Redfern**
Order Number	**E25947**
Samples	10

LABORATORY DETAILS

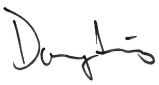
Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE243914 R0**
Date Received	2/3/2023
Date Reported	20/3/2023

COMMENTS

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

Arsenic (III&V) subcontracted to SGS Melbourne, 10/585 Blackburn Road, Notting Hill, VIC, NATA Accreditation Numbe. 2562/14420. Report No. ME332799
Hexavalent Chromium - The Limit of Reporting (LOR) has been raised due to matrix interference.

SIGNATORIES



Dong LIANG
Metals/Inorganics Team Leader

Huong CRAWFORD
Production Manager

Ly Kim HA
Organic Section Head

Shane MCDERMOTT
Inorganic/Metals Chemist

VOCs in Water [AN433] Tested: 3/3/2023

PARAMETER	UOM	LOR	GW_BH502M WATER - 1/3/2023 SE243914.001	GW_BH504M WATER - 1/3/2023 SE243914.002	GW_BH505M WATER - 1/3/2023 SE243914.003	GW-MW11 WATER - 1/3/2023 SE243914.004	GW-MW20 WATER - 1/3/2023 SE243914.005
Benzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
m/p-xylene	µg/L	1	<1	<1	<1	<1	<1
o-xylene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Xylenes	µg/L	1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Total BTEX	µg/L	3	<3	<3	<3	<3	<3
Naphthalene (VOC)*	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5

PARAMETER	UOM	LOR	GW-MW21 WATER - 1/3/2023 SE243914.006	GW-QD WATER - 1/3/2023 SE243914.007	GW-QR WATER - 1/3/2023 SE243914.008	TB WATER - 1/3/2023 SE243914.009	TS WATER - 1/3/2023 SE243914.010
Benzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	[103%]
Toluene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	[103%]
Ethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	[108%]
m/p-xylene	µg/L	1	<1	<1	<1	<1	[105%]
o-xylene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	[105%]
Total Xylenes	µg/L	1.5	<1.5	<1.5	<1.5	<1.5	-
Total BTEX	µg/L	3	<3	<3	<3	<3	-
Naphthalene (VOC)*	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	[96%]

Volatile Petroleum Hydrocarbons in Water [AN433] Tested: 3/3/2023

PARAMETER	UOM	LOR	GW_BH502M WATER - 1/3/2023 SE243914.001	GW_BH504M WATER - 1/3/2023 SE243914.002	GW_BH505M WATER - 1/3/2023 SE243914.003	GW-MW11 WATER - 1/3/2023 SE243914.004	GW-MW20 WATER - 1/3/2023 SE243914.005
TRH C6-C9	µg/L	40	<40	<40	<40	<40	<40
Benzene (F0)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TRH C6-C10	µg/L	50	<50	<50	<50	<50	<50
TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	<50	<50	<50	<50

PARAMETER	UOM	LOR	GW-MW21 WATER - 1/3/2023 SE243914.006	GW-QD WATER - 1/3/2023 SE243914.007	GW-QR WATER - 1/3/2023 SE243914.008
TRH C6-C9	µg/L	40	<40	<40	<40
Benzene (F0)	µg/L	0.5	<0.5	<0.5	<0.5
TRH C6-C10	µg/L	50	<50	<50	<50
TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	<50	<50

TRH (Total Recoverable Hydrocarbons) in Water [AN403] Tested: 3/3/2023

PARAMETER	UOM	LOR	GW_BH502M WATER - 1/3/2023 SE243914.001	GW_BH504M WATER - 1/3/2023 SE243914.002	GW_BH505M WATER - 1/3/2023 SE243914.003	GW-MW11 WATER - 1/3/2023 SE243914.004	GW-MW20 WATER - 1/3/2023 SE243914.005
TRH C10-C14	µg/L	50	<50	<50	<50	<50	<50
TRH C15-C28	µg/L	200	<200	<200	<200	<200	<200
TRH C29-C36	µg/L	200	<200	<200	<200	<200	<200
TRH C37-C40	µg/L	200	<200	<200	<200	<200	<200
TRH >C10-C16	µg/L	60	<60	<60	<60	<60	<60
TRH >C10-C16 - Naphthalene (F2)	µg/L	60	<60	<60	<60	<60	<60
TRH >C16-C34 (F3)	µg/L	500	<500	<500	<500	<500	<500
TRH >C34-C40 (F4)	µg/L	500	<500	<500	<500	<500	<500
TRH C10-C40	µg/L	320	<320	<320	<320	<320	<320

PARAMETER	UOM	LOR	GW-MW21 WATER - 1/3/2023 SE243914.006	GW-QD WATER - 1/3/2023 SE243914.007	GW-QR WATER - 1/3/2023 SE243914.008
TRH C10-C14	µg/L	50	<50	<50	<50
TRH C15-C28	µg/L	200	<200	<200	<200
TRH C29-C36	µg/L	200	<200	<200	<200
TRH C37-C40	µg/L	200	<200	<200	<200
TRH >C10-C16	µg/L	60	<60	<60	<60
TRH >C10-C16 - Naphthalene (F2)	µg/L	60	<60	<60	<60
TRH >C16-C34 (F3)	µg/L	500	<500	<500	<500
TRH >C34-C40 (F4)	µg/L	500	<500	<500	<500
TRH C10-C40	µg/L	320	<320	<320	<320

PAH (Polynuclear Aromatic Hydrocarbons) in Water [AN420] Tested: 3/3/2023

PARAMETER	UOM	LOR	GW_BH502M WATER - 1/3/2023 SE243914.001	GW_BH504M WATER - 1/3/2023 SE243914.002	GW_BH505M WATER - 1/3/2023 SE243914.003	GW-MW11 WATER - 1/3/2023 SE243914.004	GW-MW20 WATER - 1/3/2023 SE243914.005
Naphthalene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2-methylnaphthalene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1-methylnaphthalene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b&j)fluoranthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(ah)anthracene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total PAH (18)	µg/L	1	<1	<1	<1	<1	<1

PARAMETER	UOM	LOR	GW-MW21 WATER - 1/3/2023 SE243914.006
Naphthalene	µg/L	0.1	<0.1
2-methylnaphthalene	µg/L	0.1	<0.1
1-methylnaphthalene	µg/L	0.1	<0.1
Acenaphthylene	µg/L	0.1	<0.1
Acenaphthene	µg/L	0.1	<0.1
Fluorene	µg/L	0.1	<0.1
Phenanthrene	µg/L	0.1	<0.1
Anthracene	µg/L	0.1	<0.1
Fluoranthene	µg/L	0.1	<0.1
Pyrene	µg/L	0.1	<0.1
Benzo(a)anthracene	µg/L	0.1	<0.1
Chrysene	µg/L	0.1	<0.1
Benzo(b&j)fluoranthene	µg/L	0.1	<0.1
Benzo(k)fluoranthene	µg/L	0.1	<0.1
Benzo(a)pyrene	µg/L	0.1	<0.1
Indeno(1,2,3-cd)pyrene	µg/L	0.1	<0.1
Dibenzo(ah)anthracene	µg/L	0.1	<0.1
Benzo(ghi)perylene	µg/L	0.1	<0.1
Total PAH (18)	µg/L	1	<1

Total Phenolics in Water [AN295] Tested: 3/3/2023

PARAMETER	UOM	LOR	GW_BH502M WATER - 1/3/2023 SE243914.001	GW_BH504M WATER - 1/3/2023 SE243914.002	GW_BH505M WATER - 1/3/2023 SE243914.003	GW-MW11 WATER - 1/3/2023 SE243914.004	GW-MW20 WATER - 1/3/2023 SE243914.005
Total Phenols	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05

PARAMETER	UOM	LOR	GW-MW21 WATER - 1/3/2023 SE243914.006
Total Phenols	mg/L	0.05	<0.05

Total Cyanide in water by Discrete Analyser [AN077/AN287] Tested: 3/3/2023

PARAMETER	UOM	LOR	GW_BH502M WATER - 1/3/2023 SE243914.001	GW_BH504M WATER - 1/3/2023 SE243914.002	GW_BH505M WATER - 1/3/2023 SE243914.003	GW-MW11 WATER - 1/3/2023 SE243914.004	GW-MW20 WATER - 1/3/2023 SE243914.005
Total Cyanide	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004

PARAMETER	UOM	LOR	GW-MW21 WATER - 1/3/2023 SE243914.006
Total Cyanide	mg/L	0.004	<0.004

pH in water [AN101] Tested: 2/3/2023

PARAMETER	UOM	LOR	GW_BH502M WATER - 1/3/2023 SE243914.001	GW_BH504M WATER - 1/3/2023 SE243914.002	GW_BH505M WATER - 1/3/2023 SE243914.003	GW-MW11 WATER - 1/3/2023 SE243914.004	GW-MW20 WATER - 1/3/2023 SE243914.005
pH**	No unit	-	6.3	6.1	6.2	6.1	5.9

PARAMETER	UOM	LOR	GW-MW21 WATER - 1/3/2023 SE243914.006
pH**	No unit	-	6.0

Turbidity [AN119] Tested: 2/3/2023

PARAMETER	UOM	LOR	GW_BH502M WATER - 1/3/2023 SE243914.001	GW_BH504M WATER - 1/3/2023 SE243914.002	GW_BH505M WATER - 1/3/2023 SE243914.003	GW-MW11 WATER - 1/3/2023 SE243914.004	GW-MW20 WATER - 1/3/2023 SE243914.005
Turbidity	NTU	0.5	12	26	24	21	19

PARAMETER	UOM	LOR	GW-MW21 WATER - 1/3/2023 SE243914.006
Turbidity	NTU	0.5	770

Hexavalent Chromium in water by Discrete Analyser [AN283] Tested: 2/3/2023

PARAMETER	UOM	LOR	GW_BH502M WATER - 1/3/2023 SE243914.001	GW_BH504M WATER - 1/3/2023 SE243914.002	GW_BH505M WATER - 1/3/2023 SE243914.003	GW-MW11 WATER - 1/3/2023 SE243914.004	GW-MW20 WATER - 1/3/2023 SE243914.005
Hexavalent Chromium, Cr6+	mg/L	0.004	<0.020↑	<0.020↑	<0.004	<0.004	<0.004
Trivalent Chromium, Cr3+	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005

PARAMETER	UOM	LOR	GW-MW21 WATER - 1/3/2023 SE243914.006
Hexavalent Chromium, Cr6+	mg/L	0.004	<0.004
Trivalent Chromium, Cr3+	mg/L	0.005	<0.005

Oil and Grease in Water [AN185] Tested: 3/3/2023

PARAMETER	UOM	LOR	GW_BH502M WATER - 1/3/2023 SE243914.001	GW_BH504M WATER - 1/3/2023 SE243914.002	GW_BH505M WATER - 1/3/2023 SE243914.003	GW-MW11 WATER - 1/3/2023 SE243914.004	GW-MW20 WATER - 1/3/2023 SE243914.005
Oil and Grease	mg/L	5	<5	<5	<5	<5	<5

PARAMETER	UOM	LOR	GW-MW21 WATER - 1/3/2023 SE243914.006
Oil and Grease	mg/L	5	<5

Trace Metals (Dissolved) in Water by ICPMS [AN318] Tested: 6/3/2023

PARAMETER	UOM	LOR	GW_BH502M WATER - 1/3/2023 SE243914.001	GW_BH504M WATER - 1/3/2023 SE243914.002	GW_BH505M WATER - 1/3/2023 SE243914.003	GW-MW11 WATER - 1/3/2023 SE243914.004	GW-MW20 WATER - 1/3/2023 SE243914.005
Arsenic	µg/L	1	3	<1	3	<1	2
Cadmium	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	µg/L	1	<1	<1	<1	<1	<1
Copper	µg/L	1	<1	1	2	9	<1
Lead	µg/L	1	1	<1	<1	<1	<1
Nickel	µg/L	1	<1	1	1	<1	2
Zinc	µg/L	5	17	7	8	9	7
Aluminium	µg/L	5	170	71	11	32	37
Iron	µg/L	5	3000	2200	9600	120	12000

PARAMETER	UOM	LOR	GW-MW21 WATER - 1/3/2023 SE243914.006	GW-QD WATER - 1/3/2023 SE243914.007	GW-QR WATER - 1/3/2023 SE243914.008
Arsenic	µg/L	1	6	<1	<1
Cadmium	µg/L	0.1	<0.1	<0.1	<0.1
Chromium	µg/L	1	<1	<1	<1
Copper	µg/L	1	1	2	<1
Lead	µg/L	1	<1	<1	<1
Nickel	µg/L	1	1	<1	<1
Zinc	µg/L	5	12	<5	<5
Aluminium	µg/L	5	110	-	-
Iron	µg/L	5	2500	-	-

Mercury (dissolved) in Water [AN311(Perth)/AN312] Tested: 6/3/2023

PARAMETER	UOM	LOR	GW_BH502M WATER - 1/3/2023 SE243914.001	GW_BH504M WATER - 1/3/2023 SE243914.002	GW_BH505M WATER - 1/3/2023 SE243914.003	GW-MW11 WATER - 1/3/2023 SE243914.004	GW-MW20 WATER - 1/3/2023 SE243914.005
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

PARAMETER	UOM	LOR	GW-MW21 WATER - 1/3/2023 SE243914.006	GW-QD WATER - 1/3/2023 SE243914.007	GW-QR WATER - 1/3/2023 SE243914.008
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001

Metals in Water Speciated [MA1400_SP] Tested: 20/3/2023

PARAMETER	UOM	LOR	GW_BH502M WATER - 1/3/2023 SE243914.001	GW_BH504M WATER - 1/3/2023 SE243914.002	GW_BH505M WATER - 1/3/2023 SE243914.003	GW-MW11 WATER - 1/3/2023 SE243914.004	GW-MW20 WATER - 1/3/2023 SE243914.005
Arsenic (III)*	µg/L	0.5	**0.9**	**1.3**	**1.0**	**0.9**	**1.0**
Arsenic (V)*	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5

PARAMETER	UOM	LOR	GW-MW21 WATER - 1/3/2023 SE243914.006
Arsenic (III)*	µg/L	0.5	**0.9**
Arsenic (V)*	µg/L	0.5	<0.5

METHOD	METHODOLOGY SUMMARY
AN020	Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
AN077	Hydrogen cyanide is liberated from an acidified sample by distillation and purging with air. The hydrogen cyanide gas is then collected by passing it through a sodium hydroxide scrubbing solution. The scrubbing solution will then be analysed for cyanide by the appropriate method.
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN119	Turbidity by Nepholometry: Small particles in a light beam scatter light at a range of angles. A turbidimeter measures this scatter and reports results compared to turbidity standards, in NTU. This procedure is not suitable for very dark coloured liquids or samples with high solids because light absorption causes artificially low light scatter and low turbidity. Reference APHA 2130B.
AN185	Gravimetric Oil & Grease and Hydrocarbons: A known volume of sample is extracted using an organic solvent and the solvent layer with dissolved oils and greases is transferred to a pre-weighed beaker. The solvent is evaporated over low heating and the beaker reweighed. The concentration of oil and grease is determined by the increase in mass of the collection beaker per volume of sample extracted. O&G is suitable for lubricating oils and other high boiling point products but is not suitable for volatiles. Reference to APHA 5520 B and USEPA 1664 Revision B .. Internal Reference AN185
AN283	Hexavalent Chromium via DA: Soluble hexavalent chromium forms a red/violet colour with diphenylcarbazide in acidic solution. This procedure is very sensitive and nearly specific for Cr 6+. If total chromium is also measured the trivalent form of chromium Cr3+ can be calculated from the difference (Total Cr - Cr6+). Reference APHA3500CrB.
AN287	A buffered distillate or water sample is treated with chloramine/barbituric acid reagents and the intensity of the colour developed is proportional to the cyanide concentration by DA.
AN295	The water sample or extract of sample is distilled in a phosphoric acid stream. Phenolic compounds in the distillate react with a reagent stream of potassium hexacyanoferrate(III) and 4-Amino-2,3-dimethyl-3-pryazolin-5-one in an alkaline medium to form a coloured complex which is analysed spectrophotometrically onboard a continuous flow analyser.
AN311(Perth)/AN312	Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
AN318	Determination of elements at trace level in waters by ICP-MS technique,, referenced to USEPA 6020B and USEPA 200.8 (5.4).
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36 and in recognition of the NEPM 1999 (2013), >C10-C16 (F2), >C16-C34 (F3) and >C34-C40 (F4). Where F2 is corrected for Naphthalene, the VOC data for Naphthalene is used.
AN403	Additionally, the volatile C6-C9/C6-C10 fractions may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Recoveerable Hydrocarbons - Silica (TRH-Silica) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with differential polarity of the eluent solvents.
AN403	The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependent on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.
AN420	(SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols (etc) in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D). Total PAH calculated from individual analyte detections at or above the limit of reporting .
AN433	VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC`s are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.
MA1400_SP	Speciated metals are determined by liquid chromatography – inductively coupled plasma mass spectrometer (LC /ICPMS) after an appropriate sample preparation as determined by the target metals species.

FOOTNOTES

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

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

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

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

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

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

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

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

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

STATEMENT OF QA/QC PERFORMANCE

SE243914 R0

CLIENT DETAILS

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Project	**E25947 600-660 Elizabeth St Redfern**
Order Number	**E25947**
Samples	10

LABORATORY DETAILS

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SGS Reference	**SE243914 R0**
Date Received	02 Mar 2023
Date Reported	20 Mar 2023

COMMENTS

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

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

All Data Quality Objectives were met (within the SGS Alexandria Environmental laboratory).

SAMPLE SUMMARY

Sample counts by matrix	10 Water	Type of documentation received	COC
Date documentation received	2/3/2023	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	11.6°C
Sample container provider	SGS	Turnaround time requested	Three Days
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	Ice Bricks	Samples clearly labelled	Yes
Complete documentation received	Yes		

HOLDING TIME SUMMARY

SE243914 R0

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

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

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

Hexavalent Chromium in water by Discrete Analyser

Method: ME-(AU)-[ENV]AN283

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
GW_BH502M	SE243914.001	LB272915	01 Mar 2023	02 Mar 2023	29 Mar 2023	02 Mar 2023	29 Mar 2023	07 Mar 2023
GW_BH504M	SE243914.002	LB272915	01 Mar 2023	02 Mar 2023	29 Mar 2023	02 Mar 2023	29 Mar 2023	07 Mar 2023
GW_BH505M	SE243914.003	LB272915	01 Mar 2023	02 Mar 2023	29 Mar 2023	02 Mar 2023	29 Mar 2023	07 Mar 2023
GW-MW11	SE243914.004	LB272915	01 Mar 2023	02 Mar 2023	29 Mar 2023	02 Mar 2023	29 Mar 2023	07 Mar 2023
GW-MW20	SE243914.005	LB272915	01 Mar 2023	02 Mar 2023	29 Mar 2023	02 Mar 2023	29 Mar 2023	07 Mar 2023
GW-MW21	SE243914.006	LB272915	01 Mar 2023	02 Mar 2023	29 Mar 2023	02 Mar 2023	29 Mar 2023	07 Mar 2023

Mercury (dissolved) in Water

Method: ME-(AU)-[ENV]AN311(Perth)/AN312

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
GW_BH502M	SE243914.001	LB273119	01 Mar 2023	02 Mar 2023	29 Mar 2023	06 Mar 2023	29 Mar 2023	07 Mar 2023
GW_BH504M	SE243914.002	LB273119	01 Mar 2023	02 Mar 2023	29 Mar 2023	06 Mar 2023	29 Mar 2023	07 Mar 2023
GW_BH505M	SE243914.003	LB273119	01 Mar 2023	02 Mar 2023	29 Mar 2023	06 Mar 2023	29 Mar 2023	07 Mar 2023
GW-MW11	SE243914.004	LB273119	01 Mar 2023	02 Mar 2023	29 Mar 2023	06 Mar 2023	29 Mar 2023	07 Mar 2023
GW-MW20	SE243914.005	LB273119	01 Mar 2023	02 Mar 2023	29 Mar 2023	06 Mar 2023	29 Mar 2023	07 Mar 2023
GW-MW21	SE243914.006	LB273119	01 Mar 2023	02 Mar 2023	29 Mar 2023	06 Mar 2023	29 Mar 2023	07 Mar 2023
GW-QD	SE243914.007	LB273119	01 Mar 2023	02 Mar 2023	29 Mar 2023	06 Mar 2023	29 Mar 2023	07 Mar 2023
GW-QR	SE243914.008	LB273119	01 Mar 2023	02 Mar 2023	29 Mar 2023	06 Mar 2023	29 Mar 2023	07 Mar 2023

Oil and Grease in Water

Method: ME-(AU)-[ENV]AN185

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
GW_BH502M	SE243914.001	LB272964	01 Mar 2023	02 Mar 2023	29 Mar 2023	03 Mar 2023	29 Mar 2023	07 Mar 2023
GW_BH504M	SE243914.002	LB272964	01 Mar 2023	02 Mar 2023	29 Mar 2023	03 Mar 2023	29 Mar 2023	07 Mar 2023
GW_BH505M	SE243914.003	LB272964	01 Mar 2023	02 Mar 2023	29 Mar 2023	03 Mar 2023	29 Mar 2023	07 Mar 2023
GW-MW11	SE243914.004	LB272964	01 Mar 2023	02 Mar 2023	29 Mar 2023	03 Mar 2023	29 Mar 2023	07 Mar 2023
GW-MW20	SE243914.005	LB272964	01 Mar 2023	02 Mar 2023	29 Mar 2023	03 Mar 2023	29 Mar 2023	07 Mar 2023
GW-MW21	SE243914.006	LB272964	01 Mar 2023	02 Mar 2023	29 Mar 2023	03 Mar 2023	29 Mar 2023	07 Mar 2023

PAH (Polynuclear Aromatic Hydrocarbons) in Water

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

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
GW_BH502M	SE243914.001	LB272933	01 Mar 2023	02 Mar 2023	08 Mar 2023	03 Mar 2023	12 Apr 2023	07 Mar 2023
GW_BH504M	SE243914.002	LB272933	01 Mar 2023	02 Mar 2023	08 Mar 2023	03 Mar 2023	12 Apr 2023	07 Mar 2023
GW_BH505M	SE243914.003	LB272933	01 Mar 2023	02 Mar 2023	08 Mar 2023	03 Mar 2023	12 Apr 2023	07 Mar 2023
GW-MW11	SE243914.004	LB272933	01 Mar 2023	02 Mar 2023	08 Mar 2023	03 Mar 2023	12 Apr 2023	07 Mar 2023
GW-MW20	SE243914.005	LB272933	01 Mar 2023	02 Mar 2023	08 Mar 2023	03 Mar 2023	12 Apr 2023	07 Mar 2023
GW-MW21	SE243914.006	LB272933	01 Mar 2023	02 Mar 2023	08 Mar 2023	03 Mar 2023	12 Apr 2023	07 Mar 2023
GW-QD	SE243914.007	LB272933	01 Mar 2023	02 Mar 2023	08 Mar 2023	03 Mar 2023	12 Apr 2023	07 Mar 2023
GW-QR	SE243914.008	LB272933	01 Mar 2023	02 Mar 2023	08 Mar 2023	03 Mar 2023	12 Apr 2023	07 Mar 2023

pH in water

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

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
GW_BH502M	SE243914.001	LB272908	01 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023
GW_BH504M	SE243914.002	LB272908	01 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023
GW_BH505M	SE243914.003	LB272908	01 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023
GW-MW11	SE243914.004	LB272908	01 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023
GW-MW20	SE243914.005	LB272908	01 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023
GW-MW21	SE243914.006	LB272908	01 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023

Total Cyanide in water by Discrete Analyser

Method: ME-(AU)-[ENV]AN077/AN287

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
GW_BH502M	SE243914.001	LB272958	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
GW_BH504M	SE243914.002	LB272958	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
GW_BH505M	SE243914.003	LB272958	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
GW-MW11	SE243914.004	LB272958	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
GW-MW20	SE243914.005	LB272958	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
GW-MW21	SE243914.006	LB272958	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023

Total Phenolics in Water

Method: ME-(AU)-[ENV]AN295

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
GW_BH502M	SE243914.001	LB272935	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	07 Mar 2023
GW_BH504M	SE243914.002	LB272935	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	07 Mar 2023
GW_BH505M	SE243914.003	LB272935	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	07 Mar 2023
GW-MW11	SE243914.004	LB272935	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	07 Mar 2023
GW-MW20	SE243914.005	LB272935	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	07 Mar 2023

HOLDING TIME SUMMARY

SE243914 R0

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

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

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

Total Phenolics in Water (continued)

Method: ME-(AU)-[ENV]AN295

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
GW-MW21	SE243914.006	LB272935	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	07 Mar 2023

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
GW_BH502M	SE243914.001	LB273102	01 Mar 2023	02 Mar 2023	28 Aug 2023	06 Mar 2023	28 Aug 2023	06 Mar 2023
GW_BH504M	SE243914.002	LB273102	01 Mar 2023	02 Mar 2023	28 Aug 2023	06 Mar 2023	28 Aug 2023	06 Mar 2023
GW_BH505M	SE243914.003	LB273102	01 Mar 2023	02 Mar 2023	28 Aug 2023	06 Mar 2023	28 Aug 2023	06 Mar 2023
GW-MW11	SE243914.004	LB273102	01 Mar 2023	02 Mar 2023	28 Aug 2023	06 Mar 2023	28 Aug 2023	06 Mar 2023
GW-MW20	SE243914.005	LB273102	01 Mar 2023	02 Mar 2023	28 Aug 2023	06 Mar 2023	28 Aug 2023	06 Mar 2023
GW-MW21	SE243914.006	LB273102	01 Mar 2023	02 Mar 2023	28 Aug 2023	06 Mar 2023	28 Aug 2023	06 Mar 2023
GW-QD	SE243914.007	LB273102	01 Mar 2023	02 Mar 2023	28 Aug 2023	06 Mar 2023	28 Aug 2023	06 Mar 2023
GW-QR	SE243914.008	LB273102	01 Mar 2023	02 Mar 2023	28 Aug 2023	06 Mar 2023	28 Aug 2023	06 Mar 2023

TRH (Total Recoverable Hydrocarbons) in Water

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

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
GW_BH502M	SE243914.001	LB272933	01 Mar 2023	02 Mar 2023	08 Mar 2023	03 Mar 2023	12 Apr 2023	07 Mar 2023
GW_BH504M	SE243914.002	LB272933	01 Mar 2023	02 Mar 2023	08 Mar 2023	03 Mar 2023	12 Apr 2023	07 Mar 2023
GW_BH505M	SE243914.003	LB272933	01 Mar 2023	02 Mar 2023	08 Mar 2023	03 Mar 2023	12 Apr 2023	07 Mar 2023
GW-MW11	SE243914.004	LB272933	01 Mar 2023	02 Mar 2023	08 Mar 2023	03 Mar 2023	12 Apr 2023	07 Mar 2023
GW-MW20	SE243914.005	LB272933	01 Mar 2023	02 Mar 2023	08 Mar 2023	03 Mar 2023	12 Apr 2023	07 Mar 2023
GW-MW21	SE243914.006	LB272933	01 Mar 2023	02 Mar 2023	08 Mar 2023	03 Mar 2023	12 Apr 2023	07 Mar 2023
GW-QD	SE243914.007	LB272933	01 Mar 2023	02 Mar 2023	08 Mar 2023	03 Mar 2023	12 Apr 2023	07 Mar 2023
GW-QR	SE243914.008	LB272933	01 Mar 2023	02 Mar 2023	08 Mar 2023	03 Mar 2023	12 Apr 2023	07 Mar 2023

Turbidity

Method: ME-(AU)-[ENV]AN119

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
GW_BH502M	SE243914.001	LB272909	01 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023
GW_BH504M	SE243914.002	LB272909	01 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023
GW_BH505M	SE243914.003	LB272909	01 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023
GW-MW11	SE243914.004	LB272909	01 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023
GW-MW20	SE243914.005	LB272909	01 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023
GW-MW21	SE243914.006	LB272909	01 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023	02 Mar 2023

VOCs in Water

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

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
GW_BH502M	SE243914.001	LB272946	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
GW_BH504M	SE243914.002	LB272946	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
GW_BH505M	SE243914.003	LB272946	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
GW-MW11	SE243914.004	LB272946	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
GW-MW20	SE243914.005	LB272946	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
GW-MW21	SE243914.006	LB272946	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
GW-QD	SE243914.007	LB272946	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
GW-QR	SE243914.008	LB272946	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
TB	SE243914.009	LB272946	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
TS	SE243914.010	LB272946	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023

Volatile Petroleum Hydrocarbons in Water

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

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
GW_BH502M	SE243914.001	LB272946	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
GW_BH504M	SE243914.002	LB272946	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
GW_BH505M	SE243914.003	LB272946	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
GW-MW11	SE243914.004	LB272946	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
GW-MW20	SE243914.005	LB272946	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
GW-MW21	SE243914.006	LB272946	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
GW-QD	SE243914.007	LB272946	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
GW-QR	SE243914.008	LB272946	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	06 Mar 2023
TB	SE243914.009	LB272946	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	07 Mar 2023
TS	SE243914.010	LB272946	01 Mar 2023	02 Mar 2023	15 Mar 2023	03 Mar 2023	15 Mar 2023	07 Mar 2023

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

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

PAH (Polynuclear Aromatic Hydrocarbons) in Water

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

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
2-fluorobiphenyl (Surrogate)	GW_BH502M	SE243914.001	%	40 - 130%	69
	GW_BH504M	SE243914.002	%	40 - 130%	78
	GW_BH505M	SE243914.003	%	40 - 130%	54
	GW-MW11	SE243914.004	%	40 - 130%	65
	GW-MW20	SE243914.005	%	40 - 130%	62
	GW-MW21	SE243914.006	%	40 - 130%	84
d14-p-terphenyl (Surrogate)	GW_BH502M	SE243914.001	%	40 - 130%	78
	GW_BH504M	SE243914.002	%	40 - 130%	78
	GW_BH505M	SE243914.003	%	40 - 130%	56
	GW-MW11	SE243914.004	%	40 - 130%	73
	GW-MW20	SE243914.005	%	40 - 130%	74
	GW-MW21	SE243914.006	%	40 - 130%	83
d5-nitrobenzene (Surrogate)	GW_BH502M	SE243914.001	%	40 - 130%	63
	GW_BH504M	SE243914.002	%	40 - 130%	73
	GW_BH505M	SE243914.003	%	40 - 130%	51
	GW-MW11	SE243914.004	%	40 - 130%	62
	GW-MW20	SE243914.005	%	40 - 130%	57
	GW-MW21	SE243914.006	%	40 - 130%	84

VOCs in Water

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

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	GW_BH502M	SE243914.001	%	40 - 130%	95
	GW_BH504M	SE243914.002	%	40 - 130%	93
	GW_BH505M	SE243914.003	%	40 - 130%	96
	GW-MW11	SE243914.004	%	40 - 130%	93
	GW-MW20	SE243914.005	%	40 - 130%	96
	GW-MW21	SE243914.006	%	40 - 130%	99
	GW-QD	SE243914.007	%	40 - 130%	94
	GW-QR	SE243914.008	%	40 - 130%	95
	TB	SE243914.009	%	40 - 130%	95
	TS	SE243914.010	%	40 - 130%	97
d4-1,2-dichloroethane (Surrogate)	GW_BH502M	SE243914.001	%	40 - 130%	98
	GW_BH504M	SE243914.002	%	40 - 130%	97
	GW_BH505M	SE243914.003	%	40 - 130%	96
	GW-MW11	SE243914.004	%	40 - 130%	98
	GW-MW20	SE243914.005	%	40 - 130%	97
	GW-MW21	SE243914.006	%	40 - 130%	98
	GW-QD	SE243914.007	%	40 - 130%	96
	GW-QR	SE243914.008	%	40 - 130%	99
	TB	SE243914.009	%	40 - 130%	98
	TS	SE243914.010	%	40 - 130%	86
d8-toluene (Surrogate)	GW_BH502M	SE243914.001	%	40 - 130%	93
	GW_BH504M	SE243914.002	%	40 - 130%	94
	GW_BH505M	SE243914.003	%	40 - 130%	94
	GW-MW11	SE243914.004	%	40 - 130%	93
	GW-MW20	SE243914.005	%	40 - 130%	95
	GW-MW21	SE243914.006	%	40 - 130%	96
	GW-QD	SE243914.007	%	40 - 130%	94
	GW-QR	SE243914.008	%	40 - 130%	93
	TB	SE243914.009	%	40 - 130%	93
	TS	SE243914.010	%	40 - 130%	99

Volatile Petroleum Hydrocarbons in Water

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

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	GW_BH502M	SE243914.001	%	40 - 130%	95
	GW_BH504M	SE243914.002	%	40 - 130%	93
	GW_BH505M	SE243914.003	%	40 - 130%	96
	GW-MW11	SE243914.004	%	40 - 130%	93
	GW-MW20	SE243914.005	%	40 - 130%	96
	GW-MW21	SE243914.006	%	40 - 130%	99
	GW-QD	SE243914.007	%	40 - 130%	94
	GW-QR	SE243914.008	%	40 - 130%	95

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

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

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

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
d4-1,2-dichloroethane (Surrogate)	GW_BH502M	SE243914.001	%	60 - 130%	98
	GW_BH504M	SE243914.002	%	60 - 130%	97
	GW_BH505M	SE243914.003	%	60 - 130%	96
	GW-MW11	SE243914.004	%	60 - 130%	98
	GW-MW20	SE243914.005	%	60 - 130%	97
	GW-MW21	SE243914.006	%	60 - 130%	98
	GW-QD	SE243914.007	%	60 - 130%	96
	GW-QR	SE243914.008	%	60 - 130%	99
d8-toluene (Surrogate)	GW_BH502M	SE243914.001	%	40 - 130%	93
	GW_BH504M	SE243914.002	%	40 - 130%	94
	GW_BH505M	SE243914.003	%	40 - 130%	94
	GW-MW11	SE243914.004	%	40 - 130%	93
	GW-MW20	SE243914.005	%	40 - 130%	95
	GW-MW21	SE243914.006	%	40 - 130%	96
	GW-QD	SE243914.007	%	40 - 130%	94
	GW-QR	SE243914.008	%	40 - 130%	93

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

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

Hexavalent Chromium in water by Discrete Analyser

Method: ME-(AU)-[ENV]AN283

Sample Number	Parameter	Units	LOR	Result
LB272915.001	Hexavalent Chromium, Cr6+	mg/L	0.004	<0.004

Mercury (dissolved) in Water

Method: ME-(AU)-[ENV]AN311(Perth)/AN312

Sample Number	Parameter	Units	LOR	Result
LB273119.001	Mercury	mg/L	0.0001	<0.0001

Oil and Grease in Water

Method: ME-(AU)-[ENV]AN185

Sample Number	Parameter	Units	LOR	Result
LB272964.001	Oil and Grease	mg/L	5	<5

PAH (Polynuclear Aromatic Hydrocarbons) in Water

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

Sample Number		Parameter	Units	LOR	Result
LB272933.001		Naphthalene	µg/L	0.1	<0.1
		2-methylnaphthalene	µg/L	0.1	<0.1
		1-methylnaphthalene	µg/L	0.1	<0.1
		Acenaphthylene	µg/L	0.1	<0.1
		Acenaphthene	µg/L	0.1	<0.1
		Fluorene	µg/L	0.1	<0.1
		Phenanthrene	µg/L	0.1	<0.1
		Anthracene	µg/L	0.1	<0.1
		Fluoranthene	µg/L	0.1	<0.1
		Pyrene	µg/L	0.1	<0.1
		Benzo(a)anthracene	µg/L	0.1	<0.1
		Chrysene	µg/L	0.1	<0.1
		Benzo(a)pyrene	µg/L	0.1	<0.1
		Indeno(1,2,3-cd)pyrene	µg/L	0.1	<0.1
		Dibenzo(ah)anthracene	µg/L	0.1	<0.1
		Benzo(ghi)perylene	µg/L	0.1	<0.1
	Surrogates	d5-nitrobenzene (Surrogate)	%	-	78
		2-fluorobiphenyl (Surrogate)	%	-	60
		d14-p-terphenyl (Surrogate)	%	-	68

Total Cyanide in water by Discrete Analyser

Method: ME-(AU)-[ENV]AN077/AN287

Sample Number	Parameter	Units	LOR	Result
LB272958.001	Total Cyanide	mg/L	0.004	<0.004

Total Phenolics in Water

Method: ME-(AU)-[ENV]AN295

Sample Number	Parameter	Units	LOR	Result
LB272935.001	Total Phenols	mg/L	0.05	<0.05

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Sample Number	Parameter	Units	LOR	Result
LB273102.001	Aluminium	µg/L	5	<5
	Arsenic	µg/L	1	<1
	Cadmium	µg/L	0.1	<0.1
	Chromium	µg/L	1	<1
	Copper	µg/L	1	<1
	Iron	µg/L	5	<5
	Lead	µg/L	1	<1
	Nickel	µg/L	1	<1
	Zinc	µg/L	5	<5

TRH (Total Recoverable Hydrocarbons) in Water

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

Sample Number	Parameter	Units	LOR

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

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

TRH (Total Recoverable Hydrocarbons) in Water (continued)

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

Sample Number	Parameter	Units	LOR	Result
LB272933.001	TRH C10-C14	µg/L	50	<50
	TRH C15-C28	µg/L	200	<200
	TRH C29-C36	µg/L	200	<200
	TRH C37-C40	µg/L	200	<200

Turbidity

Method: ME-(AU)-[ENV]AN119

Sample Number	Parameter	Units	LOR	Result
LB272909.001	Turbidity	NTU	0.5	<0.5

VOCs in Water

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

Sample Number		Parameter	Units	LOR	Result
LB272946.001	Monocyclic Aromatic Hydrocarbons	Benzene	µg/L	0.5	<0.5
		Toluene	µg/L	0.5	<0.5
		Ethylbenzene	µg/L	0.5	<0.5
		m/p-xylene	µg/L	1	<1
		o-xylene	µg/L	0.5	<0.5
	Polycyclic VOCs	Naphthalene (VOC)*	µg/L	0.5	<0.5
	Surrogates	d4-1,2-dichloroethane (Surrogate)	%	-	108
		d8-toluene (Surrogate)	%	-	94
		Bromofluorobenzene (Surrogate)	%	-	108

Volatile Petroleum Hydrocarbons in Water

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

Sample Number		Parameter	Units	LOR	Result
LB272946.001		TRH C6-C9	µg/L	40	<40
	Surrogates	d4-1,2-dichloroethane (Surrogate)	%	-	108
		d8-toluene (Surrogate)	%	-	94
		Bromofluorobenzene (Surrogate)	%	-	108

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

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

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

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

NOTE: The RPD reported is calculated from the unrounded data for the original and replicate result. Manual calculation of the RPD from the rounded data reported may

Hexavalent Chromium in water by Discrete Analyser

Method: ME-(AU)-[ENV]AN283

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243914.006	LB272915.010	Hexavalent Chromium, Cr6+	mg/L	0.004	<0.004	<0.004	200	0

Mercury (dissolved) in Water

Method: ME-(AU)-[ENV]AN311(Perth)/AN312

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243914.001	LB273119.014	Mercury	µg/L	0.0001	<0.0001	0.0000	200	43

PAH (Polynuclear Aromatic Hydrocarbons) in Water

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

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243798.001	LB272933.028		Naphthalene	µg/L	0.1	<0.1	<0.1	200	0
			2-methylnaphthalene	µg/L	0.1	<0.1	<0.1	200	0
			1-methylnaphthalene	µg/L	0.1	<0.1	<0.1	200	0
			Acenaphthylene	µg/L	0.1	<0.1	<0.1	200	0
			Acenaphthene	µg/L	0.1	<0.1	<0.1	200	0
			Fluorene	µg/L	0.1	<0.1	<0.1	200	0
			Phenanthrene	µg/L	0.1	<0.1	<0.1	200	0
			Anthracene	µg/L	0.1	<0.1	<0.1	200	0
			Fluoranthene	µg/L	0.1	<0.1	<0.1	200	0
			Pyrene	µg/L	0.1	<0.1	<0.1	200	0
			Benzo(a)anthracene	µg/L	0.1	<0.1	<0.1	200	0
			Chrysene	µg/L	0.1	<0.1	<0.1	200	0
			Benzo(b&j)fluoranthene	µg/L	0.1	<0.1	<0.1	200	0
			Benzo(k)fluoranthene	µg/L	0.1	<0.1	<0.1	200	0
			Benzo(a)pyrene	µg/L	0.1	<0.1	<0.1	200	0
			Indeno(1,2,3-cd)pyrene	µg/L	0.1	<0.1	<0.1	200	0
			Dibenzo(ah)anthracene	µg/L	0.1	<0.1	<0.1	200	0
			Benzo(ghi)perylene	µg/L	0.1	<0.1	<0.1	200	0
		Surrogates	d5-nitrobenzene (Surrogate)	µg/L	-	0.3	0.3	30	18
			2-fluorobiphenyl (Surrogate)	µg/L	-	0.3	0.4	30	21
			d14-p-terphenyl (Surrogate)	µg/L	-	0.3	0.4	30	16
SE243914.006	LB272933.029		Naphthalene	µg/L	0.1	<0.1	<0.1	200	0
			2-methylnaphthalene	µg/L	0.1	<0.1	<0.1	200	0
			1-methylnaphthalene	µg/L	0.1	<0.1	<0.1	200	0
			Acenaphthylene	µg/L	0.1	<0.1	<0.1	200	0
			Acenaphthene	µg/L	0.1	<0.1	<0.1	200	0
			Fluorene	µg/L	0.1	<0.1	<0.1	200	0
			Phenanthrene	µg/L	0.1	<0.1	<0.1	200	0
			Anthracene	µg/L	0.1	<0.1	<0.1	200	0
			Fluoranthene	µg/L	0.1	<0.1	0.1	160	37
			Pyrene	µg/L	0.1	<0.1	0.1	170	30
			Benzo(a)anthracene	µg/L	0.1	<0.1	<0.1	200	0
			Chrysene	µg/L	0.1	<0.1	<0.1	200	0
			Benzo(b&j)fluoranthene	µg/L	0.1	<0.1	<0.1	200	0
			Benzo(k)fluoranthene	µg/L	0.1	<0.1	<0.1	200	0
			Benzo(a)pyrene	µg/L	0.1	<0.1	<0.1	200	0
			Indeno(1,2,3-cd)pyrene	µg/L	0.1	<0.1	<0.1	200	0
			Dibenzo(ah)anthracene	µg/L	0.1	<0.1	<0.1	200	0
			Benzo(ghi)perylene	µg/L	0.1	<0.1	<0.1	200	0
		Surrogates	d5-nitrobenzene (Surrogate)	µg/L	-	0.4	0.3	30	22
			2-fluorobiphenyl (Surrogate)	µg/L	-	0.4	0.4	30	13
			d14-p-terphenyl (Surrogate)	µg/L	-	0.4	0.4	30	2

pH in water

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

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243830.001	LB272908.017	pH**	pH Units	-	7.7	7.7	16	0
SE243863.001	LB272908.018	pH**	pH Units	-	7.8	7.8	16	0

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

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

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

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

NOTE: The RPD reported is calculated from the unrounded data for the original and replicate result. Manual calculation of the RPD from the rounded data reported may

Total Phenolics in Water

Method: ME-(AU)-[ENV]AN295

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243879.003	LB272935.014	Total Phenols	mg/L	0.05	<0.05	<0.05	200	0
SE243925.001	LB272935.019	Total Phenols	mg/L	0.05	<0.05	<0.05	200	0

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243914.005	LB273102.014	Aluminium	µg/L	5	37	37	29	1
		Arsenic	µg/L	1	2	2	56	5
		Cadmium	µg/L	0.1	<0.1	<0.1	200	0
		Chromium	µg/L	1	<1	<1	200	0
		Copper	µg/L	1	<1	<1	200	0
		Iron	µg/L	5	12000	12000	15	6
		Lead	µg/L	1	<1	<1	200	0
		Nickel	µg/L	1	2	2	65	2
		Zinc	µg/L	5	7	7	89	0
SE243990.001	LB273102.020	Aluminium	µg/L	5	98	100	20	3
		Arsenic	µg/L	1	3	3	51	4
		Cadmium	µg/L	0.1	0.2	0.2	73	20
		Chromium	µg/L	1	4	4	43	1
		Copper	µg/L	1	3	3	53	2
		Lead	µg/L	1	<1	<1	200	0
		Nickel	µg/L	1	3	3	49	1
		Zinc	µg/L	5	<5	<5	200	0

TRH (Total Recoverable Hydrocarbons) in Water

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

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243798.001	LB272933.028		TRH C10-C14	µg/L	50	<50	<50	154	0
			TRH C15-C28	µg/L	200	<200	<200	200	0
			TRH C29-C36	µg/L	200	<200	<200	200	0
			TRH C37-C40	µg/L	200	<200	<200	200	0
			TRH C10-C40	µg/L	320	<320	<320	200	0
		TRH F Bands	TRH >C10-C16	µg/L	60	<60	<60	179	0
			TRH >C10-C16 - Naphthalene (F2)	µg/L	60	<60	<60	179	0
			TRH >C16-C34 (F3)	µg/L	500	<500	<500	200	0
			TRH >C34-C40 (F4)	µg/L	500	<500	<500	200	0
SE243914.006	LB272933.029		TRH C10-C14	µg/L	50	<50	<50	200	0
			TRH C15-C28	µg/L	200	<200	<200	200	0
			TRH C29-C36	µg/L	200	<200	<200	200	0
			TRH C37-C40	µg/L	200	<200	<200	200	0
			TRH C10-C40	µg/L	320	<320	<320	200	0
		TRH F Bands	TRH >C10-C16	µg/L	60	<60	<60	200	0
			TRH >C10-C16 - Naphthalene (F2)	µg/L	60	<60	<60	200	0
			TRH >C16-C34 (F3)	µg/L	500	<500	<500	200	0
			TRH >C34-C40 (F4)	µg/L	500	<500	<500	200	0

Turbidity

Method: ME-(AU)-[ENV]AN119

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243914.006	LB272909.012	Turbidity	NTU	0.5	770	780	15	1

VOCs in Water

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

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243914.006	LB272946.024	Monocyclic	Benzene	µg/L	0.5	<0.5	0	200	0
		Aromatic	Toluene	µg/L	0.5	<0.5	0.0256281728	200	0
			Ethylbenzene	µg/L	0.5	<0.5	0.0063462217	200	0
			m/p-xylene	µg/L	1	<1	0.0173700061	200	0
			o-xylene	µg/L	0.5	<0.5	0.0068902030	200	0
		Polycyclic	Naphthalene (VOC)*	µg/L	0.5	<0.5	0.0496750210	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	9.8	10.702172320€	30	8
			d8-toluene (Surrogate)	µg/L	-	9.6	11.219300285(	30	16
			Bromofluorobenzene (Surrogate)	µg/L	-	9.9	9.3175128074	30	6

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

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

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

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

NOTE: The RPD reported is calculated from the unrounded data for the original and replicate result. Manual calculation of the RPD from the rounded data reported may

VOCs in Water (continued)

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

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243914.006	LB272946.024	Totals	Total BTEX	µg/L	3	<3	0	200	0

Volatile Petroleum Hydrocarbons in Water

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

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243914.006	LB272946.024		TRH C6-C10	µg/L	50	<50	0	200	0
			TRH C6-C9	µg/L	40	<40	0	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	9.8	10.7021723206	30	8
			d8-toluene (Surrogate)	µg/L	-	9.6	11.2193002850	30	16
			Bromofluorobenzene (Surrogate)	µg/L	-	9.9	9.3175128074	30	6
		VPH F Bands	Benzene (F0)	µg/L	0.5	<0.5	0	200	0
			TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	0	200	0

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

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

Hexavalent Chromium in water by Discrete Analyser

Method: ME-(AU)-[ENV]AN283

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB272915.002	Hexavalent Chromium, Cr6+	mg/L	0.004	0.047	0.05	80 - 120	94

Oil and Grease in Water

Method: ME-(AU)-[ENV]AN185

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB272964.002	Oil and Grease	mg/L	5	93	100	70 - 130	93

PAH (Polynuclear Aromatic Hydrocarbons) in Water

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

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB272933.002		Naphthalene	µg/L	0.1	25	40	60 - 140	61
		Acenaphthylene	µg/L	0.1	24	40	60 - 140	60
		Acenaphthene	µg/L	0.1	26	40	60 - 140	64
		Phenanthrene	µg/L	0.1	25	40	60 - 140	62
		Anthracene	µg/L	0.1	25	40	60 - 140	63
		Fluoranthene	µg/L	0.1	26	40	60 - 140	65
		Pyrene	µg/L	0.1	26	40	60 - 140	66
		Benzo(a)pyrene	µg/L	0.1	30	40	60 - 140	76
	Surrogates	d5-nitrobenzene (Surrogate)	µg/L	-	0.5	0.5	40 - 130	96
		2-fluorobiphenyl (Surrogate)	µg/L	-	0.4	0.5	40 - 130	76
		d14-p-terphenyl (Surrogate)	µg/L	-	0.4	0.5	40 - 130	72

pH in water

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

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB272908.003	pH**	No unit	-	7.4	7.415	98 - 102	100

Total Cyanide in water by Discrete Analyser

Method: ME-(AU)-[ENV]AN077/AN287

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB272958.002	Total Cyanide	mg/L	0.004	0.027	0.025	80 - 120	109

Total Phenolics in Water

Method: ME-(AU)-[ENV]AN295

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB272935.002	Total Phenols	mg/L	0.05	0.20	0.2	80 - 120	100

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB273102.002	Aluminium	µg/L	5	20	20	80 - 120	99
	Arsenic	µg/L	1	21	20	80 - 120	106
	Cadmium	µg/L	0.1	20	20	80 - 120	98
	Chromium	µg/L	1	20	20	80 - 120	98
	Copper	µg/L	1	19	20	80 - 120	97
	Iron	µg/L	5	20	20	80 - 120	101
	Lead	µg/L	1	19	20	80 - 120	94
	Nickel	µg/L	1	19	20	80 - 120	97
	Zinc	µg/L	5	19	20	80 - 120	94

TRH (Total Recoverable Hydrocarbons) in Water

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

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB272933.002		TRH C10-C14	µg/L	50	890	1200	60 - 140	75
		TRH C15-C28	µg/L	200	1100	1200	60 - 140	93
		TRH C29-C36	µg/L	200	1100	1200	60 - 140	95
	TRH F Bands	TRH >C10-C16	µg/L	60	1000	1200	60 - 140	87
		TRH >C16-C34 (F3)	µg/L	500	1200	1200	60 - 140	96
		TRH >C34-C40 (F4)	µg/L	500	560	600	60 - 140	93

VOCs in Water

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

Sample Number	Parameter	Units	LOR

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

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

VOCs in Water (continued)

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

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB272946.002	Monocyclic	Benzene	µg/L	0.5	46	45.45	60 - 140	101
	Aromatic	Toluene	µg/L	0.5	55	45.45	60 - 140	120
		Ethylbenzene	µg/L	0.5	48	45.45	60 - 140	106
		m/p-xylene	µg/L	1	100	90.9	60 - 140	111
		o-xylene	µg/L	0.5	50	45.45	60 - 140	110
	Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	9.4	10	60 - 140	94
		d8-toluene (Surrogate)	µg/L	-	12.1	10	70 - 130	121
		Bromofluorobenzene (Surrogate)	µg/L	-	10.9	10	70 - 130	109

Volatile Petroleum Hydrocarbons in Water

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

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB272946.002		TRH C6-C10	µg/L	50	720	946.63	60 - 140	77
		TRH C6-C9	µg/L	40	630	818.71	60 - 140	77
	Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	9.4	10	60 - 140	94
		d8-toluene (Surrogate)	µg/L	-	12.1	10	70 - 130	121
		Bromofluorobenzene (Surrogate)	µg/L	-	10.9	10	70 - 130	109
	VPH F Bands	TRH C6-C10 minus BTEX (F1)	µg/L	50	430	639.67	60 - 140	67

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

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

Mercury (dissolved) in Water

Method: ME-(AU)-[ENV]AN311(Perth)/AN312

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE243874.001	LB273119.004	Mercury	mg/L	0.0001	0.0021	<0.0001	0.008	102

Total Cyanide in water by Discrete Analyser

Method: ME-(AU)-[ENV]AN077/AN287

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE243914.006	LB272958.014	Total Cyanide	mg/L	0.004	0.026	<0.004	0.025	105

Total Phenolics in Water

Method: ME-(AU)-[ENV]AN295

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE243885.001	LB272935.004	Total Phenols	mg/L	0.05	0.19	<0.05	0.2	97

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE243874.001	LB273102.004	Arsenic	µg/L	1	41	17	20	123
		Cadmium	µg/L	0.1	19	<0.1	20	96
		Chromium	µg/L	1	20	<1	20	98
		Copper	µg/L	1	21	3	20	91
		Lead	µg/L	1	19	<1	20	95
		Nickel	µg/L	1	22	3	20	93
		Zinc	µg/L	5	24	7	20	89

VOCs in Water

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

QC Sample	Sample Number		Parameter	Units	LOR	Original	Spike	Recovery%
SE243914.001	LB272946.025	Monocyclic Aromatic	Benzene	µg/L	0.5	<0.5	45.45	122
			Toluene	µg/L	0.5	<0.5	45.45	122
			Ethylbenzene	µg/L	0.5	<0.5	45.45	119
			m/p-xylene	µg/L	1	<1	90.9	119
			o-xylene	µg/L	0.5	<0.5	45.45	121
		Polycyclic	Naphthalene (VOC)*	µg/L	0.5	<0.5	-	-
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	9.8	-	107
			d8-toluene (Surrogate)	µg/L	-	9.3	-	114
			Bromofluorobenzene (Surrogate)	µg/L	-	9.5	-	114
		Totals	Total BTEX	µg/L	3	<3	-	-

Volatile Petroleum Hydrocarbons in Water

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

QC Sample	Sample Number		Parameter	Units	LOR	Original	Spike	Recovery%
SE243914.001	LB272946.025		TRH C6-C10	µg/L	50	<50	946.63	109
			TRH C6-C9	µg/L	40	<40	818.71	109
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	9.8	-	107
			d8-toluene (Surrogate)	µg/L	-	9.3	-	114
			Bromofluorobenzene (Surrogate)	µg/L	-	9.5	-	114
		VPH F Bands	Benzene (F0)	µg/L	0.5	<0.5	-	-
			TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	639.67	110

MATRIX SPIKE DUPLICATES

SE243914 R0

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

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

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

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

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the

No matrix spike duplicates were required for this job.

Samples analysed as received.

Solid samples expressed on a dry weight basis.

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

*	NATA accreditation does not cover the performance of this service.
**	Indicative data, theoretical holding time exceeded.
***	Indicates that both * and ** apply.
-	Sample not analysed for this analyte.
IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
LOR	Limit of reporting.
QFH	QC result is above the upper tolerance.
QFL	QC result is below the lower tolerance.
①	At least 2 of 3 surrogates are within acceptance criteria.
②	RPD failed acceptance criteria due to sample heterogeneity.
③	Results less than 5 times LOR preclude acceptance criteria for RPD.
④	Recovery failed acceptance criteria due to matrix interference.
⑤	Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
⑥	LOR was raised due to sample matrix interference.
⑦	LOR was raised due to dilution of significantly high concentration of analyte in sample.
⑧	Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
⑨	Recovery failed acceptance criteria due to sample heterogeneity.
⑩	LOR was raised due to high conductivity of the sample (required dilution).
†	Refer to relevant report comments for further information.

Yin, Emily (Sydney)

From: Sharon Li - EIAustralia <sharon.li@eiaustralia.com.au>
Sent: Thursday, 2 March 2023 3:41 PM
To: Yin, Emily (Sydney); Geisiane Torres - EIAustralia
Subject: [EXTERNAL] RE: SE243914 - E25947

HI Emily

We need Arsenic(III&V) and Chromium (III&VI) for primary samples.

QD, QR, QT not required

Thanks

From: Yin, Emily (Sydney) [mailto:Emily.Yin@sgs.com]
Sent: Thursday, 2 March 2023 3:23 PM
To: Geisiane Torres - EIAustralia; Sharon Li - EIAustralia
Subject: SE243914 - E25947

Dear All,

For metals please confirm that you require Arsenic(III&V) and Chromium (III&VI).
Do you want these extra metals done for QD and QR samples as well?
Please advise as soon as possible.
Thank You.

Regards,

Emily Yin
Environment, Health & Safety
Sample Receipt

SGS Australia Pty Ltd
Unit 16, 33 Maddox Street
Alexandria NSW 2015

Phone: +61 (0)2 8594 0400
Fax: +61 (0)2 8594 0499
E-mail: au.samplereceipt.sydney@sgs.com

ANALYTICAL REPORT

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Huong Crawford	Manager	Adam Atkinson
Client	SGS I&E SYDNEY	Laboratory	SGS Melbourne EH&S
Address	Unit 16, 33 Maddox Street Alexandria NSW 2015	Address	10/585 Blackburn Road Notting Hill Victoria 3168
Telephone	02 8594 0400	Telephone	+61395743200
Facsimile	02 8594 0499	Facsimile	+61395743399
Email	au.environmental.sydney@sgs.com	Email	Au.SampleReceipt.Melbourne@sgs.com
Project	**E25947 600-660 Elizabeth St Redfern**	SGS Reference	**ME332799 R0**
Order Number	**SE243914**	Date Received	07 Mar 2023
Samples	10	Date Reported	20 Mar 2023

COMMENTS

Whilst SGS laboratories conform to ISO:17025 standards, results of analysis in this report fall outside of the current scope of NATA accreditation.

SIGNATORIES

Ryan ZHANG
Inorganics Team Leader

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	ME332799.001 Water 01 Mar 2023 SE243914.001	ME332799.002 Water 01 Mar 2023 SE243914.002	ME332799.003 Water 01 Mar 2023 SE243914.003	ME332799.004 Water 01 Mar 2023 SE243914.004
Metals in Water Speciated	**Method: MA1400_SP**	**Tested: 17/3/2023**					
Arsenic (III)	µg/L	0.5		**0.9**	**1.3**	**1.0**	**0.9**
Arsenic (V)	µg/L	0.5		<0.5	<0.5	<0.5	<0.5

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name ME332799.005 Water 01 Mar 2023 SE243914.005	ME332799.006 Water 01 Mar 2023 SE243914.006	ME332799.007 Water 03 Jan 2023 SE243914.007	ME332799.008 Water 03 Jan 2023 SE243914.008
Metals in Water Speciated Method: MA1400_SP Tested: 17/3/2023						
Arsenic (III)	µg/L	0.5	**1.0**	**0.9**	-	-
Arsenic (V)	µg/L	0.5	<0.5	<0.5	-	-

Parameter	Units	LOR	Sample Number: ME332799.009 Sample Matrix: Water Sample Date: 03 Jan 2023 Sample Name: SE243914.009	Sample Number: ME332799.010 Sample Matrix: Water Sample Date: 03 Jan 2023 Sample Name: SE243914.010
Metals in Water Speciated Method: MA1400_SP Tested: 20/3/2023				
Arsenic (III)	µg/L	0.5	-	-
Arsenic (V)	µg/L	0.5	-	-

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Metals in Water Speciated **Method: MA1400_SP**

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery	MS %Recovery
Arsenic (III)	LB060225	µg/L	0.5	<0.5	103%	100%
Arsenic (V)	LB060225	µg/L	0.5	<0.5	104%	107%

METHOD	METHODOLOGY SUMMARY
MA1400_SP	Speciated metals are determined by liquid chromatography – inductively coupled plasma mass spectrometer (LC /ICPMS) after an appropriate sample preparation as determined by the target metals species.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
***	Indicates that both * and ** apply.	NVL	Not Validated

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

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

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

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

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

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

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

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

SAMPLE RECEIPT ADVICE

SE243914

CLIENT DETAILS

Contact	Geisiane Torres
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	Geisiane.Torres @eiaustralia.com.au
Project	**E25947 600-660 Elizabeth St Redfern**
Order Number	**E25947**
Samples	10

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
Samples Received	Thu 2/3/2023
Report Due	Tue 7/3/2023
SGS Reference	**SE243914**

SUBMISSION DETAILS

This is to confirm that 10 samples were received on Thursday 2/3/2023. Results are expected to be ready by COB Tuesday 7/3/2023. Please quote SGS reference SE243914 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Sample counts by matrix	10 Water	Type of documentation received	COC
Date documentation received	2/3/2023	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	11.6°C
Sample container provider	SGS	Turnaround time requested	Three Days
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	Ice Bricks	Samples clearly labelled	Yes
Complete documentation received	Yes		

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

COMMENTS

Arsenic (III&V) subcontracted to SGS Melbourne, 10/585 Blackburn Road, Notting Hill, VIC, NATA Accreditation Numbe. 2562/14420.
Oil and Grease analysis is performed on a sub-sample.
1 sample has been placed on hold as no tests have been assigned for it. This sample will not be processed.

SAMPLE RECEIPT ADVICE

SE243914

CLIENT DETAILS

Client EI AUSTRALIA

Project E25947 600-660 Elizabeth St Redfern

SUMMARY OF ANALYSIS

No.	Sample ID	PAH (Polynuclear Aromatic Hydrocarbons) in Water	pH in water	Total Cyanide in water by Discrete Analyser	Total Phenolics in Water	TRH (Total Recoverable Hydrocarbons) in Water	Turbidity	VOCs in Water	Volatile Petroleum Hydrocarbons in Water
001	GW_BH502M	22	1	1	1	9	1	11	7
002	GW_BH504M	22	1	1	1	9	1	11	7
003	GW_BH505M	22	1	1	1	9	1	11	7
004	GW-MW11	22	1	1	1	9	1	11	7
005	GW-MW20	22	1	1	1	9	1	11	7
006	GW-MW21	22	1	1	1	9	1	11	7
007	GW-QD	-	-	-	-	9	-	11	7
008	GW-QR	-	-	-	-	9	-	11	7
009	TB	-	-	-	-	-	-	11	-
010	TS	-	-	-	-	-	-	11	-

CONTINUED OVERLEAF

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

SAMPLE RECEIPT ADVICE

SE243914

CLIENT DETAILS

Client EI AUSTRALIA

Project E25947 600-660 Elizabeth St Redfern

SUMMARY OF ANALYSIS

No.	Sample ID	Hexavalent Chromium in water by Discrete Analyser	Mercury (dissolved) in Water	Metals in Water Speciated	Oil and Grease in Water	Trace Metals (Dissolved) in Water by ICPMS
001	GW_BH502M	2	1	2	1	9
002	GW_BH504M	2	1	2	1	9
003	GW_BH505M	2	1	2	1	9
004	GW-MW11	2	1	2	1	9
005	GW-MW20	2	1	2	1	9
006	GW-MW21	2	1	2	1	9
007	GW-QD	-	1	-	-	7
008	GW-QR	-	1	-	-	7

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

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Geisiane Torres
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	Geisiane.Torres @eiaustralia.com.au
Project	**E25947 600-660 Elizabeth St Redfern**
Order Number	**E25947**
Samples	10

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE243914A R0**
Date Received	15/3/2023
Date Reported	16/3/2023

COMMENTS

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

SIGNATORIES

Dong LIANG

Metals/Inorganics Team Leader

Metals in Water (Dissolved) by ICPOES [AN320] Tested: 16/3/2023

PARAMETER	UOM	LOR	GW_BH502M WATER - 1/3/2023 SE243914A.001	GW_BH504M WATER - 1/3/2023 SE243914A.002	GW_BH505M WATER - 1/3/2023 SE243914A.003	GW-MW11 WATER - 1/3/2023 SE243914A.004	GW-MW20 WATER - 1/3/2023 SE243914A.005
Calcium, Ca	mg/L	0.1	54	22	13	36	13
Magnesium, Mg	mg/L	0.1	4.8	5.6	5.7	3.1	6.2
Total Hardness by Calculation	mg CaCO3/L	1	160	77	56	100	59

PARAMETER	UOM	LOR	GW-MW21 WATER - 1/3/2023 SE243914A.006
Calcium, Ca	mg/L	0.1	67
Magnesium, Mg	mg/L	0.1	13
Total Hardness by Calculation	mg CaCO3/L	1	220

METHOD	METHODOLOGY SUMMARY
AN020	Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
AN320	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components .
AN320	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements . Reference APHA 3120 B.

FOOTNOTES

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

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

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

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

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

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

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

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

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

STATEMENT OF QA/QC PERFORMANCE

SE243914A R0

CLIENT DETAILS

Contact	Geisiane Torres
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	Geisiane.Torres @eiaustralia.com.au
Project	**E25947 600-660 Elizabeth St Redfern**
Order Number	**E25947**
Samples	10

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE243914A R0**
Date Received	15 Mar 2023
Date Reported	16 Mar 2023

COMMENTS

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

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

All Data Quality Objectives were met (within the SGS Alexandria Environmental laboratory).

SAMPLE SUMMARY

Sample counts by matrix	6 Water	Type of documentation received	15/3/2023@12:09PI
Date documentation received	2/3/2023	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	11.6°C
Sample container provider	SGS	Turnaround time requested	Next Day
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	Ice Bricks	Samples clearly labelled	Yes
Complete documentation received	Yes		

HOLDING TIME SUMMARY

SE243914A R0

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

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

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the

Metals in Water (Dissolved) by ICPOES — **Method: ME-(AU)-[ENV]AN320**

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
GW_BH502M	SE243914A.001	LB274088	01 Mar 2023	15 Mar 2023	28 Aug 2023	16 Mar 2023	28 Aug 2023	16 Mar 2023
GW_BH504M	SE243914A.002	LB274088	01 Mar 2023	15 Mar 2023	28 Aug 2023	16 Mar 2023	28 Aug 2023	16 Mar 2023
GW_BH505M	SE243914A.003	LB274088	01 Mar 2023	15 Mar 2023	28 Aug 2023	16 Mar 2023	28 Aug 2023	16 Mar 2023
GW-MW11	SE243914A.004	LB274088	01 Mar 2023	15 Mar 2023	28 Aug 2023	16 Mar 2023	28 Aug 2023	16 Mar 2023
GW-MW20	SE243914A.005	LB274088	01 Mar 2023	15 Mar 2023	28 Aug 2023	16 Mar 2023	28 Aug 2023	16 Mar 2023
GW-MW21	SE243914A.006	LB274088	01 Mar 2023	15 Mar 2023	28 Aug 2023	16 Mar 2023	28 Aug 2023	16 Mar 2023

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

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

No surrogates were required for this job.

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

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

Metals in Water (Dissolved) by ICPOES — Method: ME-(AU)-[ENV]AN320

Sample Number	Parameter	Units	LOR	Result
LB274088.001	Calcium, Ca	mg/L	0.1	<0.1
	Magnesium, Mg	mg/L	0.1	<0.1

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

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

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

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

NOTE: The RPD reported is calculated from the unrounded data for the original and replicate result. Manual calculation of the RPD from the rounded data reported may

No duplicates were required for this job.

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

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

Metals in Water (Dissolved) by ICPOES — **Method: ME-(AU)-[ENV]AN320**

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB274088.002	Calcium, Ca	mg/L	0.1	49	50.5	80 - 120	97
	Magnesium, Mg	mg/L	0.1	49	50.5	80 - 120	97

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

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

Metals in Water (Dissolved) by ICPOES — **Method: ME-(AU)-[ENV]AN320**

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE243914A.001	LB274088.004	Calcium, Ca	mg/L	0.1	110	54	50.5	101
		Magnesium, Mg	mg/L	0.1	60	4.8	50.5	110

MATRIX SPIKE DUPLICATES

SE243914A R0

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

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

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

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

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the

No matrix spike duplicates were required for this job.

Samples analysed as received.

Solid samples expressed on a dry weight basis.

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

*	NATA accreditation does not cover the performance of this service.
**	Indicative data, theoretical holding time exceeded.
***	Indicates that both * and ** apply.
-	Sample not analysed for this analyte.
IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
LOR	Limit of reporting.
QFH	QC result is above the upper tolerance.
QFL	QC result is below the lower tolerance.
①	At least 2 of 3 surrogates are within acceptance criteria.
②	RPD failed acceptance criteria due to sample heterogeneity.
③	Results less than 5 times LOR preclude acceptance criteria for RPD.
④	Recovery failed acceptance criteria due to matrix interference.
⑤	Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
⑥	LOR was raised due to sample matrix interference.
⑦	LOR was raised due to dilution of significantly high concentration of analyte in sample.
⑧	Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
⑨	Recovery failed acceptance criteria due to sample heterogeneity.
⑩	LOR was raised due to high conductivity of the sample (required dilution).
†	Refer to relevant report comments for further information.

Yin, Emily (Sydney)

From: Geisiane Torres - EIAustralia <geisiane.torres@eiaustralia.com.au>
Sent: Wednesday, 15 March 2023 12:09 PM
To: AU.Environmental.Sydney, AU (Sydney); AU.SampleReceipt.Sydney, AU (Sydney)
Cc: Nik Kontos - EIAustralia; Sharon Li - EIAustralia
Subject: [EXTERNAL] RE: Preliminary report Job SE243914, your reference E25947 600-660 Elizabeth St Redfern, order number E25947

Hi SGS team,

Can you please test samples below on 24TAT for Hardness, TDS/TDU and EC.

1 GW_BH502M
2 GW_BH504M
3 GW_BH505M
4 GW_MW11
5 GW_MW20
6 GW_MW21

Thank you.
Best regards,

Geisiane Torres
Environmental Engineer

T (02) 9516 0722 M 0478 965 237
E geisiane.torres@eiaustralia.com.au

Suite 6.01, 55 Miller Street
Pyrmont, NSW 2009

www.eiaustralia.com.au

From: AU.Environmental.Sydney@SGS.com [mailto:AU.Environmental.Sydney@SGS.com]
Sent: Tuesday, 7 March 2023 5:48 PM
To: Geisiane Torres - EIAustralia; Laboratory Results - EIAustralia; Sharon Li - EIAustralia
Subject: Preliminary report Job SE243914, your reference E25947 600-660 Elizabeth St Redfern, order number E25947

Yin, Emily (Sydney)

From: Geisiane Torres - EIAustralia <geisiane.torres@eiaustralia.com.au>
Sent: Wednesday, 15 March 2023 3:27 PM
To: AU.Environmental.Sydney, AU (Sydney)
Cc: Sharon Li - EIAustralia; AU.SampleReceipt.Sydney, AU (Sydney)
Subject: RE: [EXTERNAL] RE: Preliminary report Job SE243914, your reference E25947 600-660 Elizabeth St Redfern, order number E25947- what is TDU?

Hi Huong,

Apologies but Can you please test samples below on 24TAT for Hardness only? Is it possible, if yes disregard previous email?

GW_BH502M
GW_BH504M
GW_BH505M
GW_MW11
GW_MW20
GW_MW21

Thanks,

Geisiane Torres
Environmental Engineer

T (02) 9516 0722 M 0478 965 237
E geisiane.torres@eiaustralia.com.au

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Pyrmont, NSW 2009

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From: AU.Environmental.Sydney, AU (Sydney) [mailto:AU.Environmental.Sydney@sgs.com]
Sent: Wednesday, 15 March 2023 3:12 PM
To: Geisiane Torres - EIAustralia
Cc: Sharon Li - EIAustralia; AU.SampleReceipt.Sydney, AU (Sydney)
Subject: RE: [EXTERNAL] RE: Preliminary report Job SE243914, your reference E25947 600-660 Elizabeth St Redfern, order number E25947- what is TDU?

SAMPLE RECEIPT ADVICE

SE243914A

CLIENT DETAILS

Contact	Geisiane Torres
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	Geisiane.Torres @eiaustralia.com.au
Project	**E25947 600-660 Elizabeth St Redfern**
Order Number	**E25947**
Samples	10

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
Samples Received	Wed 15/3/2023
Report Due	Thu 16/3/2023
SGS Reference	**SE243914A**

SUBMISSION DETAILS

This is to confirm that 10 samples were received on Wednesday 15/3/2023. Results are expected to be ready by COB Thursday 16/3/2023.
Please quote SGS reference SE243914A when making enquiries. Refer below for details relating to sample integrity upon receipt.

Sample counts by matrix	6 Water	Type of documentation received	15/3/2023@12:09PM
Date documentation received	2/3/2023	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	11.6°C
Sample container provider	SGS	Turnaround time requested	Next Day
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	Ice Bricks	Samples clearly labelled	Yes
Complete documentation received	Yes		

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

COMMENTS

SAMPLE RECEIPT ADVICE

SE243914A

CLIENT DETAILS

Client EI AUSTRALIA

Project E25947 600-660 Elizabeth St Redfern

SUMMARY OF ANALYSIS

No.	Sample ID	Metals in Water (Dissolved) by ICPOES
001	GW_BH502M	3
002	GW_BH504M	3
003	GW_BH505M	3
004	GW-MW11	3
005	GW-MW20	3
006	GW-MW21	3

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