Contamination | Remediation | Geotechnical

JAK NEWPORT PTY LTD

Hydrogeological Report including Dewatering Management Plan and Groundwater Seepage Analysis

54-58 Beaconsfield Street, Newport NSW

E26083.E16_Rev0
17 July 2024

DOCUMENT CONTROL

Report Title: Hydrogeological Report including Dewatering Management Plan and Groundwater Seepage Analysis; 54-58 Beaconsfield Street, Newport NSW

Report No: E26083.E16_Rev0

Copies		Recipient
1	Soft Copy (PDF – Secured, issued by email)	JAK Newport Pty Ltd 10 James Street, **Waterloo NSW 2017**
2	Original (Saved to Digital Archives)	EI Australia Suite 6.01, 55 Miller Street, **Pyrmont NSW 2009**

Author	Technical Reviewer
Fiona Zhang Environmental Engineer	**Nik Kontos** Principal Environmental Hydrogeologist

Revision	Details	Date	Amended By
0	Original	17 July 2024	-

TABLE OF CONTENTS

Page Number

SCHEDULE OF FIGURES (IN-TEXT)

SCHEDULE OF TABLES (IN-TEXT)

APPENDICES

APPENDIX A – FIGURES

APPENDIX B – TABLES

APPENDIX C – DEVELOPMENT PLANS

APPENDIX D – GSA REPORT (EI, 2024C)

APPENDIX E – BOREHOLE LOGS

APPENDIX F – LABORATORY DOCUMENTATION

APPENDIX G – METHODOLOGY

1. INTRODUCTION

1.1 Overview

JAK Newport Pty Ltd (‘the client’) engaged EI Australia (EI) to prepare a Hydrogeological Report including Dewatering Management Plan, Groundwater Modelling and Seepage Analysis (the ‘report’) for 54-58 Beaconsfield Street, Newport NSW (‘the site’).

The site is located within the local government area of Northern Beaches Council, as shown on **Figure A1**, **Appendix A**. The site comprises three cadastral allotments, identified as Lot 7B in Deposited Plan (DP) 162021 (54 Beaconsfield Street), Lot 6 in DP 1096088 (56 Beaconsfield Street) and Lot 5B in DP 158658 (58 Beaconsfield Street), and covers a total area of approximately 2,112 m^2 (**Figure A2**, **Appendix A**). At the time of preparation of this report, the site was occupied by three residential buildings.

The site is proposed for redevelopment (as described below), which will involve the construction of a single-level basement, requiring bulk excavation works that will intersect the shallow groundwater system, triggering the need for site dewatering. Groundwater drawn into the dewatering system is proposed to be appropriately treated to comply with relevant water quality criteria for subsequent discharge into the local municipal stormwater system, subject to Council approval.

Baseline groundwater monitoring data is presented in **Appendix B** and discussed in detail in **Section 3.4**.

Due to low hydraulic conductivity characteristics of the water bearing lithology a drained basement design is proposed during basement construction and for long-term dewatering during the operational phase of the project, as detailed in **Section 4**. Cumulative drawdown and water quality effects from long-term dewatering are assessed against the NSW Aquifer Interference Policy (AIP) in **Section 7**, to demonstrate that the proposed drained basement would meet the minimal impact considerations, as described in the AIP.

The purpose of this report is to achieve compliance with Council and Water NSW requirements in relation to the proposed dewatering activities at the site. It provide a dewatering management plan which describes dewatering methodology, quantifies construction groundwater take volumes and provides strategies for mitigating potential adverse impacts on neighbouring properties and infrastructure, local groundwater users and the environment.

It is understood that this report will be submitted to Northern Beaches Council in support of a permit application for stormwater discharge, and to WaterNSW as part of a water supply works (dewatering) license application.

1.2 Proposed Development

Based on the supplied plans (**Appendix C**), EI understands that the proposed development involves the demolition of the existing site structures and the construction of a three-storey residential building overlying a single-level basement.

The Finished Floor Level (FFL) of the basement is proposed at RL 13.0 metres relative to Australian Height Datum (m AHD). The Bulk Excavation Level (BEL) is therefore assumed to be RL 12.7 m AHD to allow for the concrete basement slabs. To achieve the BEL, excavation depths of between 3.7 to 10.7 meters Below Ground Level (mBGL) are expected. Locally deeper excavations may be required for footings, lift overrun pits, crane pads, and service trenches.

A drained basement using sub-soil drainage and a sump-and-pump system is assumed as the dewatering method for the project. The dewatering method is described in more detail in **Section 4**.

1.3 Report Objectives

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;
- Summarise relevant hydrogeological and groundwater modelling information, with reference to EI's groundwater seepage analysis (GSA) report; which is attached as **Appendix D**;
- Describe the dewatering methodology, groundwater treatment requirements, monitoring and reporting procedures to be employed during temporary dewatering activities occurring for the construction phase of the proposed basement;
- Provide effective management and contingency procedures, to ensure 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*;
- Detail post-construction seepage control measures and dewatering management procedures; and
- Provide relevant information on anticipated groundwater impacts, with reference to the NSW Aquifer Interference policy to properly inform the regulatory approval process.

It is understood that this report will form the basis for a Council permit application for connection and discharge to the municipal stormwater system and a water supply works (dewatering licence) application to WaterNSW.

1.4 Scope of Work

The following works were undertaken:

- A desktop study including:
    - Review DA consent conditions and WaterNSW requirements to determine generic and site specific conditions placed on the development in relation to dewatering;
    - Review of the development proposal and proposed shoring/dewatering designs;
    - Review of hydrogeological, landscape and acid sulfate soil (ASS) risk maps for the area;
    - Review of previous investigation reports and plans, which included:
        - A search of registered bores located within a 500m radius of the site to review local groundwater usage;
        - Onsite drilling data, including sub-surface stratigraphic data and depth to water bearing zones; and
        - Potential onsite and offsite sources of contamination that may impact on dewatering discharge water quality.
- Groundwater monitoring event (GME), including sampling of two existing monitoring wells and laboratory analysis for relevant analytical parameters to characterise baseline groundwater quality.

This report also relies on information provided in a groundwater seepage analysis (GSA) report, which is attached as **Appendix D**. The GSA includes the findings from field-based hydraulic testing and computer-based groundwater modelling used to determine total groundwater extraction volume and provide estimates for associated water level drawdown effects. GSA details and findings are incorporated into various parts of this report.

1.5 Regulatory Framework

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

Table 1-1 Regulatory Framework

NSW Legislation, Regulatory Instruments and Guidelines	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.
NSW Water Management (General) Regulation 2018.	Details relating to Water Access License requirements, if relevant.
Water Management Act 2000 and *Water Act 1912* (WM Act)	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 ▪ The disposal of water taken from an aquifer.
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.
Northern Beaches Council Plans and Policies	Provides controls and guidelines for development in the area. ▪ *Pittwater 21 Development Control Plan, as amended 15 December 2020*; and ▪ *Pittwater Local Environmental Plan 2014*.
Guidelines	▪ ANZG (2018) *Guidelines for Fresh and Marine Water Quality;* ▪ ANZECC & ARMCANZ (2000) *Guidelines for Fresh and Marine Water Quality*, Vol. 1, Chapter 3, Aquatic Ecosystems; ▪ DPIE (2022) *Minimum requirements for building site groundwater investigations and reporting;* ▪ NHMRC (2008) *Guidelines for Managing Risks in Recreational Water.*

2. SITE DESCRIPTION

2.1 Identification, Location and Zoning

Site identification details and associated information are summarised in **Table 2-1**. Site location and the proposed development are shown in **Figures A1** and **A2**, in **Appendix A**.

Table 2-1 Site Identification, Location and Zoning

Information	Detail
Site Address	54-58 Beaconsfield Street, Newport NSW
Location Description	Bound by residential properties to the north, east and west, and Beaconsfield Street to the south.
Lots and DP	Lot 7B in DP162021 (54 Beaconsfield Street) Lot 6 in DP 1096088 (56 Beaconsfield Street) Lot 5B in DP 158658 (58 Beaconsfield Street)
Local Government Area	Northern Beaches Council
Current Zoning	R3: Medium Density Residential (*Pittwater Local Environmental Plan 2014*)
Current Site Use	At the time of fieldwork for preparation of this report, the site was occupied by three residential properties.
Location Coordinates	Northern-eastern corner of site (GDA2020-MGA56): ▪ Easting: 343410.558; ▪ Northing: 6274217.917. (Source: http://maps.six.nsw.gov.au)
Site Area	Approximately 2,112 m^2 (**Figure A2**, **Appendix A**)
Typical Soil Profile	Based on the Geotechnical Investigation (EI, 2024a), the general soil profile comprises a silty sand fill layer around 0.4 to 0.8m thick, overlying a residual clay layer (3.8 to 5.9m thick), overlying weathered sandstone bedrock.

2.2 Surrounding Land Use

Surrounding land uses and local, potential receptors within close proximity (within 250m) to the site are described in **Table 2-2**.

Table 2-2 Surrounding Land Uses

Direction	Land Use Description
North	Newport Public School, Dearin Reserve, Trafalgar Park playground, Residential properties
South	Beaconsfield Street Waterfront Reserve, Residential properties
East	Residential properties
West	Residential properties

2.3 Regional Setting

Regional setting is briefly outlined in **Table 2-3**.

Table 2-3 Regional Setting Information

Attribute	Description
Topography	Based on the Geotechnical Investigation (EI, 2024a), the site is located on the high north side of the road within gentle to moderate (8° to10°) slope from the north-east to south-west. Ground elevations range from 23.52m AHD (north-east) to 16.1m AHD (south-west).
Site Drainage	Consistent with the general slope of the site. Stormwater runoff would be expected to be collected by pit and pipe systems discharging to the municipal stormwater system on Beaconsfield Street, and draining to Old Mangrove Bay (approximately 170m south of the site).
Regional Geology	According to the Department of Mineral Resources *Sydney 1:100,000 Geological Series Sheet 9130* (DMR, 1983), the site is underlain by Newport Formation and Garie Formation (Rnn) described as interbedded laminate (sandstone/siltstone), shale and quartz, to lithic-quartz sandstone.
Soil Landscape	The Soil Conservation Service of NSW Soil Landscapes of the Sydney 1:100,000 Sheet (Chapman and Murphy, 1989) indicates that the site overlies an Erina (*er*) erosional landscape which is characterised by undulating to rolling rises and low hills on fine-grained sandstones and claystones of the Narrabeen Group and a Newport (*np*) aeolian soil landscape which is characterised by gently undulating plains to rolling rises of Holocene sands mantling other soil materials or bedrock. (https://www.environment.nsw.gov.au/eSpade2Webapp)
Acid Sulfate Soil (ASS) Risk	The *Pittwater Local Environmental Plan 2014 Acid Sulfate Soils Map* shows the site to be within a Class 5 area with respect to ASS. In such cases, Council consent is required prior to commencing any works within 500m of adjacent Class 1, 2, 3 or 4 land that is below 5m AHD and where the water table is likely to be lowered below 1m AHD on adjacent Class 1, 2, 3 or 4 land. With reference to the *Hornsby / Mona Vale Acid Sulfate Soil Risk Map* (1:25,000 scale; Murphy, 1997), the site lies within the 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." The risk of ASS presence on-site was therefore considered to be low and further ASS assessment was deemed unwarranted.
Nearest Water Feature	Old Mangrove Bay at Pittwater River, located approximately 170m south of the site.
Groundwater Flow Direction	Groundwater flow direction was anticipated to be south-westerly, consistent with topographical slope, towards Old Mangrove Bay.

2.4 Local Groundwater Use

An online search for groundwater bores registered with WaterNSW was conducted by EI on 2 July 2024 (Ref. https://realtimedata.waternsw.com.au/water.stm). The search revealed two registered bores (identified as GW019148 and GW018908) within a 500m radius of the site. The registered bores were all authorized for waste disposal purposes. No standing water level or yield information was available. The salinity description recorded for bore GW018908 was 'salty'. It was therefore concluded that groundwater is not utilised for water supply purposes in the vicinity of the site.

2.5 Potential Environmental Receptors

It is proposed that during construction, extracted groundwater will be pumped through a water treatment system (**Section 5.4**) and then discharged into the local municipal stormwater system, which drains into Old Mangrove Bay at Pittwater River located approximately 170m south of the site.

Old Mangrove Bay and Pittwater River is open to the South Pacific Ocean; therefore, a marine water ecosystem for discharge water quality considerations, as detailed in **Section 5.2**.

2.6 Groundwater Dependent Ecosystems

A search of the *NSW Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023 – Schedule 4* was conducted on 2 July 2024. Old Mangrove Bay was not listed as a high priority groundwater dependent ecosystem. This information was used in the minimal harm assessment considerations under the NSW Aquifer Interference Policy, as described in **Section 7.1** of this report.

3. GROUNDWATER CONDITIONS

3.1 Previous Investigations

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

- EI (2024a) *Geotechnical Investigation at 54-58 Beaconsfield Street, Newport NSW*, Report No.: E26083.G03_Rev2, 29 May 2024.
- EI (2024b) *Groundwater Monitoring Report No.1 at 54-58 Beaconsfield Street, Newport NSW*, Report No.: E26083.G11.01, 7 June 2024.
- EI (2024c) *Groundwater Seepage Analysis at 54-58 Beaconsfield Street, Newport NSW*, Report No.: E26083.G12_Rev0, 4 July 2024.

Two groundwater monitoring wells (BH1M and BH3M) were installed during the previous geotechnical investigation (EI, 2024a). Well construction details are provided in the borehole logs presented in **Appendix E**.

The previous reports were reviewed and summarised as follows:

- ***EI (2024a) Geotechnical Investigation -*** The purpose of the investigation was to provide information on subsurface conditions on the site by way of intrusive investigation at six test bore locations. Boreholes BH1M, BH2, BH3M, BH4, BH5 and BH6 were advanced to depths between 1.6 and 12m. Boreholes BH1M and BH3M were converted to groundwater monitoring wells with depths of 9.62m BGL (7.88m AHD) and 12.0m BGL (7.6m AHD) to allow for long-term groundwater monitoring. Subsurface conditions encountered a layer of fill, followed by residual silty clay and sandy clay to as deep as 6.6m BGL and sandstone bedrock to 12m BGL (which was the maximum investigation depth at the site). The report also commented on geotechnical inputs to be considered in the preparation of designs for the proposed development.
- ***EI (2024b) Groundwater Monitoring Report -*** The purpose of the report was to provide continual groundwater levels during the monitoring period using data loggers installed within monitoring wells.
- ***EI (2024c) Groundwater Seepage Analysis -*** The GSA report was prepared by EI's geotechnical engineering group and provided details of the proposed excavation and site-specific groundwater modelling findings, including predicted water level drawdowns, expected groundwater inflow and discharge volumes, and predicted, drawdown-induced ground settlement rates at varying distances from the basement excavation.

3.2 Conceptual Hydrogeological Model

Based on previous investigation findings and EI's experience from sites with similar sub-soil conditions, the Conceptual Hydrogeological Model for the site is summarised as follows:

- Subsurface soil profile:
  - Concrete pavement – up to 0.15 m thickness;
  - Shallow fill layer (mainly clayey silt, silty clay and silty sand), 0.4m to 0.8m in thickness;
  - Residual soil layer (mainly silty clay and sandy clay) to as deep as 6.6mBGL; and
  - Sandstone bedrock, beneath the residual clay.

- Groundwater under pressure with standing water levels (SWLs) ranging between 11.78 and 16.18 mAHD, as measured within monitoring wells located inside and close to the proposed basement excavation footprint area, as shown in **Table 3-1**.
- Groundwater flow is moving through the underlying sandstone bedrock along bedding planes, joints and fractures, resulting in characteristically low hydraulic conductivities and low well yields.
- Hydraulic conductivities were detailed in the GSA report for the various strata, with specific values of 1.0 x 10^{-7} m/s for the residual silty / sandy clay layer and 6.7 x 10^{-8} m/s for the underlying sandstone bedrock.
- Groundwater flow direction in the vicinity of the site is inferred to be south-westerly towards Old Mangrove Bay.
- The shallow, fractured bedrock is not utilised for water supply purposes, as indicated by the purposes (waste disposal) of groundwater supply bores within the search area (**Section 2.4**).

3.3 Pre-Dewatering Groundwater Depth and Hydraulic Gradient

EI completed 3 months of continuous groundwater level monitoring in wells BH1M and BH3M from 22 February 2024 to 5 June 2024 (EI, 2024b), with recorded water level fluctuations as summarised in **Table 3-1**. Additional groundwater levels were also measured during the GSA (EI, 2024c) and current investigation, as shown in **Table 3-1**.

Table 3-1 Summary of 3-month Groundwater Monitoring Results

Monitoring Well	Existing Ground RL (mAHD)	Measurement Date	Groundwater RL (mAHD)
BH1M	17.50	22/2/2024 - 5/6/2024	11.78 - 16.18
		19/6/2024	12.6
		26/6/2024	12.3
BH3M	19.40	22/2/2024 - 5/6/2024	13.58 - 13.93
		19/6/2024	14.3
		26/6/2024	13.95

As discussed in the GSA report, a design groundwater level of RL 16.2m was adopted for assessment of groundwater seepage inflow rates and groundwater take volumes within the basement excavation.

3.4 Baseline Groundwater Quality Assessment

3.4.1 Monitoring Well Locations

Data from the monitoring wells (BH1M and BH3M) were used to characterise pre-dewatering groundwater quality. All well locations are illustrated on **Figure 2, Appendix A**.

3.4.2 Tested Parameters

The most recent groundwater monitoring event (GME) was conducted on 26 June 2024 and incorporated the two monitoring wells BH1M and BH3M. Collected samples were tested for the analytical parameters listed in Appendix A of DPIE (2022), as follows:

- Dissolved metals (aluminium (Al), antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), boron (B), cadmium (Cd), total chromium (Cr), cobalt (Co), copper (Cu), iron (Fe), lead (Pb), lithium (Li), manganese (Mn), mercury (Hg), molybdenum (Mo), nickel (Ni), selenium

(Se), silica (dissolved SiO2), silver (Ag), strontium (Sr), uranium (U), vanadium (V), zinc (Zn));

- Total Recoverable Hydrocarbons (TRHs);
- Benzene, Toluene, Ethylbenzene and Xylenes (BTEX);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Volatile Organic Compounds (VOCs), including Chlorinated Volatile Organic Compounds (CVOC);
- Total Cyanide;
- Total Phenols;
- Major Anions (sulfate (SO_4), chloride (Cl), carbonates (CO_3), bromide (Br), fluoride (F));
- Major Cations (calcium (Ca), magnesium (Mg), sodium (Na), potassium (K));
- Nutrients (ammonia (NH3), nitrate (NO_3), total nitrogen (N), oxidised nitrogen (N), total phosphorus (P), reactive phosphorus (P));
- Microbiological organisms (Faecal coliforms, faecal streptococci, Escherichia Coli);
- pH;
- Electrical Conductivity (EC);
- Total Dissolved Solids (TDS);
- Turbidity;
- Dissolved Oxygen (DO); and
- Total Hardness.

3.4.3 Field Observations and Water Quality Testing

The field water quality parameters DO, pH, EC, Temperature and Reduction/Oxidation (Redox) potential, were measured onsite using a flow cell and recorded as presented in **Table 3-2**. The groundwater samples were then evaluated on the basis of odour and visual signs of contamination, with the following observations noted:

- Groundwater samples collected from monitoring wells BH1M and BH3M were observed to be transparent / light brown in colour, with low to medium turbidity;
- No odour or visual evidence of contamination were detected during well purging and groundwater sampling;
- No petrochemical films or oily sheen was observed on the surface of the purged / sampled groundwater; and
- A portable photo-ionisation detector (PID) was used to screen the top of each well for VOCs. PID readings were low at BH1M and BH3M (<1ppm).

Table 3-2 Groundwater Field Data (GME date: 26 June 2024)

Well ID	DO (mg/L)	pH	EC (µS/cm)	Temperature (°C)	Redox [1] (mV)
BH1M	5.19	6.47	593	19.51	295.1
BH3M	3.11	4.5	2385	18.59	442.2

Notes:
[1] Reduction-Oxidation Potential *Redox* (mV) readings were adjusted to Standard Hydrogen Electrode (SHE) by adding field electrode potential (205mV).

The field water quality data indicated that groundwater beneath the site was acidic to slightly acidic (pH: 4.5-6.47), fresh to slightly brackish (EC: 593 to 2385 µS/cm) and generally under an oxidised state (Redox 295.1 to 442.2 mV).

3.4.4 Laboratory Data Quality Assessment

A data quality assessment in relation to the June 2024 groundwater data was undertaken, as documented in **Appendix G**. This included collection and testing of field quality control samples and review of field QC and internal laboratory QA/QC results. On the basis of the analytical data validation procedure employed the overall quality of the groundwater analytical data were considered to be of an acceptable standard for interpretive use.

3.4.5 Laboratory Analytical Results

A summary of laboratory analytical results assessed against the adopted water quality criteria is presented in **Table B1** and **Table B2** (**Appendix B**). Laboratory documentation is attached in **Appendix F**.

Groundwater quality data were assessed against the water discharge criteria (the ‘adopted criteria’), which are based on the default guideline values (DGVs) for marine water, published under the ANZG (2018) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, or appropriate default criteria, as explained in **Section 5.2**.

Results of the June 2024 GME showed compliant concentrations with the water discharge criteria in most samples, with the following exceptions:

- Copper (41µg/L) was above the adopted water quality criterion (13 µg/L) at monitoring well BH1M;
- Aluminium exceeded the adopted water quality criterion (55 µg/L) at monitoring wells BH1M (300µg/L) and BH3M (550µg/L);
- Cobalt (2µg/L) was above the adopted water quality criterion (1 µg/L) at monitoring well BH1M;
- Total oxidised nitrogen (420µg/L) was above the adopted water quality criterion (15 µg/L) at monitoring well BH1M;
- Total nitrogen (1,300µg/L) was above the adopted water quality criterion (120 µg/L) at monitoring well BH1M;
- Total phosphorus (290µg/L) was above the adopted water quality criterion (25 µg/L) at monitoring well BH1M;
- pH was outside the adopted water quality criterion (6.5 – 8.4) at monitoring wells BH1M (5.8 – 6.47) and BH3M (4.5);
- Turbidity exceeded the adopted water quality criterion (10 NTU) at monitoring wells BH1M (470 NTU) and BH3M (210 NTU); and
- Dissolved oxygen (83.8%) was marginally outside the adopted water quality criterion (85 – 100%) at monitoring wells BH1M.

Groundwater salinity was found to range between 650 mg/L and 1,300 mg/L TDS, i.e. less than 1,500 mg/L for aquifer interference policy considerations, discussed in **Section 7**.

3.4.6 Water Treatment Requirements

<u>Construction Phase Dewatering</u>

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

- Aluminium;
- Cobalt;

- Copper;
- Total oxidised nitrogen, total nitrogen and total phosphorus;
- pH; and
- Turbidity.

Potential water treatment options include pumping the water through a sediment settlement tank, where the following could be implemented:

- Addition of flocculent/coagulant for settlement of suspended particles;
- pH correction implemented concurrently to higher water pH to the required range; and
- Adjustment of flow rates to allow sufficient residence time for flocculation/coagulation and settlement to take place.

A further GME is recommended before commencement of construction, including testing of the additional DPIE (2022) water quality parameters (listed in **Section 5.3**), to verify groundwater quality for the amendment of water treatment requirements, if warranted.

A water treatment specialist should be engaged to advise on appropriate technologies for water treatment.

Further details on water quality management are provided in **Section 5.4**.

Operational Phase Dewatering

A GME is recommended at the end of construction to verify water quality parameters and review/amend the water treatment system and water quality management for the operational phase, to ensure that water quality is compliant with the discharge criteria (**Table 5-1**), prior to operational stormwater discharge.

4. DEWATERING METHODOLOGY

4.1 Excavation and Shoring

As stated in **Section 1.2**, the proposed development includes the construction of a three-level basement. A BEL of RL 12.7 m AHD has been assumed. Locally deeper excavations may be required for footings, service trenches, crane pads and lift overrun pits.

With reference to the GSA report (attached in **Appendix D**), the basement excavation is assumed to be supported by a shoring system comprised of a fully drained soldier pile wall.

This assessment does not cover the overall stability and embedment depth of the shoring system. Once final designs are made available, the GSA (and this report) should be revised accordingly.

4.2 Estimated Groundwater Take Volume

As described in the GSA report, groundwater seepage analysis for flow through and beneath the shoring wall was undertaken using the software package SEEP/W®. SEEP/W is a finite element groundwater mathematical model used to estimate the total volume of groundwater to be extracted during basement construction and to provide a rate for operational dewatering, based on a fully drained basement design.

Based on a specific set of assumptions and field test data, which included the design groundwater level of RL 16.2 m AHD (**Section 3.3)** and calculated, layer-specific hydraulic conductivities for the various classes of bedrock encountered at the site (detailed in the GSA report), annual groundwater seepage flow draining through the shored walls into the excavation is predicted to be **0.76 ML** (i.e. approximately 2.09 m^3/day). This would apply for both the construction and the operational phases of the development.

It is noted that in accordance with the NSW *Water Management (General) Regulation 2018*, a Water Access Licence is not required where the estimated groundwater take is less than 3 ML/year.

4.3 Dewatering Level and Drawdown Monitoring

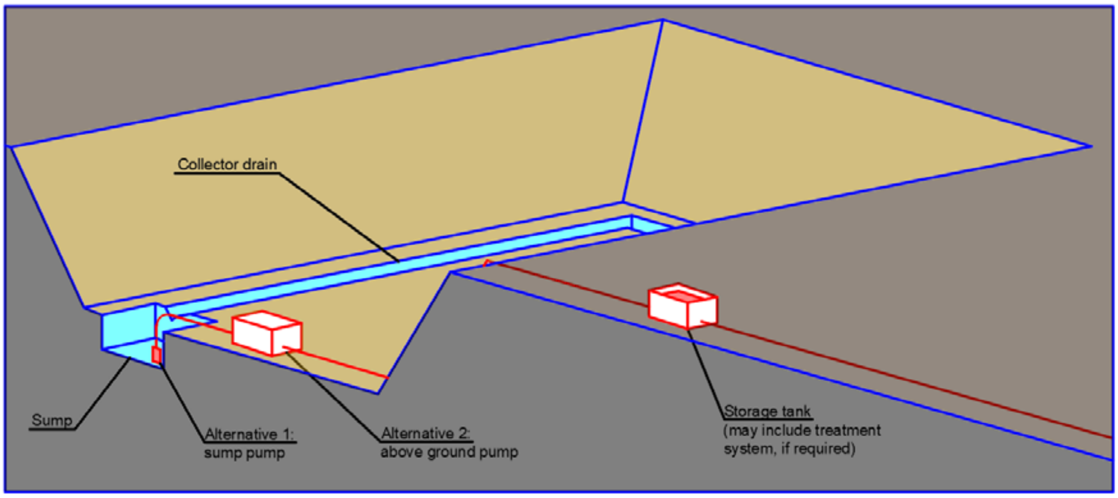
With freely draining groundwater seepage flow groundwater levels would be drawn down to the BEL of RL 13.5 mAHD from a design water level of RL 16.2 mAHD. This represents a total cumulative drop in groundwater level of approximately 2.7m at the shoring walls.

Groundwater elevations will be monitored periodically during the construction dewatering period by measuring groundwater depth in selected monitoring wells. As the estimated seepage rate is low (i.e. 0.01m^3/day per metre length of perimeter wall, as detailed in **Appendix D**), groundwater depth gauging may be adequately gauged manually by electric water contact meter during each dewatering monitoring event, as described in **Section 5.3**.

4.4 Dewatering Method

A sump and pump system will be used to control seepage into the excavation during basement construction and in the long-term, as illustrated in **Figure 4-1**.

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



4.4.1 Construction Phase Dewatering

During construction, it is recommended that groundwater is pumped-out from a collection sump located at the lowest part of the excavation and discharged initially into a vessel (or equivalent) for sediment settling. The preferred vessel type will require capacity to accommodate the rate of groundwater extraction, which is estimated to be approximately 2.09 m^3/day.

Groundwater treatment will be undertaken either in the vessel, or via a water treatment system installed close to the vessel prior to discharge. The treated water will then be discharged into the municipal storm water pit provided that prior approval for discharge has been obtained from the relevant consent authorities.

The pumping system may operate on a full time or intermittent basis (as required) for the approved construction dewatering period, to control seepage during basement construction.

The Site Manager, Dewatering Contractor and Water Treatment Specialist must agree on a dewatering strategy to confirm that dewatering treatment systems and water retention tanks can be positioned appropriately within approved areas of the site, prior to the commencement of the excavation works.

4.4.2 Operational Phase Dewatering

Given the relatively low predicted total annual groundwater take volume a drained basement is to be adopted for the operational (post-construction) phase of the development. This would involve collection of groundwater seepage via onsite detention storage (OSD tank, or equivalent), with discharge to the municipal stormwater system for the operational life of the project, with consent authority approval.

It is understood that WaterNSW may consider an application for long-term, operational phase dewatering, where minimal impact considerations under the NSW Aquifer Interference Policy (AIP) are satisfied. An assessment against the AIP was undertaken, which found minimal impact requirements would be satisfied, as described in **Section 7**.

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.

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 drawings, suitable for Council review purposes.

Flow monitoring data will be documented by a suitably trained site employee 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 taken from the site and will be included in the Construction Dewatering Completion Report (**Section 5.4.3**), to be issued to Council and WaterNSW after the completion of construction dewatering activities.

For the construction phase, water level and volume monitoring will be conducted during the same monitoring events described in **Section 5.4**. For the operation phase, these monitoring events will be conducted annually, as described in **Section 7.3**.

4.6 Potential Drawdown-Induced Impacts

In specific cases, dewatering may induce ground subsidence on neighbouring properties due to the associated increase in vertical effective stress in the ground. Ground settlement due to groundwater level drawdown is particularly an issue when occurring in soft to firm clays or sands.

The groundwater drawdown level was estimated to be 2.7m and the maximum predicted ground settlements occur immediately outside of the shoring wall and were estimated to be 10.6 mm. Ground experiencing settlements less than 10mm are considered to be a negligible risk in regards to category of damage risk due to dewatering. Although predicted drawdown-induced ground settlement value was provided, 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.

EI notes that the calculated settlement is due to drawdown only and other considerations such as the movement of the retaining structure have not been allowed for. For a more detailed analysis of potential settlement due to factors other than groundwater level drawdown a Finite Element Analysis is recommended, to model the retaining structure and construction sequence.

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 management procedures for water quality as described in this report.

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 Old Mangrove Bay at Pittwater River, which is considered a slightly to moderately disturbed marine ecosystem (**Section 2.5**). The ANZG (2018) *95% Marine Default Guideline Values* (*DGVs)* and 99% *DGVs* for bio-accumulative toxicants were therefore adopted as the Discharge Water Criteria (DWC), to ensure that only higher quality water is discharged to the environment.

For water quality parameters not currently addressed by the ANZG marine DGVs, relevant alternative criteria have been adopted as the default DWC, as summarised in **Table 5-1**. For parameters not addressed by the ANZG (2018) fresh or marine water criteria, recreational water criteria were not used, as these were deemed not relevant to the receiving water body. The adopted criteria are specified in the table footnotes.

The listed parameters and their respective criteria will apply for both the initial (pre-dewatering) and on-going assessment of the quality of water being discharged to the storm water system during the construction and occupational phases of the development.

Table 5-1 Discharge Water Criteria (DWC)

Analyte	DWC (µg/L) [1]
Metals	
Aluminium (for waters with pH > 6.5)	55 [2]
Antimony	9 [2]
Arsenic ^{III}	24 [2]
Arsenic ^{V}	13 [2]
Barium	No Relevant Criteria
Beryllium	No Relevant Criteria
Boron	940 [2]
Cadmium	0.7 [1]
Chromium ^{III}	27.4
Chromium ^{VI}	4.4
Cobalt	1
Copper	13 [3]
Iron	No Relevant Criteria

Lead	4.4
Lithium	No Relevant Criteria
Manganese	80 [2]
Mercury (total)	0.1 [1]
Molybdenum	34 [2]
Nickel	70
Selenium	11 [2]
Silica (dissolved SiO2)	No Relevant Criteria
Silver	1.4
Strontium	No Relevant Criteria
Uranium	0.5 [2]
Vanadium	100
Zinc	80 [3]
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
Toluene	180
Ethylbenzene	80
o - xylene	350 [2]
p - xylene	200 [2]
m - xylene	75
Polycyclic Aromatic Hydrocarbons (PAH)	
Benzo(a)pyrene	0.2
Naphthalene	70
PFAS	
PFOS	0.13 [8]
PFOA	220 [8]
Microbiological organisms and Other Organics	
Faecal coliforms	No Relevant Criteria
Faecal streptococci	No Relevant Criteria
Escherichia coli (E. coli)	No Relevant Criteria
Total Cyanide	4
Total Phenol	400
Major Anions	
Bromide	No Relevant Criteria

Chloride	No Relevant Criteria
Carbonates	No Relevant Criteria
Flouride	No Relevant Criteria
Sulfate	No Relevant Criteria
Major Cations	
Calcium	No Relevant Criteria
Magnesium	No Relevant Criteria
Potassium	No Relevant Criteria
Sodium	No Relevant Criteria
Nutrients	
Ammonia	910
Nitrate	700 [5]
Nitrite	No Relevant Criteria
Total Oxidised Nitrogen	5 [6]
Total Phosphorus	25 [6]
Reactive Phosphorus	10 [6]
Total Nitrogen	120 [6]
Physiochemical Parameters	
DO (% saturation)	85 -110 [6]
pH (pH units)	6.5 to 8.4 [6]
Turbidity (NTU)	10 [7]

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

Note 2 The ANZG (2018) 90% Freshwater DGVs for highly disturbed freshwater ecosystems are applied for the indicated parameters (aluminium, arsenic, boron and selenium), in the absence of marine water criteria. Note: ANZG only provides freshwater criteria at an ‘unknown’ level of species protection (%) for antimony, molybdenum, uranium, o – xylene and p - xylene; therefore, these DGVs are applied. ANZG (2018) only provides marine criteria at an “unknown” level of species protection (%) for manganese; therefore, these DGVs are applied.

Note 3 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 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 marine criteria in relation to nitrate, the Freshwater 90% trigger value was sourced from ANZECC & ARMCANZ 2000 Table 3.4.1 Trigger values for toxicants for moderately to highly disturbed systems. A marine trigger value is not currently available.

Note 6 In the absence of ANZG (2018) criteria, alternative criteria from ANZECC / ARMCANZ (2000), Table 3.2.2, Default trigger values for physical and chemical stressors for south-east Australia for moderately to highly disturbed ecosystems. The Marine criteria were adopted for total oxidised nitrogen, total phosphorus, reactive phosphorus and total nitrogen. The adopted pH and DO range are between lower limit for Lowland River and upper limit for Marine settings.

Note 7 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.

Note 8 DWC value is derived from the National Environmental Management Plan for PFAS (2020) - 95% species protection for highly disturbed systems.

5.3 Additional Pre-dewatering Monitoring Event

As described in **Section 3.4**, water quality conditions outside of the DWC have previously been detected in relation to aluminium, copper, cobalt, total oxidised nitrogen, total nitrogen, total phosphorous, pH, turbidity and dissolved oxygen. With the aim of preventing adverse impacts on receiving waters, extracted groundwater should be treated prior to stormwater discharge, while monitoring of all parameters should continue regularly, as described in **Section 5.4**.

An additional round of groundwater monitoring 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** and field testing must include the water quality parameters indicated in **Section 3.4.3**, plus the following additional parameters:

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

EI found no evidence to warrant PFAS testing of the groundwater passing beneath the site.

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 treatment equipment, including inspection that short-circuiting of water around baffles and filter media is not occurring within sediment retention tanks;
- No petrochemical sheens are visible on the water surface and no hydrocarbon odours are being generated by the treated groundwater or sediment; and
- No green, blue or extremely clear effluent, 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 filter media changeover events and operational measurements such as flow rates, pressures and water flow meter readings (if used), to enable the calculation of cumulative dewatering discharge volumes.

5.4.2 Sample Collection and Analysis

On-going sample analysis must continue for the duration of construction 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 (Old Mangrove Bay).

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 listed in **Table 5-1** (**Section 5.2**), in accordance with *Appendix A – Routine water quality monitoring lists* (Ref. DPIE, 2022). Additional water quality parameters may be added to the priority test suite, should daily monitoring indicate that 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.

- **Construction Monitoring Period (Weekly, Fortnightly and Monthly)**: After the Trial-Run Period, and subject to statutory 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 if 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.

- **Operational Monitoring Period (Annual)**: Provided that the Discharge Monitoring Period shows consistent and compliant results, the monitoring frequency can be extended to annually during the operational period, until the end of year 3, as described in **Section 7.3**. As per the construction period, contingency measures detailed in **Section 6.5** should be implemented if 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 criteria (**Section 5.2**). 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 methods and procedures, provide a comparison between historical and current results, assess the results against the adopted criteria and provide recommendations on corrective actions, when required.
- Following completion of construction dewatering activities, a **Dewatering Completion Report** will be prepared by the appointed Environmental Consultant, and must include copies of all analytical results and interim monitoring reports issued during the construction phase dewatering period. A clear statement will be made regarding the overall quality of groundwater discharged in comparison to the acceptable quality standards. The final report will be submitted to Council and Water NSW.
- **Annual Dewatering Monitoring Reports** will be prepared upon receipt of laboratory data for each annual round of water quality monitoring during the operational phase of the development, as described in **Section 7.3**.

5.4.4 Reporting of Other Information

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

5.5 Water Treatment

5.5.1 Water Treatment Design Considerations

Baseline groundwater quality data to date (**Section 3.4.5**) indicates that treatment of seeped groundwater will be necessary prior to discharge to the storm water system. It is recommended that the selection and design of the preferred treatment system are managed by a Dewatering Contractor / Water Treatment Specialist, in collaboration with the appointed Environmental Consultant. Alternative and/or additional water treatment options may be required, depending on which parameters are found to exceed the DWC after the additional, pre-dewatering monitoring event described in **Section 5.3**.

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 **Sections 4.2** and **4.4**);
- Water filtration to reduce coarse and fine suspended solids;
- If applicable, automated in-line chemical dosing systems for the addition of coagulants for the adjustment of turbidity 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 to below the values presented in **Section 5.2**;
- Spare retention tank(s) 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 water treatment system should be installed, tested and made operational prior to the commencement of dewatering, to ensure that only treated water that meets the adopted quality criteria is discharged.

5.5.2 Treatment System Maintenance

The water 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 AND 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 report 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 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 the noise emission of 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 Problem	Preventive/Corrective Actions
Water Quality Criteria Non-Compliance	
Water Quality Criteria Exceedance Laboratory analytical report for any monitoring event reveals that the quality of treated discharge water does not satisfy the adopted criteria detailed in **Table 5-1**.	Immediate action must be taken to halt the release of water into receiving water bodies, where water quality is found not to meet the adopted criteria detailed in **Table 5-1** Discharge of water must be suspended to enable the following procedure to be implemented: 1) Water will be redirected to storage retention basin/tanks; 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 criteria, the treated water outlet may be redirected to receiving water bodies; however 4) Should the analytical result for the confirmation sample show that the discharge water quality does not comply with the adopted criteria, the environmental consultant / water treatment specialist will be required to modify the water

Anticipated Problem	Preventive/Corrective Actions
	treatment system, in order to achieve compliant discharge water quality. Collection of further treated water samples will be required to confirm the effectiveness of the modifications; 5) After laboratory confirmation that the revised treated water quality complies with criteria, extracted groundwater may be redirected to receiving water bodies; and 6) Weekly monitoring of treated discharge water quality monitoring will be required, until such time that contaminant concentrations are within the adopted criteria values for three consecutive sampling events. Once this is achieved, fortnightly monitoring may be reinstated. **Note: Wastewater Removal** - It may be necessary to have collected waters removed by a licensed wastewater contractor, should quantities exceed the on-site capacity for temporary storage. In this case, records must be maintained to document quantities of wastewater disposed in this way, with provision of wastewater disposal dockets issued by the contractor to be retained for audit and reporting purposes.
Visible and 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 an alternative retention vessel, while the treatment system is adjusted. It may be necessary to have collected waters removed by a licensed wastewater contractor, should retained quantities exceed the on-site 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 non-compliances for discharge water quality.	Retain extracted water onsite in appropriate bulk containers for subsequent removal by a licensed wastewater contractor. Determine an alternative discharge method, if necessary, updating this report accordingly.
Groundwater Take Non-Compliance	
Excessive Extraction Daily discharge rate is exceeded.	Retain tail water onsite in appropriate bulk containers. Remove water by a licensed wastewater contractor, or seek Council approval for temporary increase in discharge rate to the stormwater system.
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 environmental consultant / water quality expert and collect samples for analysis, to assess the identified concentrations against relevant criteria. If the contaminant is found to exceed the adopted criteria, follow the corrective actions corresponding to *Water Quality Criteria Exceedance* above. Expand the adopted criteria accordingly.
Chemical/fuel spill and leaks from machinery	Stop earthworks, notify site manager. Use accessible soil or

Anticipated Problem	Preventive/Corrective Actions
	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 seek advice from environmental consultant in regard to assessment and treatment requirements.
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 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.
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 odours and volatile emissions using photo-ionisation detectors (PID), if applicable.
Complaint management	Notify client, site manager and environmental consultant (if required) logging and following up complaint. Reporting should follow management procedures. Implement control measures to address reason of complaint (if possible) and notify complainant of outcome.

7. MINIMAL HARM ASSESSMENT

7.1 Consideration of NSW Aquifer Interference Policy

The site-specific hydrogeological conceptual model (**Section 3.2**) indicates that groundwater seepage would enter the excavation flowing through joints, faults and bedding plane fractures within the bedrock. Lower seepage flow volumes may be expected during depressed groundwater levels in dry periods, with higher seepage flow after high rainfall events, which would be expected to cause temporary, elevated groundwater levels.

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 site will be dewatered by allowing groundwater to drain from the sandstone bedrock, which has been characterised with an average groundwater salinity of 975 mg/L TDS (see **Section 3.4.3**). Modelled inflow to the basement will be 2.09 m^3/day (**Section 4.2**) i.e. 0.024 L/sec, for both the construction and operational phases of the development.

The aquifer at the site therefore meets the description of a *"less productive groundwater source"*, 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."*

Table 1 *Minimal Impact Considerations for Aquifer Interference Activities* of the NSW AIP shows that for *Less Productive Groundwater Sources* in low yielding porous and fractured rock water sources that are under groundwater pressure conditions, the following minimal impact considerations are applicable:

Drawdown

- *Level 1 – A cumulative pressure head decline of not more than 2m, at any water supply work.*
- *Level 2 – If the predicted pressure head decline is greater than the Level 1 requirement (above), then appropriate studies are required to demonstrate to the Minister's satisfaction that the decline will not prevent the long-term viability of the affected water supply works unless make good provisions apply.*

Water Quality

- *Level 1 - Any change in groundwater quality should not lower the beneficial use category of the groundwater source beyond 40m from the activity.*
- *Level 2 - If the Level 1 condition (above) is not met, then appropriate studies will need to demonstrate to the Minister's satisfaction that the change in groundwater quality will not prevent the long-term viability of the dependent ecosystem, significant site or affected water supply works.*

The proposed dewatering for the construction and operational phases of the project are considered to be compliant with the NSW AIP minimal impact criteria for the following reasons:

- Although the estimated maximum cumulative pressure head decline has been modelled to be 2.7m (**Section 4.3**), the drawdown will occur in competent bedrock, which is characterised to have a low hydraulic conductivity (6.7 x 10^{-8} m/sec), as documented in the GSA report;
- There are no known potential sources of groundwater contamination within 250 m of the site, which could adversely impact the beneficial use category of the groundwater source;
- The of registered water supply bores within a 500m radius of the site (**Section 2.4**), indicates that groundwater is not relied on as a water supply source in surrounding areas, particularly as a more reliable and convenient, reticulated potable water supply is readily available and preferred by domestic and commercial/industrial water users;
- Treated water quality, cumulative drawdown and water take will be monitored and documented for the duration of site dewatering; and
- There is no high priority, groundwater dependant ecosystem within 40m of the site.

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 is estimated to be **0.76 ML** per year, for both the construction phase and the operational phase of the development.
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 GSA report in **Appendix D**).
3. Ground elevation across the site	Based on the Geotechnical Investigation (EI, 2024a), the site slopes from the north-east to south-west, with elevation ranging from 23.52mAHD (north-east) to 16.1mAHD (south-west).
4. Geotechnical ground characterisation	Refer to GSA report in **Appendix D**.
5. Water level measurements	Groundwater levels were measured at depths from 11.78 mAHD (minimum) to 16.18 mAHD (maximum), as detailed in **Section 3.3**. Periodic groundwater level gauging will be conducted on an annual basis (i.e. 1 monitoring event per year) at monitoring wells during the operational phase, as described in **Section 5.3.2**.
6. Required water level draw down and potential impacts	The GSA (EI, 2024c) assumed that the groundwater drawdown level was estimated to be 2.7m and the maximum predicted ground settlements occur immediately outside of the shoring wall and were estimated to be 10.6mm. Ground experiencing settlements less than 10mm are considered to be a negligible risk in regards to category of damage risk due to dewatering, as described in **Section 4.6**.
7. Works proposed for dewatering	A drained basement using drainage of sub-soil seepage waters and a sump-and-pump system, as described in **Section 4.4**.
8. The base level of the aquifer	Fractured sandstone bedrock extends below the proposed BEL, see **Section 3.2**.

Assessment Items	Comments
9. Excavation footprint dimensions	Not available at the time of this report.
10. Hydraulic conductivity of lithological units	Detailed in Table 1 of the GSA report (EI, 2024c) in **Appendix D**.
11. Anticipated duration of dewatering	Dewatering will be ongoing for the approved construction dewatering period, while operational dewatering will be ongoing for the life time of the project.
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.

7.3 Operational (Occupational) Phase Dewatering Management

The following procedure will be adhered to by strata management to ensure that the long-term dewatering system is managed appropriately:

- **Groundwater level monitoring**: Scheduled groundwater level monitoring is required for the first 36 months of the sump and pump operational phase in order to characterise seasonal groundwater level fluctuations for the operational (post-construction) phase of the development. It is noted that the occupational phase of the development commences prior to the sump and pump commences operation.

  EI notes that the existing groundwater monitoring well BH1M is located outside the basement footprint and BH3M is located inside of the basement footprint. At least one of two wells (and if practical, all) should be preserved to enable groundwater level monitoring close to the basement.

  <u>Should the existing wells be damaged during the construction works, installation of a new groundwater monitoring well will be required, under the management of a qualified and appropriately experienced environmental consultant</u>. Strata management should formally engage the environmental / geotechnical consultant to perform the required monitoring.

  A quarterly groundwater level monitoring frequency (i.e. once every 3 months) will be adopted for the first twelve months of occupation. This will be followed by semi-annual water level monitoring (i.e. once every 6 months) for the second year; then annual monitoring (i.e. a monitoring event at the end of the third year). Water level data will be recorded on a data form to document date of monitoring, well identification number, reference point from where all water level measurements are consistently taken (e.g. top of well casing, or ground level), the depth to water and the name of the person conducting the monitoring.

- **Discharge volume monitoring**: The volume of water discharged to stormwater must be monitored by a calibrated flow meter (or equivalent alternative means) that is integrated as part of the long-term pumping system. The flow meter (or flow monitoring device) will display cumulative volume discharged, which will be recorded onto the same data form used to document groundwater level, at the time of each water level monitoring event. Discharge volume monitoring frequency will therefore be the same as for groundwater level monitoring, i.e. quarterly for the first year, every 6 months for year two, and a single monitoring event at the end of year three.

- **Water quality monitoring**: A single, post-treatment water sample will be collected on an annual basis during the final monitoring event in each year (i.e. at 12 months and 24 months of operation). Treated water samples will be laboratory analysed for the priority discharge water quality parameters (**Table 5-1**), to confirm that DWC compliance and show that discharge water quality is not deteriorating with time. Given that the groundwater is to be treated prior to offsite discharge, the risks presented to the human health and environment for the construction phase of the development are considered low and acceptable. Groundwater assessment of water quality parameters is required at the end of the construction phase to verify concentrations, and review or amend proposed operational phase water treatment if required.

- **Annual dewatering monitoring report**: A factual, 12-monthly Dewatering Monitoring Report will be prepared in letter format after each 12 months of monitoring by the appointed consultant. Each report will document the groundwater level gauging results, groundwater quality results and the cumulative volume of water discharge from the seepage collection sump to the storm water system. The monitoring report will also include an updated copy of the monitoring data form, showing all monitoring records since the start of the occupational phase. Each annual monitoring report will also include a trend analysis of the monitoring data and provide a discussion to characterise trends in groundwater quality, groundwater levels as measured in the monitoring well and water discharge volumes over time.
- **Cessation of monitoring**: Should the annual dewatering monitoring report after the 36th month of occupation confirm that groundwater quality, groundwater level fluctuations at the monitoring well(s) and annual groundwater discharge volumes are stable (i.e. not statistically trending up or down), then it will be determined that equilibrium has been reached and termination of the monitoring program would be justified. If this is not the case then the dewatering program will be reviewed accordingly. The appointed environmental consultant will provide notification to Council to document the termination or continuation of monitoring at this stage. Should monitoring be continued, a review of monitoring frequency will be undertaken and appropriate notification to Council will be issued by the appointed environmental consultant.

8. DEWATERING MANAGEMENT SUMMARY

The requirements of this report are summarised in **Table 8-1**.

Table 8-1 Dewatering Management Summary

Item	Requirement / Procedure
Objective	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 5.5**for groundwater treatment options.* Provide comment on groundwater level changes that occur during dewatering: ▪ *See **Section 4** for summary of groundwater seepage analysis and dewatering drawdown impacts.* ▪ *Refer to **Appendix D** for groundwater seepage analysis model.* Provide relevant information demonstrating that post-construction, operational dewatering would pose minimal harm to the groundwater source: *See **Section 7** for operational phase dewatering management.*
Person Responsible for Implementation of this Report	During basement excavation and construction, the Site Manager / Water Treatment Specialist will be responsible for ensuring the implementation of appropriate treatment of extracted groundwater, as outlined in this document. Occupation phase responsibility will rest with Strata Management.
Operation Dewatering Policy	To ensure that all extracted groundwater from dewatering is effectively treated prior to discharge to the receiving water bodies, as will be confirmed by the Operational Dewatering Management Procedure detailed in **Section 7.3**.
Pre-Dewatering Groundwater Assessment	As set out in **Section 3**, 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 discharge 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 (DWC) 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.

Item	Requirement / Procedure
Monitoring Requirements for Construction Phase Dewatering	As specified in **Section 5.4**: ▪ 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.*
Monitoring Requirements for Operational Phase Dewatering	As specified in **Section 7.3**: Quarterly for the first year, every 6 months for year two, and a single monitoring event at the end of year three.
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 discharges 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 JAK Newport Pty Ltd, which 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 the client.

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.

REFERENCES

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

ANZG (2018) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian and New Zealand Governments and Australian State and Territory Governments, Canberra ACT, Australia, August 2018.

Cashman and Preene (2001) *Groundwater Lowering in Construction*, *A Practical Guide* (Edition 1), New York: Spon Press.

Chapman GA and Murphy CL (1989) *Soil Landscapes of the Sydney 1:100 000 Sheet*, Soil Conservation Service of NSW, Sydney, September 1989.

DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*, NSW Department of Environment and Conservation, DEC 2007/144, June 2007.

DMR (1983) *Sydney 1:100,000 Geological Series Sheet 9130* (Edition 1), Geological Survey of New South Wales, Department of Mineral Resources.

DCCEEW (2023) *eSPADE v2.0 Portal*. NSW Department of Planning, Industry and Environment (retrieved from www.espade.environment.nsw.gov.au).

DPIE (2022) *Minimum requirements for building site groundwater investigations and reporting*, NSW Dept. of Planning and Environment, Doc. PUB20/940, Rev. V02.2210, October 2022.

EI (2024a) Geotechnical Investigation at 54-58 Beaconsfield Street, Newport NSW, Report No.: E26083.G03_Rev2, 29 May 2024.

EI (2024b) Groundwater Monitoring Report No.1 at 54-58 Beaconsfield Street, Newport NSW, Report No.: E26083.G11.01, 7 June 2024.

EI (2024c) Groundwater Seepage Analysis at 454-58 Beaconsfield Street, Newport NSW, Report No.: E26083.G12_Rev0, 4 July 2024.

Murphy CL (1997) *Acid Sulfate Soil Risk of the Hornsby / Mona Vale Sheet* (Second Edition). Department of Land and Water Conservation, Sydney. Supplied by the Sydney South Coast, Geographical Information Systems Unit.

NEPC (2013) *National Environmental Protection (Assessment of Site Contamination) Amendment Measure*, National Environmental Protection Council, April, 2013.

NHMRC (2008) *Guidelines for Managing Risks in Recreational Water*, National Health and Medical Research Council, Australian Government, 2008.

NHMRC (2022) *Australian Drinking Water Guidelines, Paper 6 National Water Quality Management Strategy*, National Health and Medical Research Council, Commonwealth of Australia, Canberra, Version 3.8, September 2022.

NUDLC (2020) *Minimum Construction Requirements for Water Bores in Australia* (4th Edition), National Uniform Drillers Licensing Committee.

NSW EPA (2013) *Licencing Fact Sheet – Using Environment Protection Licensing to Control Water* Pollution, EPA 2013/0119, May 2013.

NSW Government (2018) *Water Management (General) Regulation*.

NSW Government (2021) *Minimum Requirements for Building Site Groundwater Investigations and Reporting, Information for Developers and Consultants*, Department of Planning, Industry and Environment, January 2021.

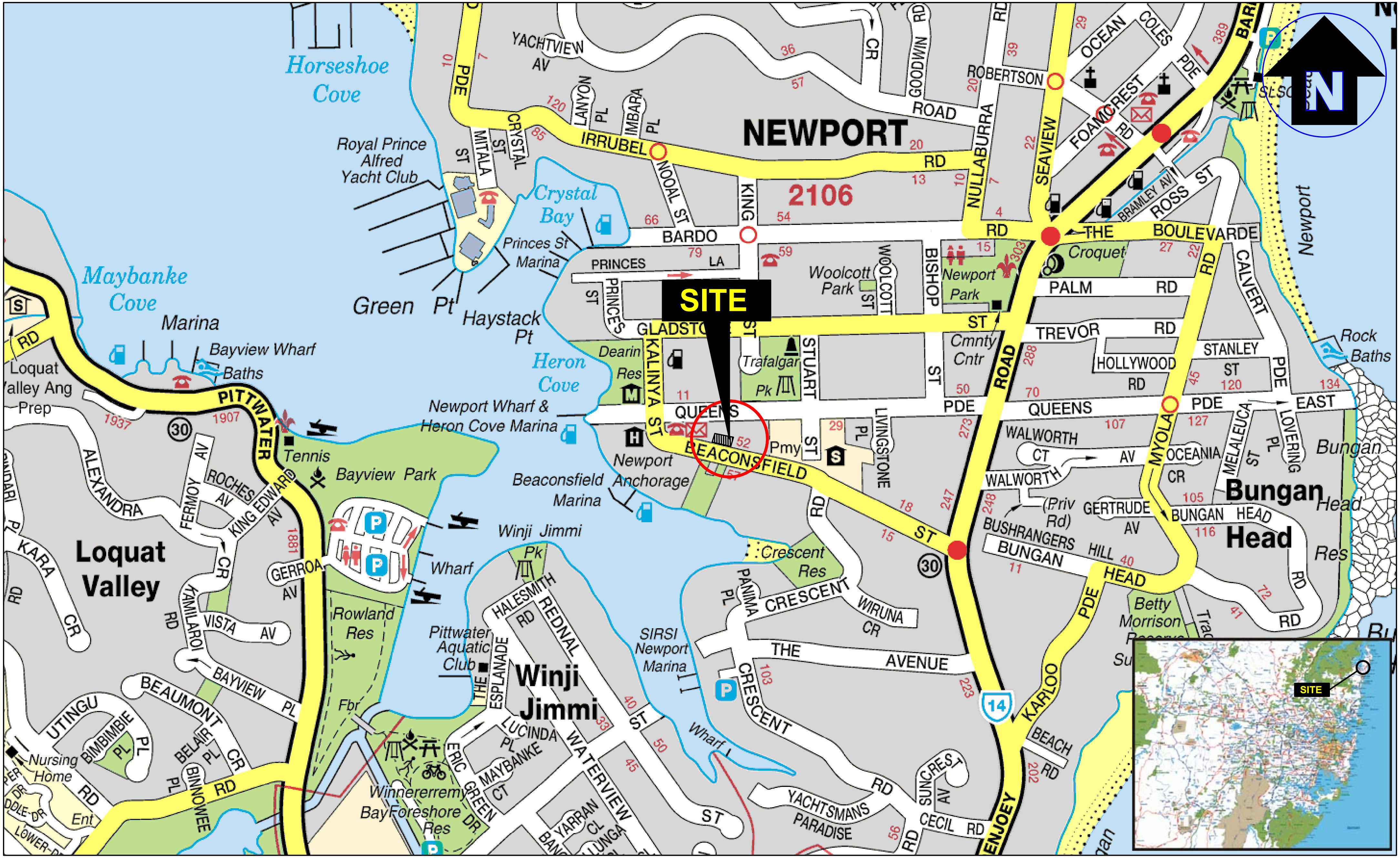
NSW Government (2023) *Water Sharing Plans for the Greater Metropolitan Region Groundwater Sources 2023 under the Water Management Act 2000*, 27 June 2023.

Pittwater Local Environmental Plan 2014.

ABBREVIATIONS

AIP	Aquifer Interference Policy
ANZECC	Australian and New Zealand Environment Conservation Council
ANZG	Australian and New Zealand Governments
ASS	Acid Sulfate Soil
BEL	Bulk Excavation Level
BTEX	Benzene, Toluene, Ethyl benzene, Xylene
DGV	Default Guideline Values
DO	Dissolved Oxygen
DP	Deposited Plan
DWC	Discharge Water Criteria
EC	Electrical Conductivity
EI	EI Australia
FFL	Finished Floor Level
GME	Groundwater Monitoring Event
GSA	Groundwater Seepage Analysis
LGA	Local Government Area
LOR	Limit of Reporting (limit of laboratory reporting for analytical method; see PQL)
m	metres
mAHD	metres Australian Height Datum
mBGL	metres Below Ground Level
ML	Megalitres
mg/L	Milligrams per Litre
µg/L	Micrograms per Litre
µS/cm	Microsiemens per Centimetre
N/A	No Available Criterion
NATA	National Association of Testing Authorities
NTU	Nepholemetric Turbidity Units
PAHs	Polycyclic Aromatic Hydrocarbons
pH	Potential Hydrogen (a measure of the acidity or basicity of an aqueous solution)
PID	Photo-ionisation Detector
PQL	Practical Quantitation Limit (limit of reporting for analytical method; see LOR)
RL	Reduced Level
TDS	Total Dissolved Solids
TRH	Total Recoverable Hydrocarbons (non-specific analysis of organic compounds)
VOCs	Volatile 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:	J.O.
Approved:	S.K.
Date:	11/10/2023
Scale:	Not To Scale

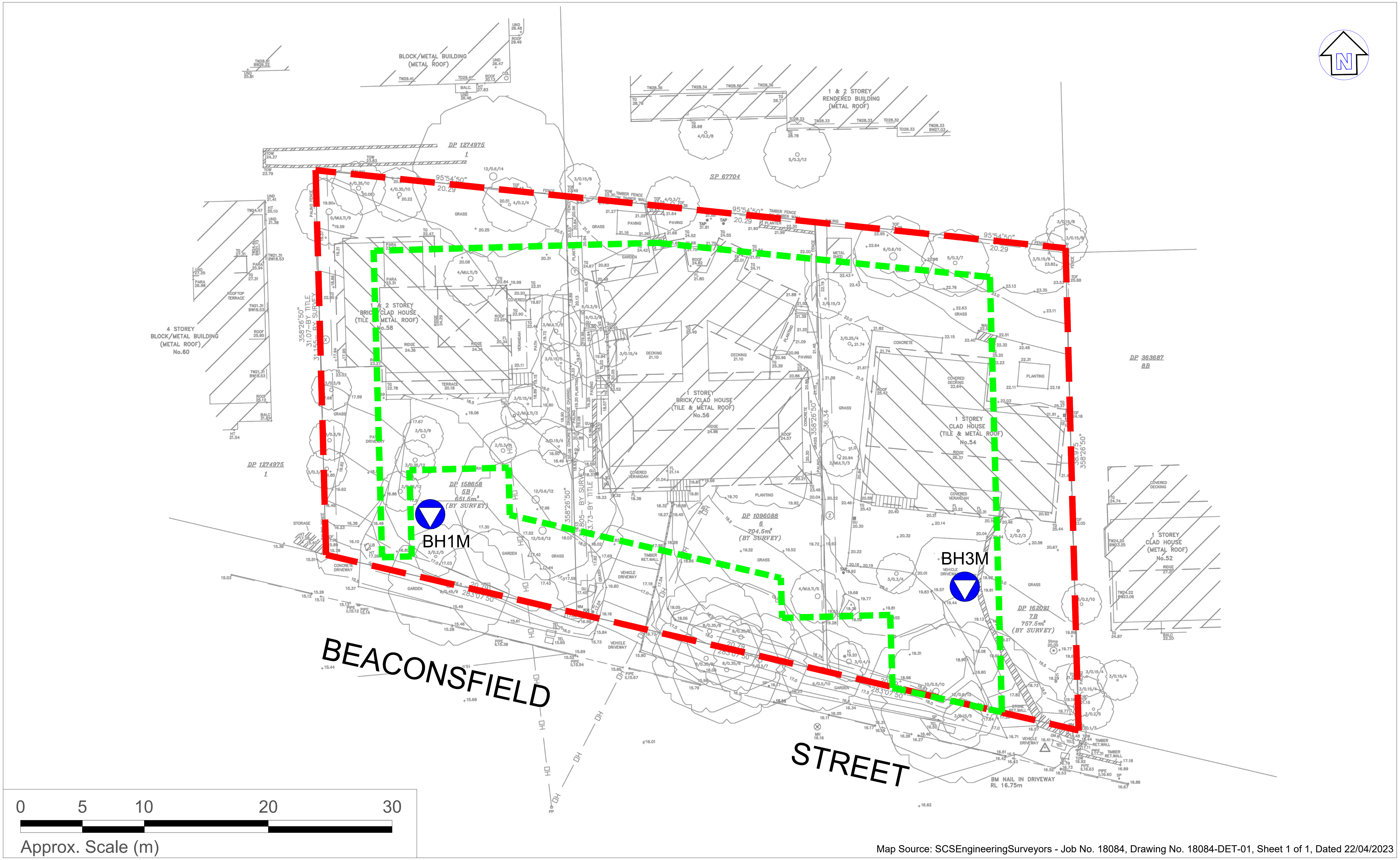
JAK Newport Pty Ltd

Hydrogeological Report including DMP & GSA
54-58 Beaconsfield Street, Newport NSW

Site Locality Plan

Figure:
A1

Project: E26083.E16



Map Source: SCSEngineeringSurveyors - Job No. 18084, Drawing No. 18084-DET-01, Sheet 1 of 1, Dated 22/04/2023

LEGEND (All Locations are Approximate)

- 🟥 Site boundary
- 🟩 Basement boundary
- ▼ Monitoring well locations

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

Drawn:	K.P.
Approved:	K.X.
Date:	06-05-24

JAK Newport Pty Ltd
Hydrogeological Report including DMP & GSA
54-58 Beaconsfield Street, Newport NSW

Monitoring Well Location Plan

Figure:
A2

Project: E26083.E16

Appendix B – Tables

Table B1 - Summary of Baseline Groundwater Quality - Analytical Results

Sample ID	Sampling Date	Metals																								PAHs			BTEX					VOCs
		Total As	Cd	[1] Total Cr	Cu	Pb	Hg	Ni	Zn	Al (pH>6.5)	Sb	Ba	Be	Bo	Co	Fe	Li	Mn	Mo	Se	SiO_2	Ag	Sr	U	V	Total PAHs	Benzo(α)pyrene	Naphthalene	Benzene	Toluene	Ethylbenzene	o-xylene	m/p-xylene	Total VOCs
Groundwater Investigation (EI, 2024)																																		
BH1M	26/6/2024	<1	<0.1	2	41	<1	<0.1	3	11	300	<1	8	<1	110	2	1100	<5	41	<1	<1	8700	<1	64	<1	2	<1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<1	<10
BH3M		<1	<0.1	3	10	<1	<0.1	4	24	550	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<1	<10
Guidelines																																		
Water Quality Criteria		24 (As III) 13 (As V)	0.7	27.4 (CrIII) 4.4 (CrVI)	13	4.4	0.1	70	80	55	9			940	1			80	34	11		1.4		0.5	100		0.2	70	700	180	80	350	275	

Sample ID	Sampling Date	Petroleum Hydrocarbons			Microbiological Organisms			Total Phenols	Total Cyanide	Major Anions					Major Cations					Nutrients							Other						
		Oil & Grease	TPH C6 - C9	TPH C10 - C40	Faecal coliforms	Faecal streptococci	Escherichia coli (E. coli)			Flouride (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	Bromide (mg/L)	Carbonates	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	Ammonia Nitrogen NH_3 as N	Nitrate Nitrogen NO3-N	Nitrite Nitrogen NO2 as N	Total Oxidised Nitrogen, NOx-N	Total Kjeldahl Nitrogen	Total Nitrogen (calc)	Total Phosphorus (Kjeldahl) as P	Filterable Reactive Phosphorus as P	Bicarbonate Alkalinity as CaCO3 (mg/L)	Carbonate Alkalinity as CaCO3 (mg/L)	Hydroxide Alkalinity as CaCO3 (mg/L)	Total Alkalinity as CaCO3 (mg/L)	Hydroxide Alkalinity as OH (meq/L)	Bicarbonate Alkalinity as HCO3 (meq/L)	Carbonate Alkalinity as CO3 (meq/L)
Groundwater Investigation (EI, 2024)																																	
BH1M	26/6/2024	NA	<40	<320	40	<1	2	<50	<4	<0.1	120	96	0.82	NA	9.7	5.7	130	2.9	30	420	<5	420	890	1300	290	<5	33	<1	<5	33	<0.06	0.66	<0.03
BH3M		NA	<40	<320	NA	NA	NA	<50	<4	NA	NA	NA	NA	NA	1.9	16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Guidelines																																	
Water Quality Criteria								400	4										910	700		15		120	25	10							

Notes:

All values are µg/L unless stated otherwise

Water quality criteria are based on the ANZG, 2018 (Rev. Jan 2024) 90% marine water DGVs, or relevant default guidelines where ANZG Fresh DGVs are not currently available, as explained in the footnotes to **Table 5-1**, in **Section 5** of the DMP.

[1] This result was for *Total Chromium*. Chromium speciation testing was not undertaken, but should be included in future monitoring.

🟨 Highlighted value does not meet the adopted criteria

▨ No relevant criteria are currently available

Table B2 – Summary of Baseline Groundwater Quality Results: Physicochemical Characteristics

E26083 - Newport

Sample ID	Date sampled	Physiochemical Characteristics													Aesthetic Properties
		Electrical Conductivity (Field EC) (µs/cm)	Electrical Conductivity (µs/cm)	pH (field)	pH	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Turbidity (NTU)	Field Redox (mV)	Hardness (mg $CaCO_3$/L)	Dissolved Oxygen (field DO) (mg/kg)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	Total Organic Carbon as NPOC (mg/L)	Oil & Grease (present/absent)
Groundwater Investigation (EI, 2024)															
BH1M	26/6/2024	593	1,100	6.47	5.8	650	430	470	295.1	48	5.19	7.8	83.8	14	Absent
BH3M		2,385	2,200	4.5	4.50	1,300	NA	210	442.2	69	3.11	NA	NA	NA	Absent
Guidelines															
Water Quality Criteria				6.5 - 8.4	6.5 - 8.4			10					85 - 110		No visible sheens, surface films or oil and grease

Notes:

All values are in units as shown.

Water quality criteria are based on the ANZG, 2018 (Rev. Jan 2024) 95% fresh water DGVs, or relevant default guidelines where ANZG Fresh 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

▨ No relevant criteria are currently available

Table B3 Summary of Results for the Field QA/QC samples

Sample identification	Sampled Date	Description	TRH				BTEX				Heavy Metals							
			F1*	F2**	F3 ($>C_{16}$ - C_{34})	F4 ($>C_{34}$ - C_{40})	Benzene	Toluene	Ethylbenzene	Xylene (total)	Arsenic	Cadmium	Chromium (Total)	Copper	Lead	Mercury	Nickel	Zinc
Intra-laboratory Duplicate																		
BH1M	26/6/2024	Groundwater	<50	<60	<500	<500	<0.5	<0.5	<0.5	<1.5	<1	<0.1	2	41	<1	<0.1	3	11
GW_QD1		Duplicate of BH1M	<50	<60	<500	<500	<0.5	<0.5	<0.5	<1.5	<1	<0.1	1	46	<1	<0.1	3	10
RPD (%)			***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***66.7***	***11.5***	***0.0***	***0.0***	***0.0***	***9.5***
Inter-laboratory Duplicate																		
BH1M	26/6/2024	Groundwater	<50	<60	<500	<500	<0.5	<0.5	<0.5	<1.5	<1	<0.1	2	41	<1	<0.1	3	11
GW-QT1		Duplicate of BH1M	<10	<50	<100	<100	<1	<1	<1	<3	<1	<0.1	1	31	<1	<0.05	3	13
RPD (%)			***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***0.0***	***0.0***	***66.7***	***27.8***	***0.0***	***NA***	***0.0***	***16.7***
Groundwater																		
GW_QR1	26/06/2024	Rinsate					<0.5	<0.5	<0.5	<1.5								
GW_TS1		Trip spike	-	-	-	-	[90%]	[91%]	[92%]	[93%]	-	-	-	-	-	-	-	-
GW_TB1		Trip blank	-	-	-	-	<0.5	<0.5	<0.5	<1.5	-	-	-	-	-	-	-	-

▒	Indicates values where a single result is found to be less than detection, with the duplicate sample found to be over the detection limit.
■	RPD exceeds 30-50% range referenced from AS4482.1 (2005)

NOTE:
All soil results are reported in mg/kg . All water results are reported in µg/L.
* - to obtain F1 subtract the sum of BTEX concentrations from the C_6-C_{10} fraction
** - to obtain F2 subtract naphthalene from the > C_{10}-C_{16} fraction

Appendix C – Development Plans

GENERAL NOTES:

- ALL WORKS TO COMPLY WITH BUILDING CODE OF AUSTRALIA, REQUIREMENTS OF RELEVENT STATUTORY AUTHORITIES/ LOCAL GOVERNMENT & RELEVENT AUSTRALIAN BUILDING STANDARDS
- DRAWINGS FOR THE PURPOSES OF DA ONLY (NOT FOR CONSTRUCTION) - FURTHER CONSULTANT/ AUTHORITY COORDINATION WILL BE REQUIRED AT CC STAGE WHICH MAY IMPACT ON DESIGN AND PLANNING LAYOUTS
- ARCHITECTURAL PLANS TO BE READ IN CONJUNCTION WITH CONSULTANT'S DRAWINGS, SPECIFICATIONS & REPORTS
- COPYRIGHT OF DESIGN SHOWN HEREON IS RETAINED BY PBD ARCHITECTS AND AUTHORITY IS REQUIRED FOR ANY REPRODUCTION
- AREA SCHEDULES SUPPLIED ARE APPROXIMATE ONLY - FUTURE ALLOWANCE FOR VERTICAL SERVICE DUCTS, STRUCTURAL WALL SYSTEMS AND CONSULTANT INPUT WILL BE REQUIRED

LEGEND:

AW	AWNING
AH	ACCESS HATCH
AC	A/C CONDENSER UNITS
FH	FIRE HYDRANT
FHR	FIRE HOSE REEL
FS	FIRE STAIRS
GC	GARBAGE CHUTE
HW	HIGHLIGHT WINDOW
MV	MECHANICAL RISER TO FUTURE DETAIL
MB	MAILBOX TO FUTURE DETAIL
R	240L RECYCLING BIN
SK	SKYLIGHT
ST	STORAGE
HWU	HOT WATER UNITS

MATERIALS LEGEND:

AFG	ALUMINIUM FRAMED GLAZING
LV	ALUMINIUM ELLIPTICAL FIXED LOUVERS
AW	AWNING (TO FUTURE DETAIL)
CONC	CONCRETE
FB	FACE BRICK
GB	FRAMELESS TOUCHENED GLASS BALUSTRADE (TO BCA/AUS STANDARDS)
MB	METAL BALUSTRADE
MC	METAL CLADDING
FCE	METAL FENCING (TO FUTURE SELECTION)
PC	COMPOSITE PANEL CLADDING
PSx	PRIVACY SCREEN (TO FUTURE SELECTION)
PTx	PAINT FINISH TYPEx
RD	ROLLER DOOR
RP	RIVER PEBBLES
RW	RENDERED FINISH/SELECTED PAINT FINISH
TC	TIMBER CLADDING
VB	EXTERNAL VENETIAN BLINDS

Issue	Date	Description
A	28/11/2023	DEVELOPMENT APPPLICATION
B	2/05/2024	AMMENDED DEVELOPMENT APPLICATION

Scale Bar 1 : 100 @ A1

1 2 3 4 5 Meters

N

CLIENT:
JAK Newport Pty Ltd

pbd
architects

P - 02 9698 8140
E - info@pbdarchitects.com.au
W - pbdarchitects.com.au

Level 2, 52 Albion Street,
Surry Hills NSW 2010

ABN 36 147 035 550
Nominated Architect:
Paul Buljevic NSW 7768

PROJECT:
RESIDENTIAL FLAT BUILDING - KENZA
54 - 58 BEACONSFIELD STREET NEWPORT NSW

DRAWING TITLE:
Site Plan

DRAWING BY:	CHECKED BY:	DATE:
AS	KL	2/05/2024
SCALE: 1:100@A1	DRAWING NO: DA004	ISSUE: B
PROJECT NO: 2311		

GENERAL NOTES:

- ALL WORKS TO COMPLY WITH BUILDING CODE OF AUSTRALIA, REQUIREMENTS OF RELEVENT STATUTORY AUTHORITIES/ LOCAL GOVERNMENT & RELEVENT AUSTRALIAN BUILDING STANDARDS
- DRAWINGS FOR THE PURPOSES OF DA ONLY (NOT FOR CONSTRUCTION) - FURTHER CONSULTANT/ AUTHORITY COORDINATION WILL BE REQUIRED AT CC STAGE WHICH MAY IMPACT ON DESIGN AND PLANNING LAYOUTS
- ARCHITECTURAL PLANS TO BE READ IN CONJUNCTION WITH CONSULTANTS DRAWINGS, SPECIFICATIONS & REPORTS
- COPYRIGHT OF DESIGN SHOWN HEREON IS RETAINED BY PBD ARCHITECTS AND AUTHORITY IS REQUIRED FOR ANY REPRODUCTION
- AREA SCHEDULES SUPPLIED ARE APPROXIMATE ONLY - FUTURE ALLOWANCE FOR VERTICAL SERVICE DUCTS, STRUCTURAL WALL SYSTEMS AND CONSULTANT INPUT WILL BE REQUIRED

LEGEND:

AW	AWNING
AH	ACCESS HATCH
AC	A/C CONDENSER UNITS
FH	FIRE HYDRANT
FHR	FIRE HOSE REEL
FS	FIRE STAIRS
GC	GARBAGE CHUTE
HW	HIGHLIGHT WINDOW
MV	MECHANICAL RISER TO FUTURE DETAIL
MB	MAILBOX TO FUTURE DETAIL
R	240L RECYCLING BIN
SK	SKYLIGHT
ST	STORAGE
HWU	HOT WATER UNITS

MATERIALS LEGEND:

AFG	ALUMINIUM FRAMED GLAZING
LV	ALUMINIUM ELLIPTICAL FIXED LOUVERS
AW	AWNING (TO FUTURE DETAIL)
CONC	CONCRETE
FB	FACE BRICK
GB	FRAMELESS TOUCHENED GLASS BALUSTRADE (TO BCA/AUS STANDARDS)
MB	METAL BALUSTRADE
MC	METAL CLADDING
FCE	METAL FENCING (TO FUTURE SELECTION)
PC	COMPOSITE PANEL CLADDING
PSx	PRIVACY SCREEN (TO FUTURE SELECTION)
PTx	PAINT FINISH TYPEx
RD	ROLLER DOOR
RP	RIVER PEBBLES
RW	RENDERED FINISH/SELECTED PAINT FINISH
TC	TIMBER CLADDING
VB	EXTERNAL VENETIAN BLINDS

Issue	Date	Description
A	28/11/2023	DEVELOPMENT APPPLICATION
B	2/05/2024	AMMENDED DEVELOPMENT APPLICATION

Scale Bar 1 : 100 @ A1

1 2 3 4 5 Meters

N

CLIENT:
JAK Newport Pty Ltd

pbd
architects

P - 02 9698 8140
E - info@pbdarchitects.com.au
W - pbdarchitects.com.au

Level 2, 52 Albion Street,
Surry Hills NSW 2010

ABN 36 147 035 550
Nominated Architect:
Paul Buljevic NSW 7768

PROJECT:
RESIDENTIAL FLAT BUILDING - KENZA
54 - 58 BEACONSFIELD STREET NEWPORT NSW

DRAWING TITLE:
Ground Floor Plan

DRAWING BY:	CHECKED BY:	DATE:
AS	KL	2/05/2024
SCALE:	DRAWING NO:	ISSUE:
1:100@A1	DA100	B
PROJECT NO:		
2311		

GENERAL NOTES:

- ALL WORKS TO COMPLY WITH BUILDING CODE OF AUSTRALIA, REQUIREMENTS OF RELEVENT STATUTORY AUTHORITIES/ LOCAL GOVERNMENT & RELEVENT AUSTRALIAN BUILDING STANDARDS
- DRAWINGS FOR THE PURPOSES OF DA ONLY (NOT FOR CONSTRUCTION) - FURTHER CONSULTANT/ AUTHORITY COORDINATION WILL BE REQUIRED AT CC STAGE WHICH MAY IMPACT ON DESIGN AND PLANNING LAYOUTS
- ARCHITECTURAL PLANS TO BE READ IN CONJUNCTION WITH CONSULTANT'S DRAWINGS, SPECIFICATIONS & REPORTS
- COPYRIGHT OF DESIGN SHOWN HEREON IS RETAINED BY PBD ARCHITECTS AND AUTHORITY IS REQUIRED FOR ANY REPRODUCTION
- AREA SCHEDULES SUPPLIED ARE APPROXIMATE ONLY - FUTURE ALLOWANCE FOR VERTICAL SERVICE DUCTS, STRUCTURAL WALL SYSTEMS AND CONSULTANT INPUT WILL BE REQUIRED

LEGEND:

AW	AWNING
AH	ACCESS HATCH
AC	A/C CONDENSER UNITS
FH	FIRE HYDRANT
FHR	FIRE HOSE REEL
FS	FIRE STAIRS
GC	GARBAGE CHUTE
HW	HIGHLIGHT WINDOW
MV	MECHANICAL RISER TO FUTURE DETAIL
MB	MAILBOX TO FUTURE DETAIL
R	240L RECYCLING BIN
SK	SKYLIGHT
ST	STORAGE
HWU	HOT WATER UNITS

MATERIALS LEGEND:

AFG	ALUMINIUM FRAMED GLAZING
LV	ALUMINIUM ELLIPTICAL FIXED LOUVERS
AW	AWNING (TO FUTURE DETAIL)
CONC	CONCRETE
FB	FACE BRICK
GB	FRAMELESS TOUCHENED GLASS BALUSTRADE (TO BCA/AUS STANDARDS)
MB	METAL BALUSTRADE
MC	METAL CLADDING
FCE	METAL FENCING (TO FUTURE SELECTION)
PC	COMPOSITE PANEL CLADDING
PSx	PRIVACY SCREEN (TO FUTURE SELECTION)
PTx	PAINT FINISH TYPEx
RD	ROLLER DOOR
RP	RIVER PEBBLES
RW	RENDERED FINISH/SELECTED PAINT FINISH
TC	TIMBER CLADDING
VB	EXTERNAL VENETIAN BLINDS

Issue	Date	Description
A	28/11/2023	DEVELOPMENT APPPLICATION
B	2/05/2024	AMMENDED DEVELOPMENT APPLICATION

Scale Bar 1 : 100 @ A1
1 2 3 4 5 Meters

N

CLIENT:
JAK Newport Pty Ltd

pbd
architects

P - 02 9698 8140
E - info@pbdarchitects.com.au
W - pbdarchitects.com.au

Level 2, 52 Albion Street,
Surry Hills NSW 2010

ABN 36 147 035 550
Nominated Architect:
Paul Buljevic NSW 7768

PROJECT:
RESIDENTIAL FLAT BUILDING - KENZA
54 - 58 BEACONSFIELD STREET NEWPORT NSW

DRAWING TITLE:
Basement Plan

DRAWING BY: AS	CHECKED BY: KL	DATE: 2/05/2024
SCALE: 1:100@A1	DRAWING NO: DA104	ISSUE: B
PROJECT NO: 2311		

1 East Elevation 1:100

2 North Elevation 1:100

GENERAL NOTES:

- ALL WORKS TO COMPLY WITH BUILDING CODE OF AUSTRALIA, REQUIREMENTS OF RELEVENT STATUTORY AUTHORITIES / LOCAL GOVERNMENT & RELEVENT AUSTRALIAN BUILDING STANDARDS
- DRAWINGS FOR THE PURPOSES OF DA ONLY (NOT FOR CONSTRUCTION) - FURTHER CONSULTANT/ AUTHORITY COORDINATION WILL BE REQUIRED AT CC STAGE WHICH MAY IMPACT ON DESIGN AND PLANNING LAYOUTS
- ARCHITECTURAL PLANS TO BE READ IN CONJUNCTION WITH CONSULTANT'S DRAWINGS, SPECIFICATIONS & REPORTS
- COPYRIGHT OF DESIGN SHOWN HEREON IS RETAINED BY PBD ARCHITECTS AND AUTHORITY IS REQUIRED FOR ANY REPRODUCTION
- AREA SCHEDULES SUPPLIED ARE APPROXIMATE ONLY - FUTURE ALLOWANCE FOR VERTICAL SERVICE DUCTS, STRUCTURAL WALL SYSTEMS AND CONSULTANT INPUT WILL BE REQUIRED

LEGEND:

AW	AWNING
AH	ACCESS HATCH
AC	A/C CONDENSER UNITS
FH	FIRE HYDRANT
FHR	FIRE HOSE REEL
FS	FIRE STAIRS
GC	GARBAGE CHUTE
HW	HIGHLIGHT WINDOW
MV	MECHANICAL RISER TO FUTURE DETAIL
MB	MAILBOX TO FUTURE DETAIL
R	240L RECYCLING BIN
SK	SKYLIGHT
ST	STORAGE
HWU	HOT WATER UNITS

MATERIALS LEGEND:

AFG	ALUMINIUM FRAMED GLAZING
LV	ALUMINIUM ELLIPTICAL FIXED LOUVERS
AW	AWNING (TO FUTURE DETAIL)
CONC	CONCRETE
FB	FACE BRICK
GB	FRAMELESS TOUCHENED GLASS BALUSTRADE (TO BCA/AUS STANDARDS)
MB	METAL BALUSTRADE
MC	METAL CLADDING
FCE	METAL FENCING (TO FUTURE SELECTION)
PC	COMPOSITE PANEL CLADDING
PSx	PRIVACY SCREEN (TO FUTURE SELECTION)
PTx	PAINT FINISH TYPEx
RD	ROLLER DOOR
RP	RIVER PEBBLES
RW	RENDERED FINISH/SELECTED PAINT FINISH
TC	TIMBER CLADDING
VB	EXTERNAL VENETIAN BLINDS

Issue	Date	Description
A	28/11/2023	DEVELOPMENT APPPLICATION
B	2/05/2024	AMMENDED DEVELOPMENT APPLICATION

Scale Bar 1 : 100 @ A1
1 2 3 4 5 Meters

CLIENT:
JAK Newport Pty Ltd

pbd
architects

P - 02 9698 8140
E - info@pbdarchitects.com.au
W - pbdarchitects.com.au

Level 2, 52 Albion Street,
Surry Hills NSW 2010

ABN 36 147 035 550
Nominated Architect:
Paul Buljevic NSW 7768

PROJECT:
RESIDENTIAL FLAT BUILDING - KENZA
54 - 58 BEACONSFIELD STREET NEWPORT NSW

DRAWING TITLE:
Elevation Sheet 1

DRAWING BY: AS	CHECKED BY: KL	DATE: 2/05/2024
SCALE: 1:100@A1	DRAWING NO: **DA200**	ISSUE: **B**
PROJECT NO: 2311		

3 South Elevation 1:100

4 West Elevation 1:100

GENERAL NOTES:

- ALL WORKS TO COMPLY WITH BUILDING CODE OF AUSTRALIA, REQUIREMENTS OF RELEVENT STATUTORY AUTHORITIES/ LOCAL GOVERNMENT & RELEVENT AUSTRALIAN BUILDING STANDARDS
- DRAWINGS FOR THE PURPOSES OF DA ONLY (NOT FOR CONSTRUCTION) - FURTHER CONSULTANT/ AUTHORITY COORDINATION WILL BE REQUIRED AT CC STAGE WHICH MAY IMPACT ON DESIGN AND PLANNING LAYOUTS
- ARCHITECTURAL PLANS TO BE READ IN CONJUNCTION WITH CONSULTANT'S DRAWINGS, SPECIFICATIONS & REPORTS
- COPYRIGHT OF DESIGN SHOWN HEREON IS RETAINED BY PBD ARCHITECTS AND AUTHORITY IS REQUIRED FOR ANY REPRODUCTION
- AREA SCHEDULES SUPPLIED ARE APPROXIMATE ONLY - FUTURE ALLOWANCE FOR VERTICAL SERVICE DUCTS, STRUCTURAL WALL SYSTEMS AND CONSULTANT INPUT WILL BE REQUIRED

LEGEND:

AW	AWNING
AH	ACCESS HATCH
AC	A/C CONDENSER UNITS
FH	FIRE HYDRANT
FHR	FIRE HOSE REEL
FS	FIRE STAIRS
GC	GARBAGE CHUTE
HW	HIGHLIGHT WINDOW
MV	MECHANICAL RISER TO FUTURE DETAIL
MB	MAILBOX TO FUTURE DETAIL
R	240L RECYCLING BIN
SK	SKYLIGHT
ST	STORAGE
HWU	HOT WATER UNITS

MATERIALS LEGEND:

AFG	ALUMINIUM FRAMED GLAZING
LV	ALUMINIUM ELLIPTICAL FIXED LOUVERS
AW	AWNING (TO FUTURE DETAIL)
CONC	CONCRETE
FB	FACE BRICK
GB	FRAMELESS TOUCHENED GLASS BALUSTRADE (TO BCA/AUS STANDARDS)
MB	METAL BALUSTRADE
MC	METAL CLADDING
FCE	METAL FENCING (TO FUTURE SELECTION)
PC	COMPOSITE PANEL CLADDING
PSx	PRIVACY SCREEN (TO FUTURE SELECTION)
PTx	PAINT FINISH TYPEx
RD	ROLLER DOOR
RP	RIVER PEBBLES
RW	RENDERED FINISH/SELECTED PAINT FINISH
TC	TIMBER CLADDING
VB	EXTERNAL VENETIAN BLINDS

Issue	Date	Description
A	28/11/2023	DEVELOPMENT APPPLICATION
B	2/05/2024	AMMENDED DEVELOPMENT APPLICATION

Scale Bar 1 : 100 @ A1
1 2 3 4 5 Meters

CLIENT:
JAK Newport Pty Ltd

pbd
architects

P - 02 9698 8140
E - info@pbdarchitects.com.au
W - pbdarchitects.com.au

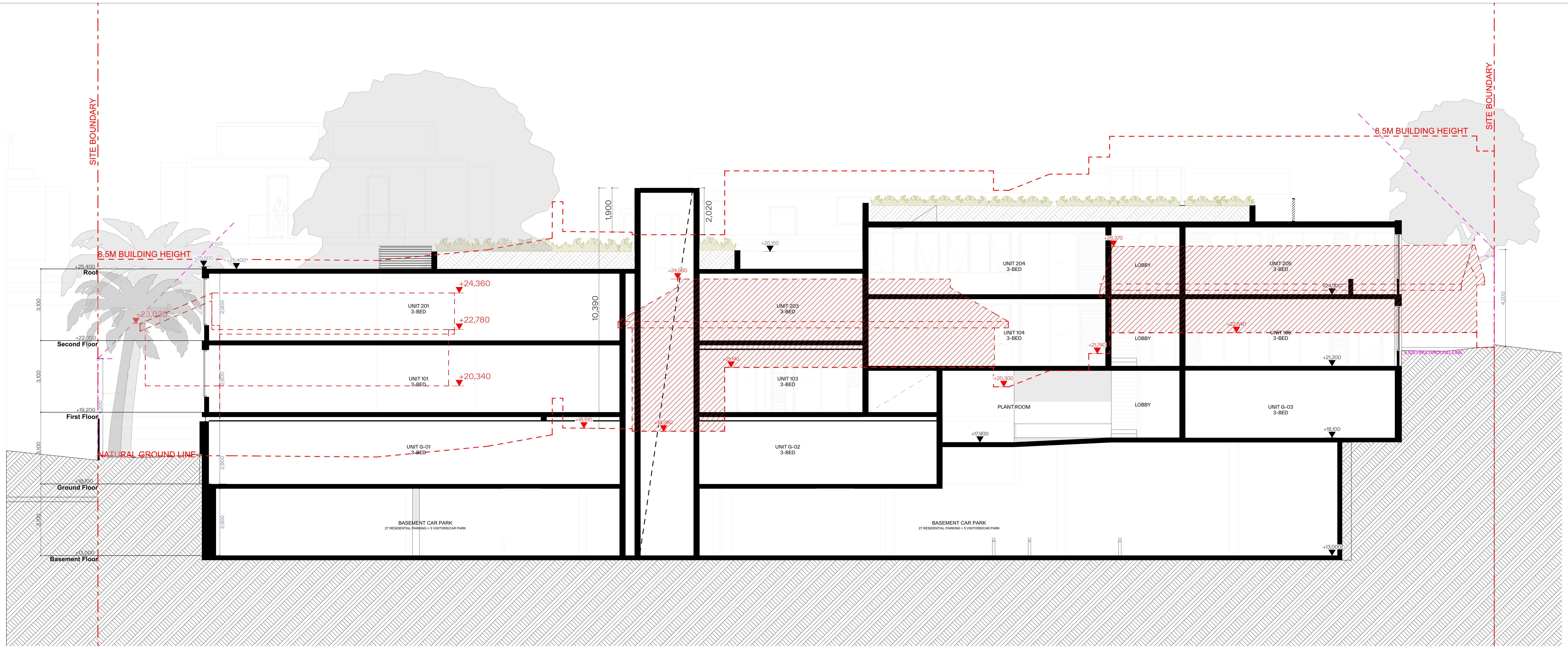
Level 2, 52 Albion Street,
Surry Hills NSW 2010

ABN 36 147 035 550
Nominated Architect:
Paul Buljevic NSW 7768

PROJECT:
RESIDENTIAL FLAT BUILDING - KENZA
54 - 58 BEACONSFIELD STREET NEWPORT NSW

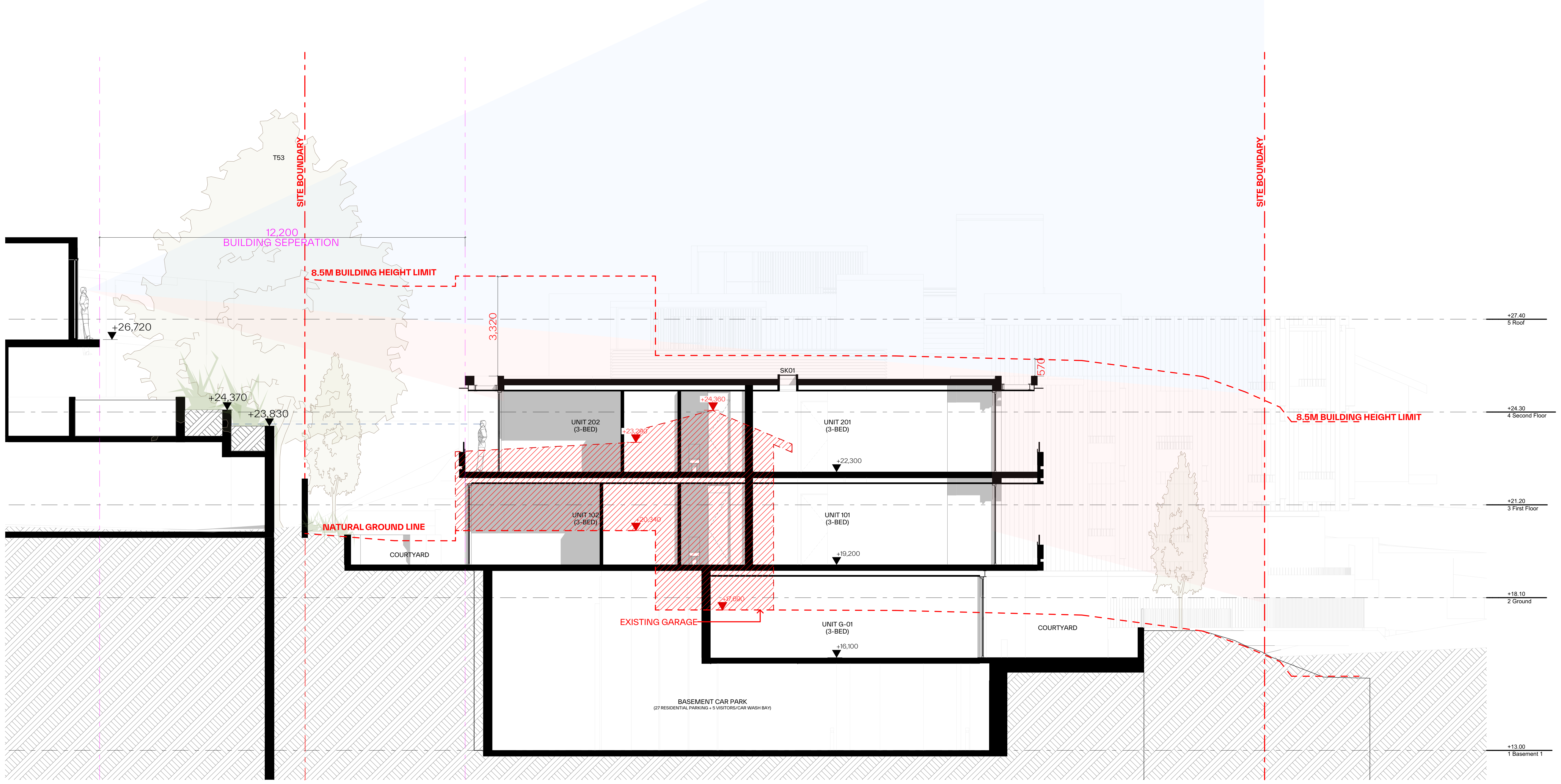
DRAWING TITLE:
Elevation Sheet 2

DRAWING BY: AS	CHECKED BY: KL	DATE: 2/05/2024
SCALE: 1:100@A1	DRAWING NO: **DA201**	ISSUE: **B**
PROJECT NO: 2311		



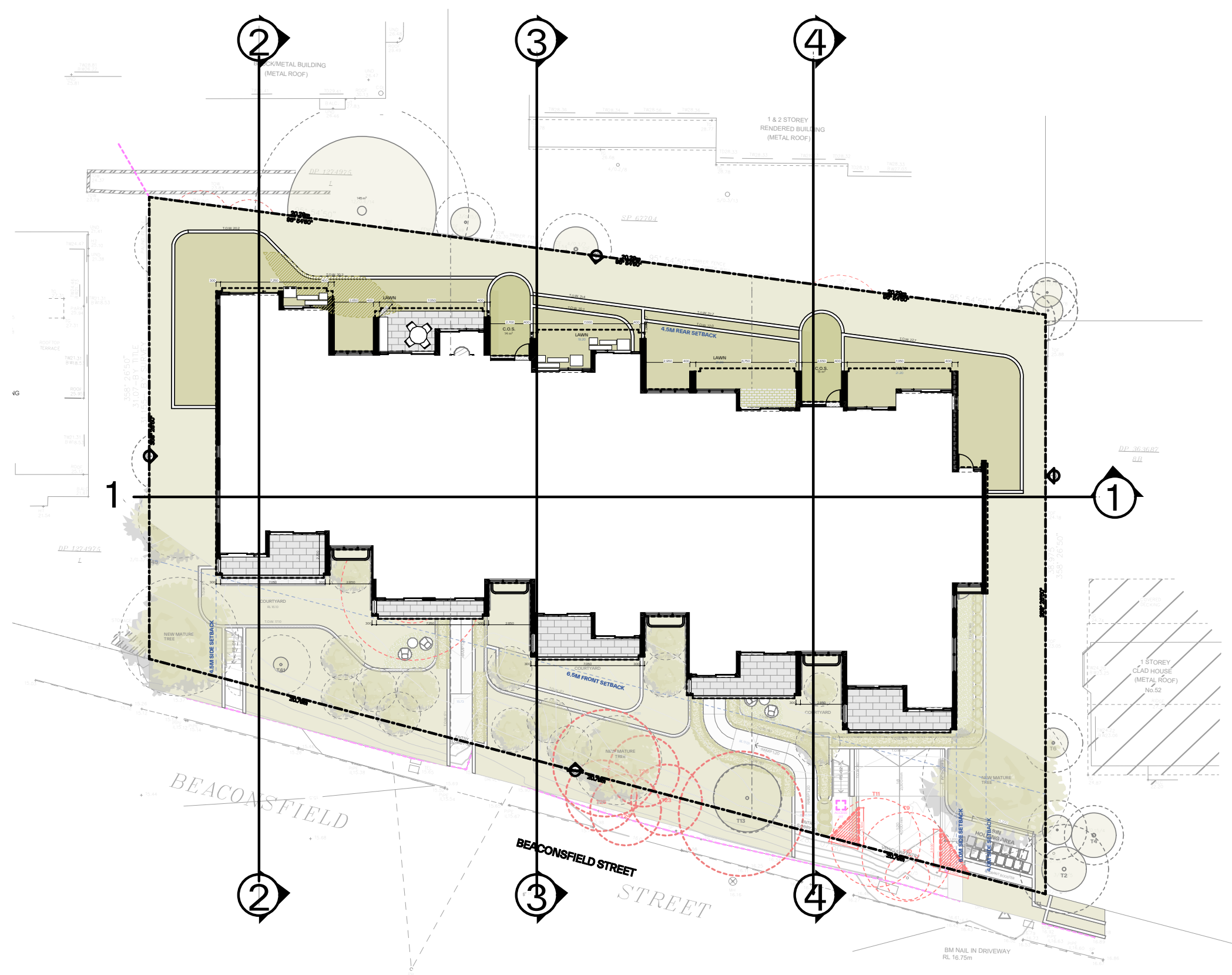
SECTION 01

1:100



SECTIO 02

1:100



KEY PLAN @1:500

GENERAL NOTES:

- ALL WORKS TO COMPLY WITH BUILDING CODE OF AUSTRALIA, REQUIREMENTS OF RELEVENT STATUTORY AUTHORITIES/ LOCAL GOVERNMENT & RELEVENT AUSTRALIAN BUILDING STANDARDS
- DRAWINGS FOR THE PURPOSES OF DA ONLY (NOT FOR CONSTRUCTION) - FURTHER CONSULTANT/ AUTHORITY COORDINATION WILL BE REQUIRED AT CC STAGE WHICH MAY IMPACT ON DESIGN AND PLANNING LAYOUTS
- ARCHITECTURAL PLANS TO BE READ IN CONJUNCTION WITH CONSULTANT'S DRAWINGS, SPECIFICATIONS & REPORTS
- COPYRIGHT OF DESIGN SHOWN HEREON IS RETAINED BY PBD ARCHITECTS AND AUTHORITY IS REQUIRED FOR ANY REPRODUCTION
- AREA SCHEDULES SUPPLIED ARE APPROXIMATE ONLY - FUTURE ALLOWANCE FOR VERTICAL SERVICE DUCTS, STRUCTURAL WALL SYSTEMS AND CONSULTANT INPUT WILL BE REQUIRED

LEGEND:

AW	AWNING
AH	ACCESS HATCH
AC	A/C CONDENSER UNITS
FH	FIRE HYDRANT
FHR	FIRE HOSE REEL
FS	FIRE STAIRS
GC	GARBAGE CHUTE
HW	HIGHLIGHT WINDOW
MV	MECHANICAL RISER TO FUTURE DETAIL
MB	MAILBOX TO FUTURE DETAIL
R	240L RECYCLING BIN
SK	SKYLIGHT
ST	STORAGE
HWU	HOT WATER UNITS

MATERIALS LEGEND:

AFG	ALUMINIUM FRAMED GLAZING
LV	ALUMINIUM ELLIPTICAL FIXED LOUVERS
AW	AWNING (TO FUTURE DETAIL)
CONC	CONCRETE
FB	FACE BRICK
GB	FRAMELESS TOUCHENED GLASS BALUSTRADE (TO BCA/AUS STANDARDS)
MB	METAL BALUSTRADE
MC	METAL CLADDING
FCE	METAL FENCING (TO FUTURE SELECTION)
PC	COMPOSITE PANEL CLADDING
PSx	PRIVACY SCREEN (TO FUTURE SELECTION)
PTx	PAINT FINISH TYPEx
RD	ROLLER DOOR
RP	RIVER PEBBLES
RW	RENDERED FINISH/SELECTED PAINT FINISH
TC	TIMBER CLADDING
VB	EXTERNAL VENETIAN BLINDS

Issue	Date	Description
B	2/05/2024	AMMENDED DEVELOPMENT APPLICATION

Scale Bar 1 : 100 @ A1
1 2 3 4 5 Meters

N

CLIENT:
JAK Newport Pty Ltd

pbd
architects

P - 02 9698 8140
E - info@pbdarchitects.com.au
W - pbdarchitects.com.au

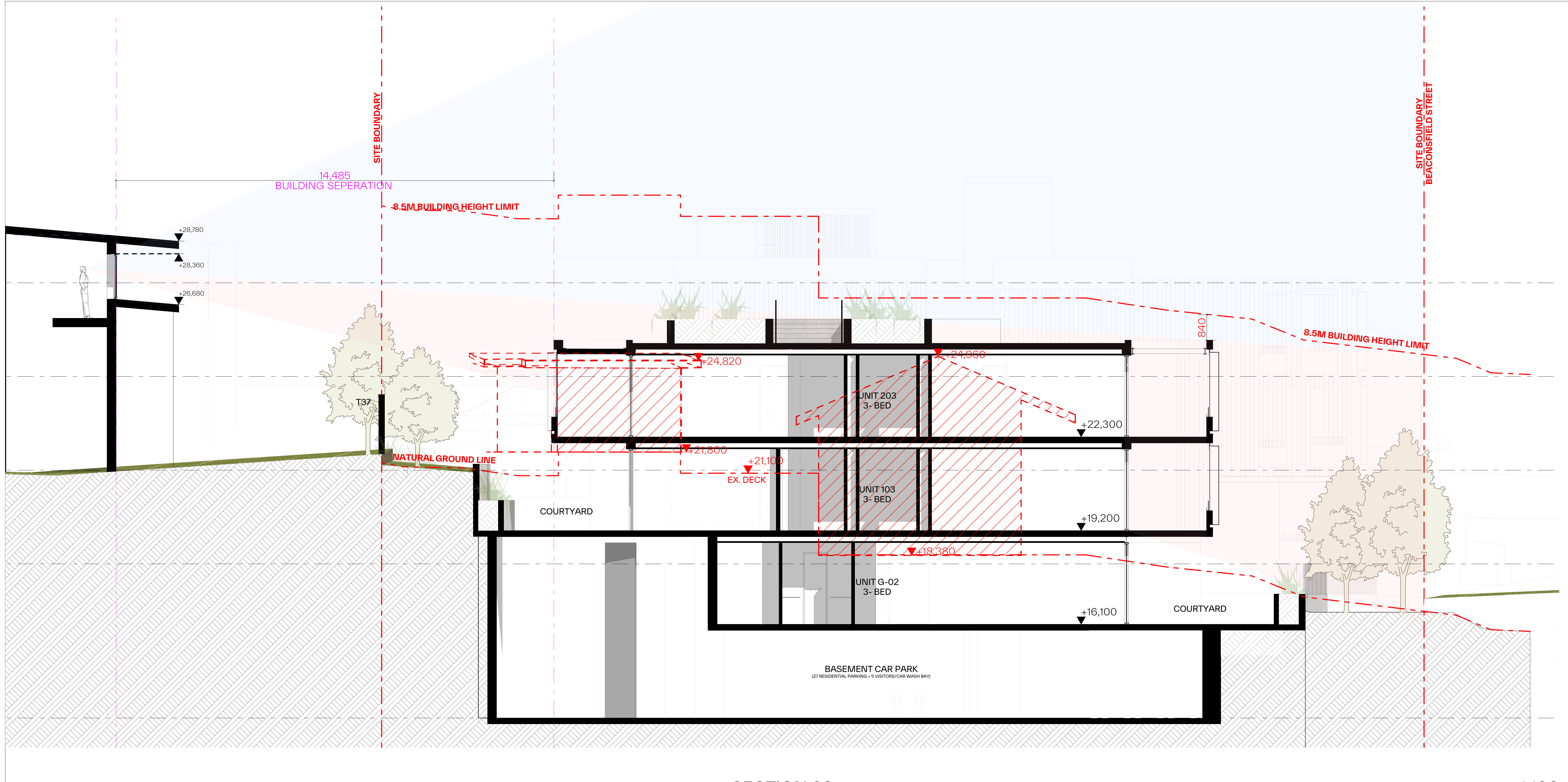
Level 2, 52 Albion Street,
Surry Hills NSW 2010

ABN 36 147 035 550
Nominated Architect:
Paul Buljevic NSW 7768

PROJECT:
RESIDENTIAL FLAT BUILDING - KENZA
54 - 58 BEACONSFIELD STREET NEWPORT NSW

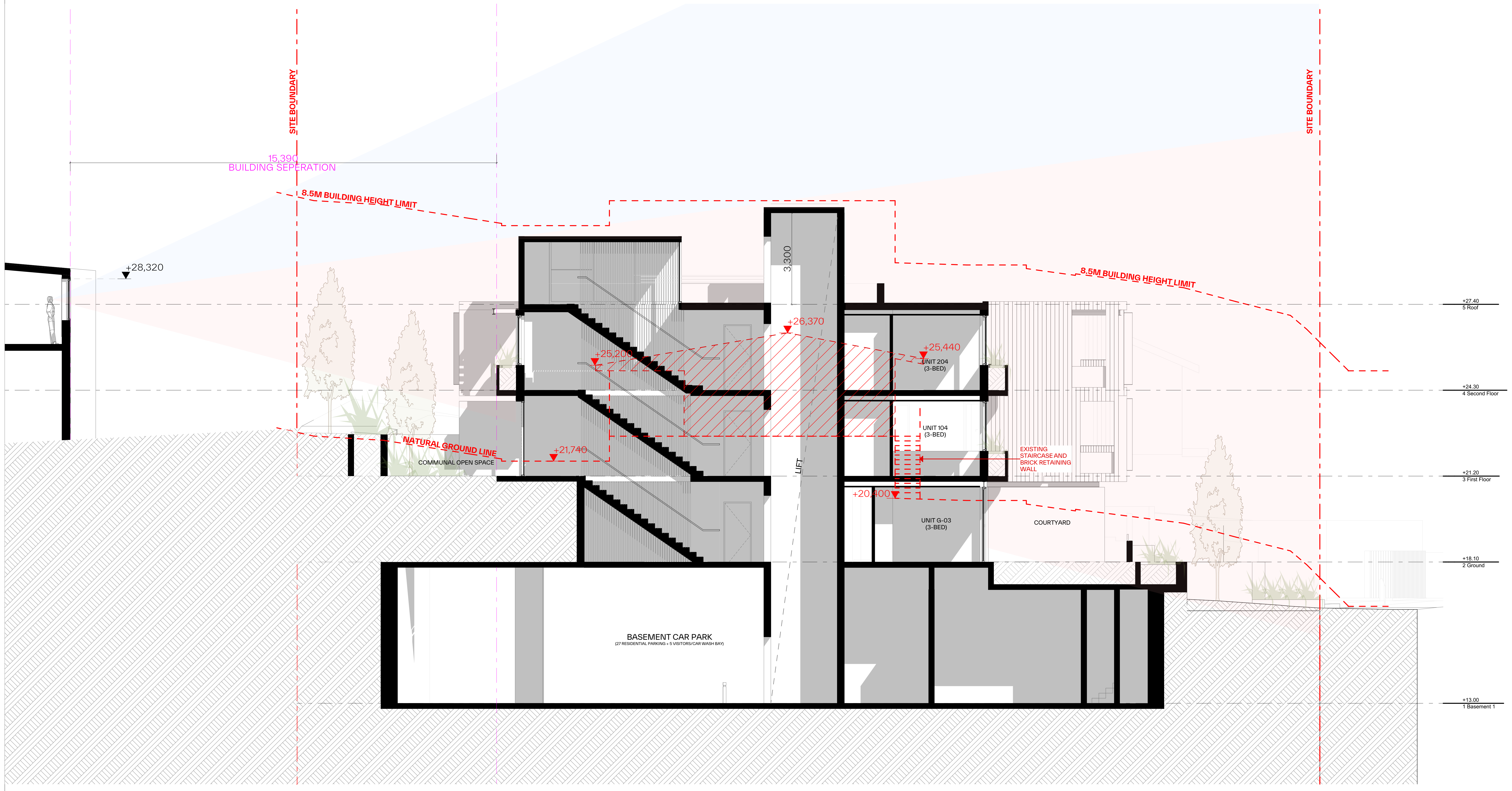
DRAWING TITLE:
Section Sheet 1

DRAWING BY: AS	CHECKED BY: KL	DATE: 2/05/2024
SCALE: 1:100@A1	DRAWING NO: **DA300**	ISSUE: **B**
PROJECT NO: 2311		



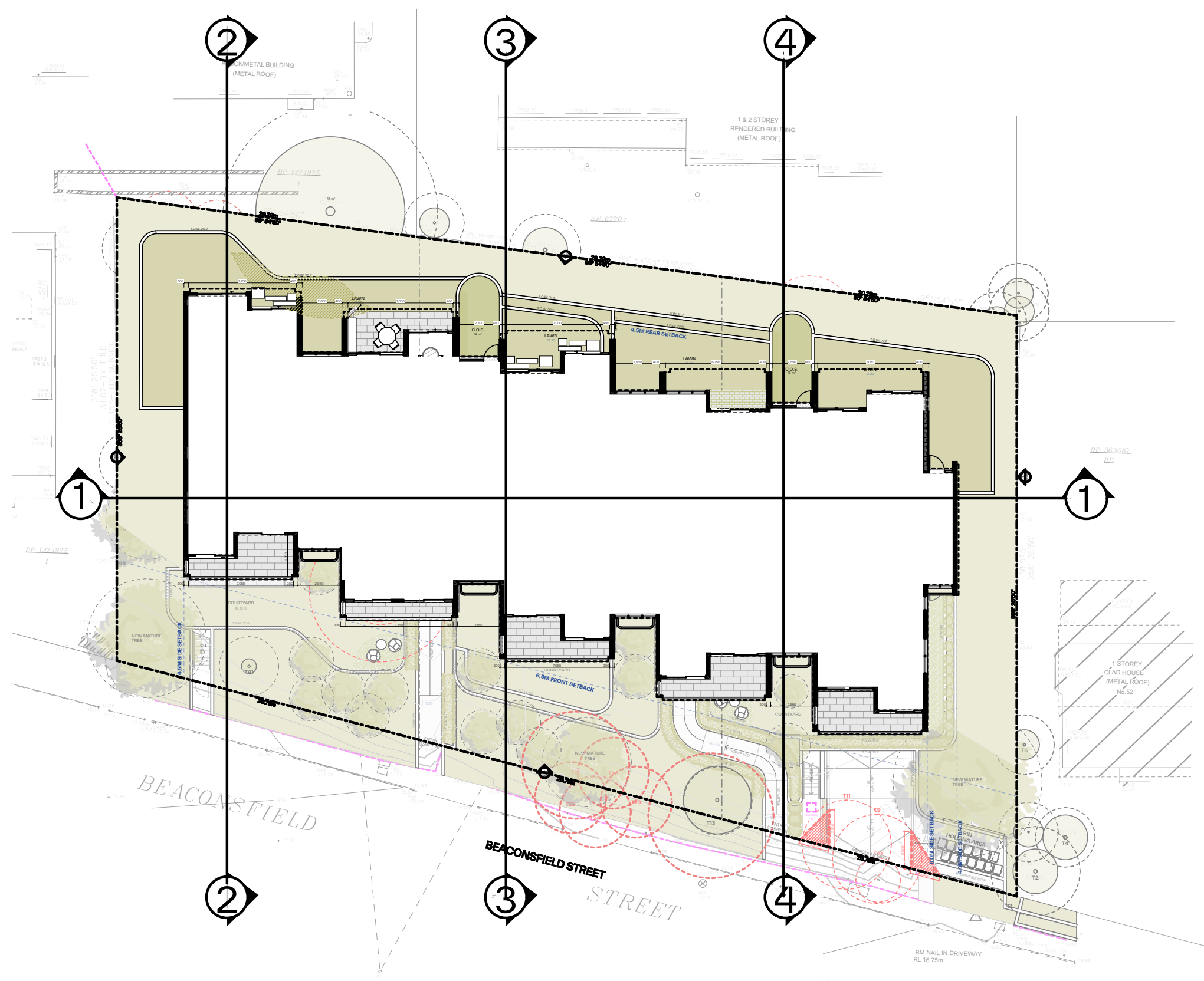
SECTION 03

1:100



SECTION 04

1:100



KEY PLAN @1:500

GENERAL NOTES:

- ALL WORKS TO COMPLY WITH BUILDING CODE OF AUSTRALIA, REQUIREMENTS OF RELEVENT STATUTORY AUTHORITIES/ LOCAL GOVERNMENT & RELEVENT AUSTRALIAN BUILDING STANDARDS
- DRAWINGS FOR THE PURPOSES OF DA ONLY (NOT FOR CONSTRUCTION) - FURTHER CONSULTANT/ AUTHORITY COORDINATION WILL BE REQUIRED AT CC STAGE WHICH MAY IMPACT ON DESIGN AND PLANNING LAYOUTS
- ARCHITECTURAL PLANS TO BE READ IN CONJUNCTION WITH CONSULTANT'S DRAWINGS, SPECIFICATIONS & REPORTS
- COPYRIGHT OF DESIGN SHOWN HEREON IS RETAINED BY PBD ARCHITECTS AND AUTHORITY IS REQUIRED FOR ANY REPRODUCTION
- AREA SCHEDULES SUPPLIED ARE APPROXIMATE ONLY - FUTURE ALLOWANCE FOR VERTICAL SERVICE DUCTS, STRUCTURAL WALL SYSTEMS AND CONSULTANT INPUT WILL BE REQUIRED

LEGEND:

AW	AWNING
AH	ACCESS HATCH
AC	A/C CONDENSER UNITS
FH	FIRE HYDRANT
FHR	FIRE HOSE REEL
FS	FIRE STAIRS
GC	GARBAGE CHUTE
HW	HIGHLIGHT WINDOW
MV	MECHANICAL RISER TO FUTURE DETAIL
MB	MAILBOX TO FUTURE DETAIL
R	240L RECYCLING BIN
SK	SKYLIGHT
ST	STORAGE
HWU	HOT WATER UNITS

MATERIALS LEGEND:

AFG	ALUMINIUM FRAMED GLAZING
LV	ALUMINIUM ELLIPTICAL FIXED LOUVERS
AW	AWNING (TO FUTURE DETAIL)
CONC	CONCRETE
FB	FACE BRICK
GB	FRAMELESS TOUCHENED GLASS BALUSTRADE (TO BCA/AUS STANDARDS)
MB	METAL BALUSTRADE
MC	METAL CLADDING
FCE	METAL FENCING (TO FUTURE SELECTION)
PC	COMPOSITE PANEL CLADDING
PSx	PRIVACY SCREEN (TO FUTURE SELECTION)
PTx	PAINT FINISH TYPEx
RD	ROLLER DOOR
RP	RIVER PEBBLES
RW	RENDERED FINISH/SELECTED PAINT FINISH
TC	TIMBER CLADDING
VB	EXTERNAL VENETIAN BLINDS

Issue	Date	Description
B	2/05/2024	AMMENDED DEVELOPMENT APPLICATION

Scale Bar 1 : 100 @ A1
1 2 3 4 5 Meters

CLIENT:
JAK Newport Pty Ltd

pbd
architects

P - 02 9698 8140
E - info@pbdarchitects.com.au
W - pbdarchitects.com.au

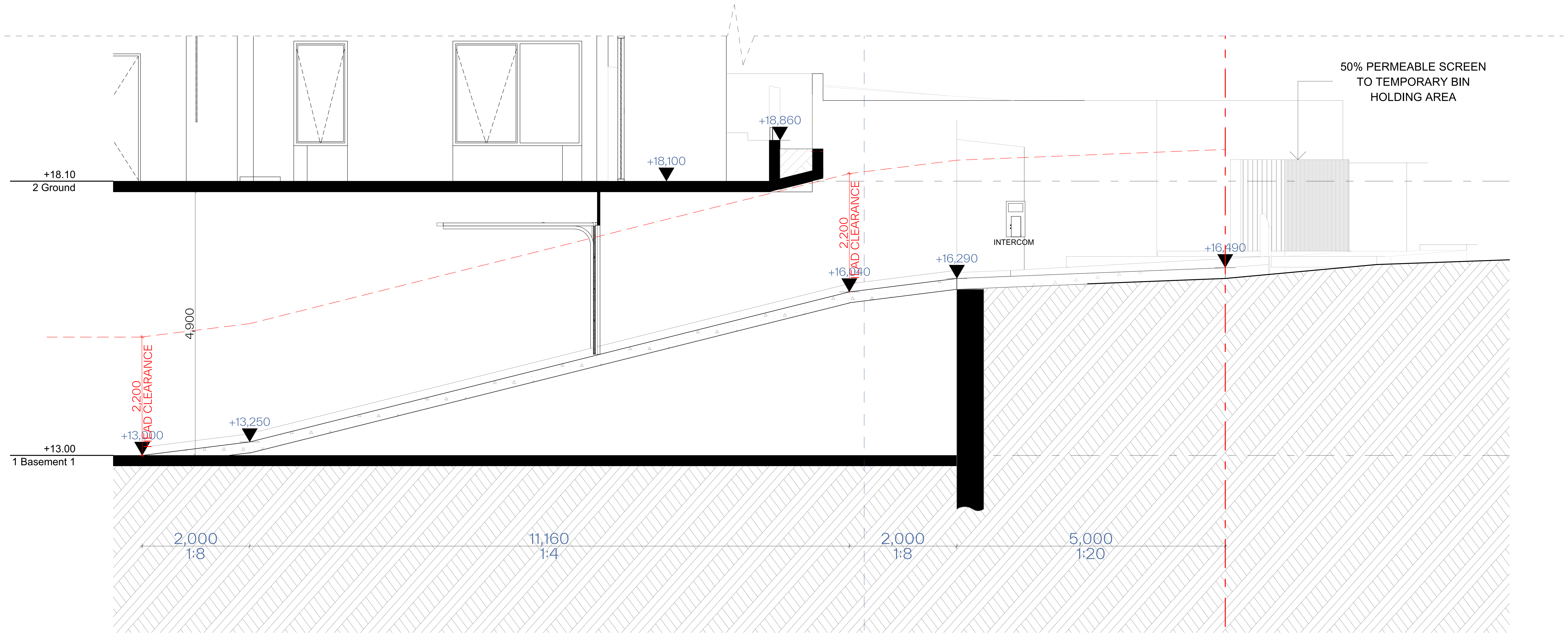
Level 2, 52 Albion Street,
Surry Hills NSW 2010

ABN 36 147 035 550
Nominated Architect:
Paul Buljevic NSW 7768

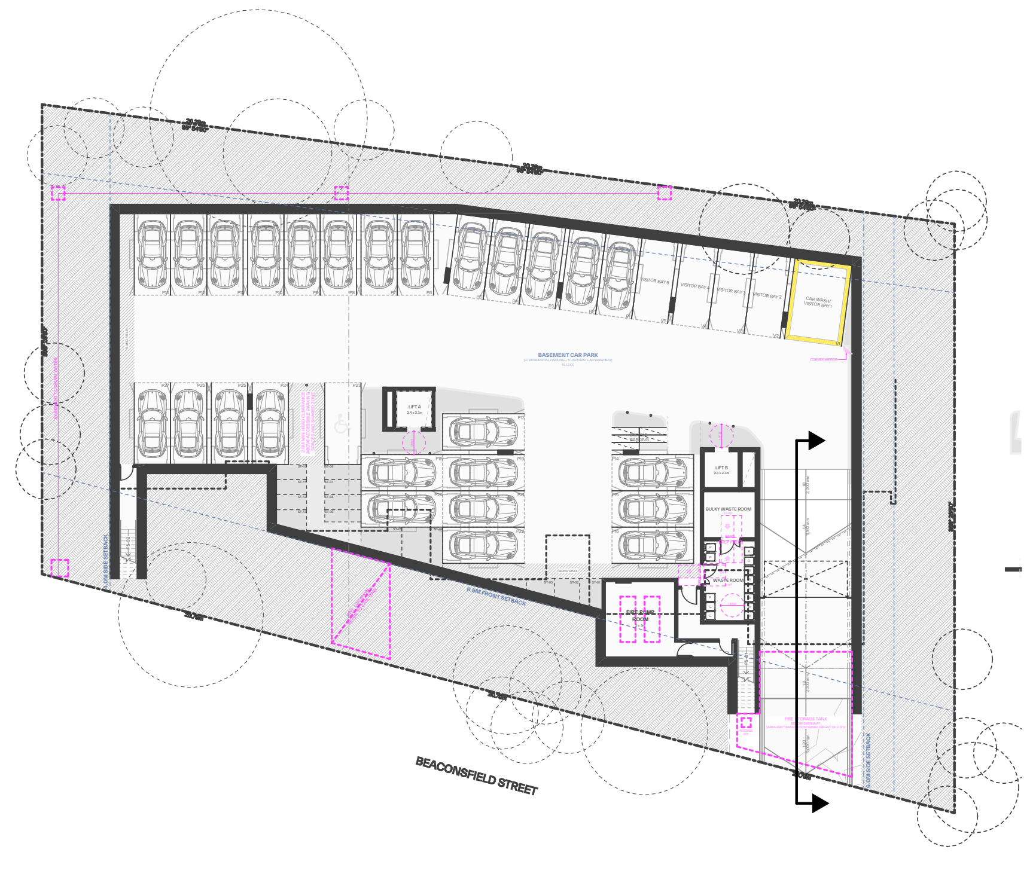
PROJECT:
RESIDENTIAL FLAT BUILDING - KENZA
54 - 58 BEACONSFIELD STREET NEWPORT NSW

DRAWING TITLE:
Section Sheet 2

DRAWING BY:	CHECKED BY:	DATE:
AS	KL	2/05/2024
SCALE: 1:50@A1	DRAWING NO:	ISSUE:
PROJECT NO: 2311	**DA301**	**B**



Driveway Section 1:50



1 Basement Plan 1:500

GENERAL NOTES:

- ALL WORKS TO COMPLY WITH BUILDING CODE OF AUSTRALIA, REQUIREMENTS OF RELEVENT STATUTORY AUTHORITIES/ LOCAL GOVERNMENT & RELEVENT AUSTRALIAN BUILDING STANDARDS
- DRAWINGS FOR THE PURPOSES OF DA ONLY (NOT FOR CONSTRUCTION) - FURTHER CONSULTANT/ AUTHORITY COORDINATION WILL BE REQUIRED AT CC STAGE WHICH MAY IMPACT ON DESIGN AND PLANNING LAYOUTS
- ARCHITECTURAL PLANS TO BE READ IN CONJUNCTION WITH CONSULTANT'S DRAWINGS, SPECIFICATIONS & REPORTS
- COPYRIGHT OF DESIGN SHOWN HEREON IS RETAINED BY PBD ARCHITECTS AND AUTHORITY IS REQUIRED FOR ANY REPRODUCTION
- AREA SCHEDULES SUPPLIED ARE APPROXIMATE ONLY - FUTURE ALLOWANCE FOR VERTICAL SERVICE DUCTS, STRUCTURAL WALL SYSTEMS AND CONSULTANT INPUT WILL BE REQUIRED

LEGEND:

AW	AWNING
AH	ACCESS HATCH
AC	A/C CONDENSER UNITS
FH	FIRE HYDRANT
FHR	FIRE HOSE REEL
FS	FIRE STAIRS
GC	GARBAGE CHUTE
HW	HIGHLIGHT WINDOW
MV	MECHANICAL RISER TO FUTURE DETAIL
MB	MAILBOX TO FUTURE DETAIL
R	240L RECYCLING BIN
SK	SKYLIGHT
ST	STORAGE
HWU	HOT WATER UNITS

MATERIALS LEGEND:

AFG	ALUMINIUM FRAMED GLAZING
LV	ALUMINIUM ELLIPTICAL FIXED LOUVERS
AW	AWNING (TO FUTURE DETAIL)
CONC	CONCRETE
FB	FACE BRICK
GB	FRAMELESS TOUCHENED GLASS BALUSTRADE (TO BCA/AUS STANDARDS)
MB	METAL BALUSTRADE
MC	METAL CLADDING
FCE	METAL FENCING (TO FUTURE SELECTION)
PC	COMPOSITE PANEL CLADDING
PSx	PRIVACY SCREEN (TO FUTURE SELECTION)
PTx	PAINT FINISH TYPEx
RD	ROLLER DOOR
RP	RIVER PEBBLES
RW	RENDERED FINISH/SELECTED PAINT FINISH
TC	TIMBER CLADDING
VB	EXTERNAL VENETIAN BLINDS

Issue	Date	Description
A	28/11/2023	DEVELOPMENT APPPLICATION
B	2/05/2024	AMMENDED DEVELOPMENT APPLICATION

Scale Bar 1 : 100 @ A1
1 2 3 4 5 Meters

N

CLIENT:
JAK Newport Pty Ltd

pbd
architects

P - 02 9698 8140
E - info@pbdarchitects.com.au
W - pbdarchitects.com.au

Level 2, 52 Albion Street,
Surry Hills NSW 2010

ABN 36 147 035 550
Nominated Architect:
Paul Buljevic NSW 7768

PROJECT:
RESIDENTIAL FLAT BUILDING - KENZA
54 - 58 BEACONSFIELD STREET NEWPORT NSW

DRAWING TITLE:
Driveway Section

DRAWING BY:	CHECKED BY:	DATE:
AS	KL	2/05/2024

SCALE:
1:500, 1:50@A1

PROJECT NO:
2311

DRAWING NO:
DA302

ISSUE:
B

Appendix D – GSA Report (EI, 2024c)

eiaustralia

EI Australia
Suite 6.01, 55 Miller Street
PYRMONT, NSW 2009

ABN 42 909 129 957

E service@eiaustralia.com.au
W www.eiaustralia.com.au
T 02 9516 0722

4 July 2024
E26083.G12

JAK Newport Pty Ltd
10 James St, Waterloo
KOGARAH NSW 2217

GSA - Groundwater Seepage Analysis
Proposed Residential/Industrial/Commercial Development
54-58 Beaconsfield St, Newport

1. INTRODUCTION

1.1. BACKGROUND

At the request of JAK Newport Pty Ltd (the Client), EI Australia (EI) has prepared this GSA - Groundwater Seepage Analysis for 54-58 Beaconsfield St, Newport (the site).

EI has prepared a Geotechnical Investigation (GI) report for the site, referenced E26083.G03_Rev2, dated 29 May 2024.

1.2. PROPOSED DEVELOPMENT

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

- Architectural Drawings prepared by PBD Architects – Job No. 2311 Revision B, Drawing No. DA000 – DA610, dated 2 May 2024.
- Detail Survey Plan prepared by SCS – Job No.18084, surveyed on 22 April 2023;
- Geotechnical Assessment, prepared by JK Geotechnics – Report Ref. 32714BCrpt, Dated 29 October 2019;
- Request for Further Information, prepared by WaterNSW – Reference IDAS1153140, Dated 18 January 2024;
- Desktop Geotechnical Assessment Report prepared by Asset Geotechnical Engineering Pty Ltd – Reference No.4680-R1, dated 13 November 2017;

Based on the provided documents, EI understands that the proposed development involves the demolition of the existing site structures and the construction of a three storey mixed use development overlying a single-level basement. The Finished Floor Level (FFL) of the basement proposed to be RL 13.0m. The Bulk Excavation Level (BEL) is assumed to be 12.7m to allow for the construction of the basement slab. To achieve the BEL, an estimated of excavation depth of between 3.7m to 10.7m 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 GSA is to address the comments from WaterNSW in the letter referenced above and to provide an estimation of the groundwater seepage 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 (if any).

2. SITE MODEL

2.1. SUBSURFACE CONDITIONS PERMEABILITY

For the purpose of the groundwater take assessment, the most conservative subsurface conditions found in BH3M as outlined our geotechnical investigation report (E26083.G03_Rev2, dated 29 May 2024) have been adopted. Material anisotropy was assumed to be 1 for all geological units. A summary of the permeability values which were adopted for the assessment of groundwater take volumes are presented in **Table 3** below.

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)
Topsoil/Fill [3]	0	19.60	1 x 10^{-4}
Residual Soil [3]	0.55	19.05	1.0 x 10^{-7}
Sandstone Bedrock [4]	6.45	13.15	6.7 x 10^{-8}

Notes:

1 For more detailed descriptions of subsurface conditions reference should be made to the Geotechnical Investigation Report.
2 Depths and levels presented in
3 **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.
4 Permeability values have been correlated for material encountered during the GSA using Look (2014).
5 Permeability value of the Sandstone Bedrock was calculated based on the pump out test carried out by EI.

The permeability the Sandstone bedrock was calculated based on the pump-out test completed within monitoring wells. The monitoring wells and pump out test results are summarised in **Table 2** below.

Table 2 Monitoring Well Details and Pump Out Test Results

Monitoring Well/ Test ID	Total Well Depth (m BEGL)	Screen Length (m)	Screened Section	Date of Test	Approximate RL of Groundwater Level (m AHD)	Adopted Permeability (m/s) [3]
BH1M	9.62	5.62	Sandstone	19-June-24	12.6	6.72 x 10^{-8}
BH3M	12.0	9	Sandstone/Clay	19-June-24	14.3	6.66 x 10^{-8}

2.2. GROUNDWATER OBSERVATIONS AND PUMP OUT TESTS

As part of the GI, EI installed 2 monitoring wells (BH1M, BH3M) for groundwater monitoring. EI undertook a Groundwater Monitoring Event (GME) on 19 June 2024 and carried out Pump Out tests on the same day, within both monitoring wells.. Groundwater measurements are presented in **Table 3** below.

Table 3 Summary of Groundwater Levels

Monitoring Well / Test ID	Date of Observation	Approximate Depth to Groundwater Level m BEGL)	Approximate RL of Groundwater Level (m AHD)
BH1M	19-June-24	4.94	12.6
BH3M	19-June-24	5.35	14.3

Long term groundwater monitoring using data loggers was undertaken in wells BH1M and BH3M for a period of three months and two weeks, between the dates 22 February 2024 and 5 June 2024.

Based on the long term groundwater data, a design groundwater level of RL 16.2m (which is within the residual clay layer) has been adopted for assessment of groundwater seepage inflow rates and groundwater take volumes within the excavation. This design level represents the highest observed groundwater level in either of the wells during the monitoring period.

2.3. SHORING SYSTEM

At the time of this assessment, no detailed structural designs were available. As such EI has adopted a solider pile wall with piles socketed 3m below B.E.L. (RL of about 9.7mAHD), which is in line with the advice given within the geotechnical report.

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

3. GROUNDWATER TAKE ASSESSMENT

3.1. GROUNDWATER SEEPAGE VOLUMES DURING CONSTRUCTION PHASE

Groundwater seepage analysis for flow through and beneath the shoring wall during construction has been undertaken using SEEP/W, a finite element groundwater seepage analysis software. SEEP/W estimates the seepage rate of water entering the excavation from 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. The permeability values presented in
- **Table** 1 above were adopted for each unit.
- The solider pile shoring walls are assumed to be permeable and free to drain.
- As bulk excavation will extend primarily through residual clay, the volume of water removed from the site as a result of bulk excavation work considered to be negligible.
- For the simplicity of this model, temporary dewatering will be undertaken within the basement retaining wall perimeter to BEL, or about RL 12.7m.
- An external design groundwater level of RL 16.2m was assumed to be constant at 20m away from the shoring wall.
- A “No-Flow” boundary is defined along the symmetric line (the centre of the excavation), at 12.5m from the perimeter shoring wall.
- The shoring walls surrounding the basement excavation has a total length of about 157m.

The SEEP/W model is presented in **Appendix A and B. 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)	Inflow into excavation (m^3/day)	Total Inflow during construction (ML/365 days)
Solider Pile Shoring Walls	1.54×10^{-7}	0.01	2.09	0.76

3.2. ASSESSMENT OF GROUNDWATER TAKE DURING OPERATIONAL PHASE

A drained basement using sub-soil drainage and a sump-and-pump system was assumed. Based on the SEEP/W results, the estimated volume of groundwater removed beneath the basement during the operational phase of the development is expected to be the same as during the construction phase, approximately 0.76ML per year.

3.3. DRAWDOWN AND SETTLEMENT ASSESSMENT

The likely settlement as a result of dewatering was estimated using PLAXIS 2D. PLAXIS 2D is a finite element package intended for the two dimensional analysis to predict earth deformations and structural movements in geotechnical engineering. It is equipped with features to deal with various aspects of geotechnical structures and construction processes using robust and theoretically sound computational procedures.

The PLAXIS model adopted soil parameters based on the most conservative ground conditions which were encountered in **BH3M**.

Table 5 Predicted Groundwater Levels within the drawdown cone of depression

Design Groundwater Level (RL m AHD)	Distance from Shoring Wall (m)	Drawdown Level (RL m AHD)	Drawdown (m)	Estimated Maximum Settlement (mm)
16.2	1	13.5	2.7	10.6
	5	14.2	2.0	9.5
	10	14.8	1.4	7.7
	15	15.6	0.6	5.8
	20	16.2	0	4.3

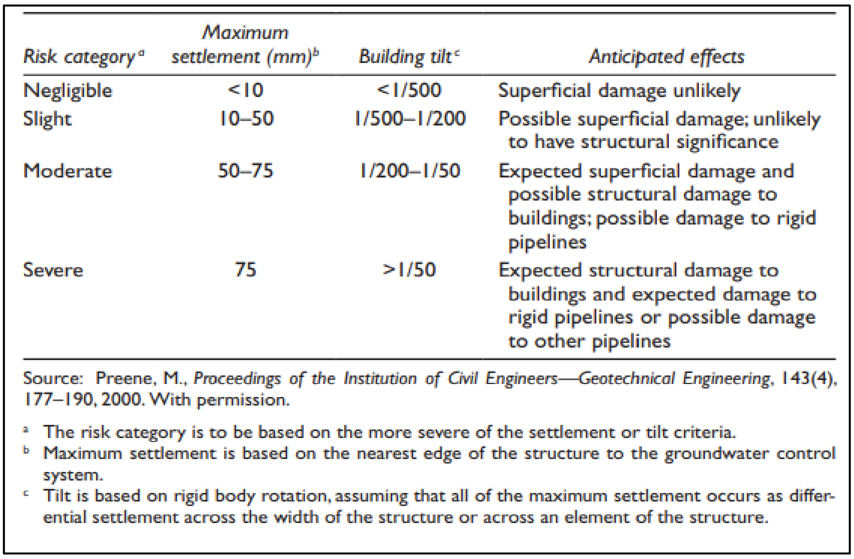
The maximum predicted ground settlements occur immediately outside of the shoring wall and were estimated to be 10.6mm. Ground experiencing settlements less than 10mm are considered to be a ‘negligible risk in regards to category of damage risk due to dewatering, as defined in Cashman and Preene (2021)[1], 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.

EI notes that the calculated settlement is due to drawdown only and other considerations such as the movement of the retaining structure have not been allowed for. If a more detailed analysis is required EI recommends a Finite Element Analysis report be completed which will model the retaining structure and construction sequence.

---

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



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)

4. CONCLUSIONS AND COMMENTS

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

- Construction and operational phase groundwater take will be approximately 0.76ML / year. If a period other than one year is required the results can be linearly interpolated from this report.
- The above estimate is based on the following assumptions:
    - The shoring wall system is an fully drained soldier pile wall retention system;
    - Continuous dewatering in order to maintain the groundwater at a depth of BEL during construction, and operational phases of the basement;
    - The basement walls and slab will be designed as drained 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.
- An impact assessment based on the settle calculated settlements should be undertaken by a suitably qualified structural engineer to assess the impact on surrounding structures.
- Based on our assessment, the groundwater volumes expected per year appear to be manageable using a drained basement system for its lifetime. Hence in our opinion “tanking” of the basement is not warranted and a drained basement is possible for the development.

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

5. LIMITATIONS

This report has been prepared for the exclusive use of JAK Newport 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 JAK Newport 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.

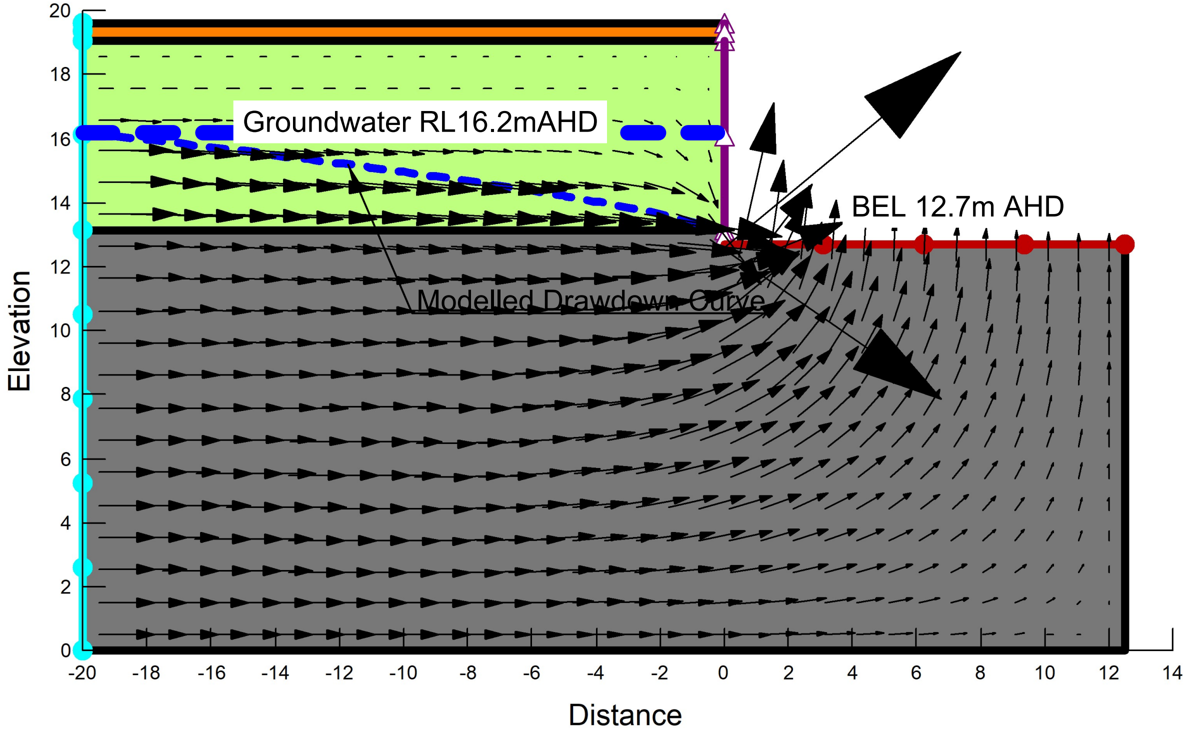
6. CLOSURE

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

For and on behalf of
EI Australia

Author	Technical Reviewer
Camillos	John Byers
Anthony Camillos Senior Geotechnical Engineer	John Byers Senior Geotechnical Engineer

Attachments: Seep/W Model
Important Information



Color	Name	Hydraulic Material Model	Ky'/Kx' Ratio
🟧	Fill	Saturated / Unsaturated	1
🟩	Residual Clay	Saturated / Unsaturated	1
⬛	Shale	Saturated / Unsaturated	1

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

Drawn:	AC
Approved:	JB
Date:	8/7/24
Approx Scale:	N/A

JAK Newport Pty Ltd
Groundwater Seepage Assessment
54 - 58 Beaconsfield Street, Newport, NSW
Seep/W Model

Appendix:
A

Project: E26083.G12

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

This report is the subject of copyright and shall not be reproduced either totally or in part without the express permission of this Company. 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.

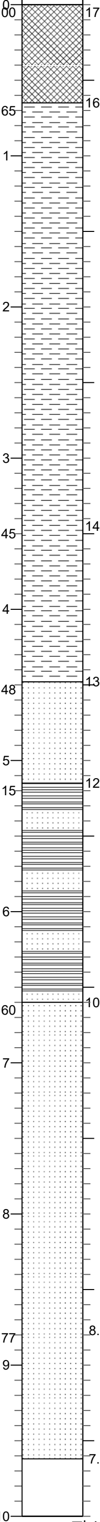
Appendix E – Borehole Logs

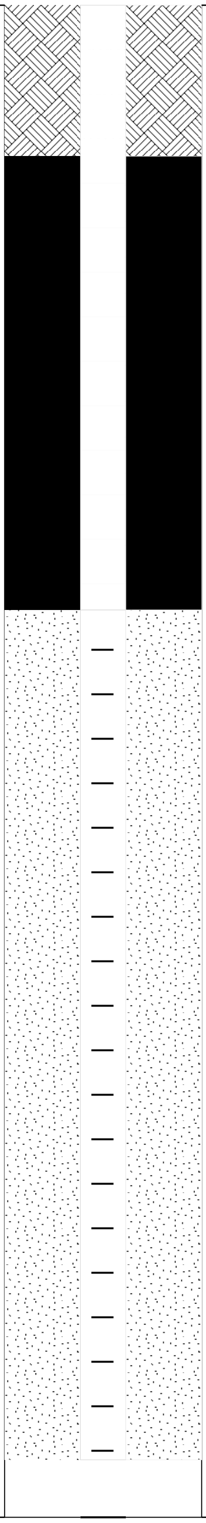
eiaustralia

BOREHOLE LOG

BH ID: BH1M

Location	54-58 Beaconsfield Street, Newport			**Started**	06 July 2023		
Client	JAK Newport			**Completed**	06 July 2023		
Job No.	E26083			**Logged By**	DD	**Date**	06 July 2023
Sheets	1 of 1			**Review By**	SK	**Date**	10 October 2023
Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈17.50 m (AHD)	**Northing**	6274211.5196 (MGA 2020 Zone 56)		
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	343349.5257 (MGA 2020 Zone 56)		





WATER	SAMPLES & FIELD TESTS	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
GWNE		0.00	17.50	TOPSOIL: Clayey SILT: low plasticity, dark brown, with fine grained sand, with rootlets, no odour	M < PL	Cuttings 0.00m - 1.00m	Well Stickup =0.0m (RL 17.50m)
	BH1M_1.50-1.95 SPT 1.50-1.95 6,12,18 N=30 BH1M_3.00-3.45 SPT 3.00-3.45 10,18,20 N=38	0.65	16.85	Silty CLAY: high plasticity, mottled grey-red, with fine to medium sub-angular to sub-rounded iron indurated siltstone		Bentonite 1.00m - 4.00m	0.0m - 4.0m PVC casing (50mm Ø)
	SPT 4.00-4.25 18,22/100 mm HB N=R BH1M_4.50-4.80	3.45	14.05	From 3.45m, high plasticity, mottled red and grey, with ironstone gravels, grading into extremely weathered material			
90%		4.48	13.02	LAMINITE: orange-grey, very thinly bedeed		Sand 4.00m - 9.62m	4.0m - 9.62m PVC screen (50mm Ø)
		5.15	12.35	LAMINITE: dark grey Siltstone [20%], and grey fine grained Sandstone [80%], thinly bedded			
95%		6.60	10.90	SANDSTONE: fine grained, grey and interbedded dark grey siltstone, medium bedded			
		8.77	8.73	From 8.77m, From 8.77m, increasing Siltstone lamination, thinly bedded			
			7.88	Terminated at 9.62m. Target Depth Reached.			

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

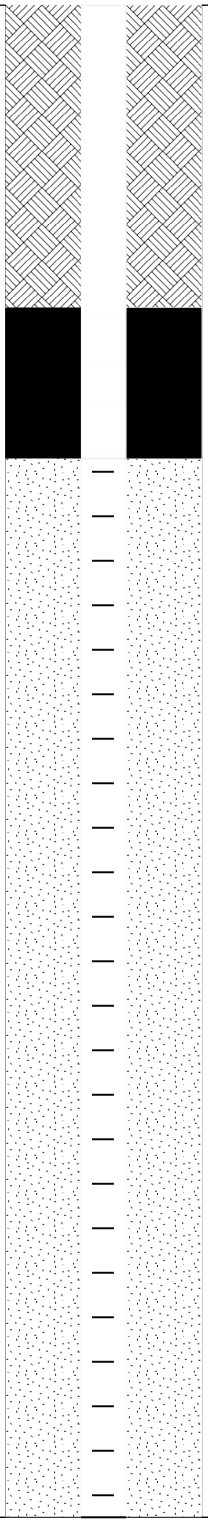
BOREHOLE LOG

BH ID: BH3M

Location	54-58 Beaconsfield Street, Newport	**Started**	07 July 2023		
Client	JAK Newport	**Completed**	07 July 2023		
Job No.	E26083	**Logged By**	DD	**Date**	07 July 2023
Sheets	1 of 2	**Review By**	SK	**Date**	10 October 2023

Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈19.40 m (AHD)	**Latitude**	-
Plant	Comacchio Geo 205	**Inclination**	90°	**Longitude**	-

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION
GWNE		0.00	19.40	CONCRETE: 150mm thick	-
		0.15	19.25	FILL: Silty SAND: dark brown, with clay, no odour	M
		0.55	18.85	Silty CLAY: high plasticity, mottled grey and red, with fine to medium sub-angular to sub-rounded iron indurated siltstone, no odour	M < PL
	BH3M_1.50-1.95 SPT 1.50-1.95 8,8,12 N=20				
	BH3M_3.00-3.45 SPT 3.00-3.45 12,16,22 N=38				
	BH3M_4.50-4.95 SPT 4.50-4.95 12,18,22 N=40				
	BH3M_6.00-6.45 SPT 6.00-6.45 3,7,10 N=17				
85%		6.47	12.93	SANDSTONE: orange-brown, very thinly bedded	
		7.08	12.32	From 7.08m, SANDSTONE: fine grained, pale grey, medium bedded	
		8.57	10.83	From 8.57m, From 8.57m, with Siltstone Laminations	
90%					



BACKFILL DETAILS	STANDPIPE DETAILS
	Well Stickup =0.0m (RL 19.40m)
Cuttings 0.00m - 2.00m	0.0m - 3.0m PVC casing (50mm Ø)
Bentonite 2.00m - 3.00m	
Sand 3.00m - 12.00m	3.0m - 12.0m PVC screen (50mm Ø)

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

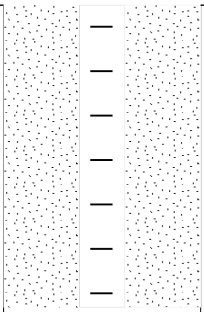
BOREHOLE LOG

BH ID: BH3M

Location	54-58 Beaconsfield Street, Newport	**Started**	07 July 2023		
Client	JAK Newport	**Completed**	07 July 2023		
Job No.	E26083	**Logged By**	DD	**Date**	07 July 2023
Sheets	2 of 2	**Review By**	SK	**Date**	10 October 2023

Drilling Contractor	Geosense Drilling Engineers	**Surface RL**	≈19.40 m (AHD)	**Latitude**	-
Plant	Comacchio Geo 205	**Inclination**	90°	**Longitude**	-

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
90%		10.05		9.35	From 8.57m, From 8.57m, with Siltstone Laminations LAMINITE: pale grey fine grained sandstone, dark grey siltstone, laminated			
		10.75		8.65	SANDSTONE: grey, with dark grey interbedded Siltstone, medium bedded			
		12		7.40	Terminated at 12.00m. Target Depth Reached.			



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

eiaustralia
Contamination | Remediation | Geotechnical

EXPLANATION OF NOTES, ABBREVIATIONS & TERMS USED ON BOREHOLE AND TEST PIT LOGS

DRILLING/EXCAVATION METHOD

		RR	Rock Roller	RH	Rock Hammer
HA	Hand Auger	RD	Rotary blade or drag bit	NQ	Diamond Core - 47 mm
DTC	Diatube Coring	RT	Rotary Tricone bit	NMLC	Diamond Core - 52 mm
NDD	Non-destructive digging	RAB	Rotary Air Blast	HQ	Diamond Core - 63 mm
AS*	Auger Screwing	RC	Reverse Circulation	HMLC	Diamond Core - 63mm
AD*	Auger Drilling	PT	Push Tube	BH	Tractor Mounted Backhoe
*V	V-Bit	CT	Cable Tool Rig	EX	Tracked Hydraulic Excavator
*T	TC-Bit, e.g. ADT	JET	Jetting	EE	Existing Excavation
ADH	Hollow Auger	WB	Washbore or Bailer	HAND	Excavated by Hand Methods

PENETRATION/EXCAVATION RESISTANCE

L	**Low resistance.** Rapid penetration/ excavation possible with little effort from equipment used.
M	**Medium resistance.** Penetration/ excavation possible at an acceptable rate with moderate effort from equipment used.
H	**High resistance.** Penetration/ excavation is possible but at a slow rate and requires significant effort from equipment used.
R	**Refusal/ Practical Refusal.** No further progress possible without risk of damage or unacceptable wear to equipment used.

These assessments are subjective and are dependent on many factors, including equipment power and weight, condition of excavation or drilling tools and experience of the operator.

WATER

▽	Water level at date shown	◁	Partial water loss
▷	Water inflow	◀	Complete water loss

GROUNDWATER NOT OBSERVED	Observation of groundwater, whether present or not, was not possible due to drilling water, surface seepage or cave-in of the borehole/ test pit.
GROUNDWATER NOT ENCOUNTERED	Borehole/ test pit was dry soon after excavation. However, groundwater could be present in less permeable strata. Inflow may have been observed had the borehole/ test pit been left open for a longer period.

SAMPLING AND TESTING

SPT	Standard Penetration Test to AS1289.6.3.1-2004
4,7,11 N=18	4,7,11 = Blows per 150mm. N = Blows per 300mm penetration following 150mm
seating 30/80mm	Where practical refusal occurs, the blows and penetration for that interval are reported
RW	Penetration occurred under the rod weight only
HW	Penetration occurred under the hammer and rod weight only
HB	Hammer double bouncing on anvil
Sampling	
DS	Disturbed Sample
BDS	Bulk disturbed Sample
GS	Gas Sample
WS	Water Sample
U63	Thin walled tube sample - number indicates nominal sample diameter in millimetres
Testing	
FP	Field Permeability test over section noted
FVS	Field Vane Shear test expressed as uncorrected shear strength (sv = peak value, sr = residual value)
PID	Photoionisation Detector reading in ppm
PM	Pressuremeter test over section noted
PP	Pocket Penetrometer test expressed as instrument reading in kPa
WPT	Water Pressure tests
DCP	Dynamic Cone Penetrometer test
CPT	Static Cone Penetration test
CPTu	Static Cone Penetration test with pore pressure (u) measurement

RANKING OF VISUALLY OBSERVABLE CONTAMINATION AND ODOUR (for specific soil contamination assessment

R = 0	No visible evidence of contamination	R = A	No non-natural odours identified
R = 1	Slight evidence of visible contamination	R = B	Slight non-natural odours identified
R = 2	Visible contamination	R = C	Moderate non-natural odours identified
R = 3	Significant visible contamination	R = D	Strong non-natural odours identified

ROCK CORE RECOVERY

TCR = Total Core Recovery (%)

$$= \frac{\textbf{Length of core recevered}}{\textbf{Lengh of core run}} \mathbf{x\ 100}$$

SCR = Solid Core Recovery (%)

$$= \frac{\boldsymbol{\Sigma}\ \textbf{Length ofcylindrical core recevered}}{\textbf{Lengh of core run}} \mathbf{x\ 100}$$

RQD = Rock Quality Designation (%)

$$= \frac{\boldsymbol{\Sigma}\textbf{Axial Lenghts of core} > \textbf{100mm}}{\textbf{Lengh of core run}} \mathbf{x\ 100}$$

MATERIAL BOUNDARIES

———— = inferred boundary

- - - - - - - - = probable boundary

— ?— ?— ?— ?— ? = possible boundary

eiaustralia
Contamination | Remediation | Geotechnical

METHOD OF SOIL DESCRIPTION USED ON BOREHOLE AND TEST PIT LOGS

▩	FILL	⁂	ORGANIC SOILS (OL, OH or Pt)	☰	CLAY (CL, CI or CH)
○	COUBLES or BOULDERS	×	SILT (ML or MH)	⋯	SAND (SP or SW)
□	GRAVEL (GP or GW)		Combinations of these basic symbols may be used to indicate mixed materials such as sandy clay		

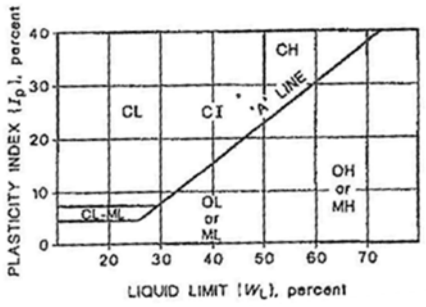
CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil is broadly classified and described in Borehole and Test Pit Logs using the preferred method given in AS1726 – 1993, (Amdt1 – 1994 and Amdt2 – 1994), Appendix A. Material properties are assessed in the field by visual/tactile methods.

PARTICLE SIZE CHARACTERISTICS

Major Division	Sub Division	Particle Size
BOULDERS		>200 mm
COBBLES		63 to 200 mm
GRAVEL	Coarse	20 to 63 mm
	Medium	6 to 20 mm
	Fine	2 to 6 mm
SAND	Coarse	0.6 to 2 mm
	Medium	0.2 to 0.6 mm
	Fine	0.075 to 0.2mm
SILT		0.002 to 0.075 mm
CLAY		<0.002 mm

PLASTICITY PROPERTIES



USCS SYMBOLS

Major Divisions		Symbol	Description
COARSE GRAINED SOILS More than 50% by dry mass less than 63mm is greater than 0.075mm	More than 50% of coarse grains are >2.mm	GW	Well graded gravel and gravel-sand mixtures, little or no fines.
		GP	Poorly graded gravel and gravel-sand mixtures, little or no fines.
		GM	Silty gravel, gravel-sand-silt mixtures.
		GC	Clayey gravel, gravel-sand-clay mixtures.
	More than 50% of coarse grains are <2 mm	SW	Well graded sand and gravelly sand, little or no fines.
		SP	Poorly graded sand and gravelly sand, little or no fines.
		SM	Silty sand, sand-silt mixtures.
		SC	Clayey sand, sandy-clay mixtures.
FINE GRAINED SOILS More than 50% by dry mass less than 63mm is less than 0.075mm	Liquid Limit less < 50%	ML	Inorganic silts of low plasticity, very fine sands, rock flour, silty or clayey fine sands.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays.
		OL	Organic silts and organic silty clays of low plasticity.
	Liquid Limit > than 50%	MH	Inorganic silts of high plasticity.
		CH	Inorganic clays of high plasticity.
		OH	Organic clays of medium to high plasticity.
		PT	Peat muck and other highly organic soils.

MOISTURE CONDITION

Symbol	Term	Description
D	Dry	Sands and gravels are free flowing. Clays & Silts may be brittle or friable and powdery.
M	Moist	Soils are darker than in the dry condition & may feel cool. Sands and gravels tend to cohere.
W	Wet	Soils exude free water. Sands and gravels tend to cohere.

Moisture content of cohesive soils may also be described in relation to plastic limit (WP) or liquid limit (WL) [» much greater than, > greater than, < less than, « much less than].

CONSISTENCY

Symbol	Term	Undrained Shear Strength
VS	Very Soft	0. to 12 kPa
S	Soft	12 to 25 kPa
F	Firm	25 to 50 kPa
St	Stiff	50 to 100 kPa
VSt	Very Stiff	100 to 200 kPa
H	Hard	Above 200 kPa

DENSITY

Symbol	Term	Density Index %	SPT "N" #
VL	Very Loose	< 15	0 to 4
L	Loose	15 to 35	4 to 10
MD	Medium Density	35 to 65	10 to 30
D	Dense	65 to 85	30 to 50
VD	Very Dense	Above 85	Above 50

In the absence of test results, consistency and density may be assessed from correlations with the observed behaviour of the material.
SPT correlations are not stated in AS1726 – 1993, and may be subject to corrections for overburden pressure and equipment type.

MINOR COMPONENTS

Term	Assessment Guide	Proportion by Mass
Trace	Presence just detectable by feel or eye but soil properties little or no different to general properties of primary component	Coarse grained soils: ≤ 5% Fine grained soil: ≤15%
Some	Presence easily detectable by feel or eye but soil properties little or no different to general properties of primary component	Coarse grained soils: 5 - 12% Fine grained soil: 15 - 30%

eiaustralia
Contamination | Remediation | Geotechnical

TERMS FOR ROCK MATERIAL STRENGTH AND WEATHERING

CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil is broadly classified and described in Borehole and Test Pit Logs using the preferred method given in AS1726 – 1993, (Amdt1 – 1994 and Amdt2 – 1994), Appendix A. Material properties are assessed in the field by visual/ tactile methods.

STRENGTH

Symbol	Term	Point Load Index, $Is_{(50)}$ (MPa) #	Field Guide
EL	Extremely Low	< 0.03	Easily remoulded by hand to a material with soil properties.
VL	Very Low	0.03 to 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30 mm can be broken by finger pressure.
L	Low	0.1 to 0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of pick point; has dull sound under hammer. A piece of core 150 mm long by 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
M	Medium	0.3 to 1	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.
H	High	1 to 3	A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken with pick with a single firm blow; rock rings under hammer.
VH	Very High	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
EH	Extremely High	>10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

 # Rock Strength Test Results

▼ Point Load Strength Index, $Is_{(50)}$, Axial test (MPa)

◀ Point Load Strength Index, $Is_{(50)}$, Diametral test (MPa)

Relationship between rock strength test result ($Is_{(50)}$) and unconfined compressive strength (UCS) will vary with rock type and strength, and should be determined on a site-specific basis. UCS is typically 10 to 30 x $Is_{(50)}$, but can be as low as 5 MPa.

ROCK MATERIAL WEATHERING

Symbol		Term	Field Guide
RS		Residual Soil	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
EW		Extremely Weathered	Rock is weathered to such an extent that it has soil properties - i.e. it either disintegrates or can be remoulded, in water.
DW	HW	Distinctly Weathered	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores. In some environments it is convenient to subdivide into Highly Weathered and Moderately Weathered, with the degree of alteration typically less for MW.
	MW		
SW		Slightly Weathered	Rock slightly discoloured but shows little or no change of strength relative to fresh rock.
FR		Fresh	Rock shows no sign of decomposition or staining.

ABBREVIATIONS AND DESCRIPTIONS FOR ROCK MATERIAL AND DEFECTS

CLASSIFICATION AND INFERRED STRATIGRAPHY

Rock is broadly classified and described in Borehole Logs using the preferred method given in AS1726 – 1993, (Amdt1 – 1994 and Amdt2 – 1994), Appendix A. Material properties are assessed in the field by visual/ tactile methods.

ROCK MATERIAL DESCRIPTION

Layering

Term	Description
Massive	No layering apparent
Poorly Developed	Layering just visible; little effect on properties
Well Developed	Layering (bedding, foliation, cleavage) distinct; rock breaks more easily parallel to layering

Structure

Term	Spacing (mm)
Thinly laminated	<6
Laminated	6 – 20
Very thinly bedded	20 – 60
Thinly bedded	60 – 200
Medium bedded	200 – 600
Thickly bedded	600 – 2,000
Very thickly bedded	> 2,000

ABBREVIATIONS AND DESCRIPTIONS FOR DEFECT TYPES

Defect Type	Abbr.	Description
Joint	JT	Surface of a fracture or parting, formed without displacement, across which the rock has little or no tensile strength. May be closed or filled by air, water or soil or rock substance, which acts as cement.
Bedding Parting	BP	Surface of fracture or parting, across which the rock has little or no tensile strength, parallel or sub-parallel to layering/ bedding. Bedding refers to the layering or stratification of a rock, indicating orientation during deposition, resulting in planar anisotropy in the rock material.
Foliation	FL	Repetitive planar structure parallel to the shear direction or perpendicular to the direction of higher pressure, especially in metamorphic rock, e.g. Schistosity (SH) and Gneissosity.
Contact	CO	The surface between two types or ages of rock.
Cleavage	CL	Cleavage planes appear as parallel, closely spaced and planar surfaces resulting from mechanical fracturing of rock through deformation or metamorphism, independent of bedding.
Sheared Seam/ Zone (Fault)	SS/SZ	Seam or zone with roughly parallel almost planar boundaries of rock substance cut by closely spaced (often <50 mm) parallel and usually smooth or slickensided joints or cleavage planes.
Crushed Seam/ Zone (Fault)	CS/CZ	Seam or zone composed of disoriented usually angular fragments of the host rock substance, with roughly parallel near-planar boundaries. The brecciated fragments may be of clay, silt, sand or gravel sizes or mixtures of these.
Decomposed Seam/ Zone	DS/DZ	Seam of soil substance, often with gradational boundaries, formed by weathering of the rock material in places.
Infilled Seam	IS	Seam of soil substance, usually clay or clayey, with very distinct roughly parallel boundaries, formed by soil migrating into joint or open cavity.
Schistocity	SH	The foliation in schist or other coarse grained crystalline rock due to the parallel arrangement of platy or prismatic mineral grains, such as mica.
Vein	VN	Distinct sheet-like body of minerals crystallised within rock through typically open-space filling or crack-seal growth.

ABBREVIATIONS AND DESCRIPTIONS FOR DEFECT SHAPE AND ROUGHNESS

Shape	Abbr.	Description	Roughness	Abbr.	Description
Planar	Pl	Consistent orientation	Polished	Pol	Shiny smooth surface
Curved	Cu	Gradual change in orientation	Slickensided	SL	Grooved or striated surface, usually polished
Undulating	Un	Wavy surface	Smooth	S	Smooth to touch. Few or no surface irregularities
Stepped	St	One or more well defined steps	Rough	RF	Many small surface irregularities (amplitude generally <1mm). Feels like fine to coarse sandpaper
Irregular	Ir	Many sharp changes in orientation	Very Rough	VR	Many large surface irregularities, amplitude generally >1mm. Feels like very coarse sandpaper

Orientation: **Vertical Boreholes –** The dip (inclination from horizontal) of the defect.
Inclined Boreholes – The inclination is measured as the acute angle to the core axis.

ABBREVIATIONS AND DESCRIPTIONS FOR DEFECT COATING

Coating	Abbr.	Description
Clean	CN	No visible coating or infilling
Stain	SN	No visible coating but surfaces are discoloured by staining, often limonite (orange-brown)
Veneer	VNR	A visible coating of soil or mineral substance, usually too thin to measure (< 1 mm); may be patchy

DEFECT APERTURE

Aperture	Abbr.	Description
Closed	CL	Closed.
Open	O	Without any infill material.
Infilled	-	Soil or rock i.e. clay, talc, pyrite, quartz, etc.

Appendix F – Laboratory Documentation

eiaustralia

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 355090

Client Details

Client	EI Australia
Attention	Alejandra Beltran
Address	Suite 6.01, 55 Miller Street, Pyrmont, NSW, 2009

Sample Details

Your Reference	**E26083, 54-58 Beaconsfield Street, Newport NSW**
Number of Samples	1 Water
Date samples received	27/06/2024
Date completed instructions received	27/06/2024

Analysis Details

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

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

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

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

Report Details

Date results requested by	04/07/2024
Date of Issue	03/07/2024

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
Giovanni Agosti, Group Technical Manager
Jack Wallis, Chemist (FAS)

Authorised By
Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Water		
Our Reference		355090-1
Your Reference	UNITS	GW-QT1
Date Sampled		26/06/2024
Type of sample		Water
Date extracted	-	01/07/2024
Date analysed	-	02/07/2024
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	%	100
Surrogate Toluene-d8	%	99
Surrogate 4-Bromofluorobenzene	%	84

svTRH (C10-C40) in Water		
Our Reference		355090-1
Your Reference	UNITS	GW-QT1
Date Sampled		26/06/2024
Type of sample		Water
Date extracted	-	28/06/2024
Date analysed	-	29/06/2024
TRH C_{10} - C_{14}	µg/L	160
TRH C_{15} - C_{28}	µg/L	<100
TRH C_{29} - C_{36}	µg/L	<100
Total +ve TRH (C10-C36)	µg/L	160
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	%	83

HM in water - dissolved		
Our Reference		355090-1
Your Reference	UNITS	GW-QT1
Date Sampled		26/06/2024
Type of sample		Water
Date prepared	-	01/07/2024
Date analysed	-	01/07/2024
Arsenic-Dissolved	µg/L	<1
Cadmium-Dissolved	µg/L	<0.1
Chromium-Dissolved	µg/L	1
Copper-Dissolved	µg/L	31
Lead-Dissolved	µg/L	<1
Mercury-Dissolved	µg/L	<0.05
Nickel-Dissolved	µg/L	3
Zinc-Dissolved	µg/L	13

Method ID	Methodology Summary
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements. Salt forms (e.g. FeO, PbO, ZnO) are determined stoichiometrically from the base metal concentration.
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-W1	[NT]
Date extracted	-			01/07/2024	1	01/07/2024	02/07/2024		01/07/2024	[NT]
Date analysed	-			02/07/2024	1	02/07/2024	03/07/2024		02/07/2024	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	1	<10	<10	0	118	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	1	<10	<10	0	118	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	117	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	116	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	119	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	119	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	117	[NT]
Naphthalene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	95	1	100	103	3	98	[NT]
Surrogate Toluene-d8	%		Org-023	100	1	99	101	2	99	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	86	1	84	87	4	99	[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	-			28/06/2024	[NT]	[NT]	[NT]	[NT]	28/06/2024	[NT]
Date analysed	-			29/06/2024	[NT]	[NT]	[NT]	[NT]	29/06/2024	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	109	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	115	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	100	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	109	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	115	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	100	[NT]
Surrogate o-Terphenyl	%		Org-020	98	[NT]	[NT]	[NT]	[NT]	86	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W6	[NT]
Date prepared	-			01/07/2024	[NT]	[NT]	[NT]	[NT]	01/07/2024	[NT]
Date analysed	-			01/07/2024	[NT]	[NT]	[NT]	[NT]	01/07/2024	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	93	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	[NT]	[NT]	[NT]	[NT]	100	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	108	[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.

Report Comments

Dissolved Metals: The preserved sample provided was not identified as either total or dissolved, therefore the unpreserved sample was filtered through 0.45µm filter at the lab.
Note: there is a possibility some elements may be underestimated.

Sheet 1 of 1

Site:
54-58 Beaconsfield Street,
Newport NSW

Project No: E26038

Laboratory:
Envirolab Services
12 Ashley Street,
CHATSWOOD NSW 2067
P: 02 9910 6200

	Sample ID	Laboratory ID	Container Type	Sampling Date	Sampling Time	SOIL	WATER	0.45 µm field filtered	OTHER	HM^A /TRH/BTEX/PAHs OCP/OP/PCB/Asbestos	HM^A /TRH/BTEX/PAHs	HM^A /TRH/BTEX	BTEX	VOCs	Asbestos	Asbestos Quantification	Excavated Natural Material (ENM) Suite	Dewatering Suite	pH / pH peroxide	sPOCAS	Chromium Reducible Sulfur (CrS)	PFAS	pH / CEC (cation exchange)	pH / EC (electrical conductivity)	Sulphate / Chloride			TCLP HM^B / PAH
1	GW-QT1		S,P,2VC	26/6/24	am		X	X				X																

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 355090
Date Received: 27/6/24
Time Received: 1300
Received By: P
Temp: [✓ Cool]/Ambient
Cooling: Ice/[✓ Icepack]
Security: [✓ Intact]/Broken/None

Comments

HM^A
Arsenic
Cadmium
Chromium
Copper
Lead
Mercury
Nickel
Zinc

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

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

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

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

Sampler's Name (EI):	Received by (Envirolab):
Print Fiona Zhang	Print Paul
Signature	Signature
Date 26/6/2024	Date 27/6/24 1300

Report with EI Waste Classification Table ☐

Sampler's Comments:
Please cc Alejandra
QT sample from SGS

SE267354
ATC 12224
27-6-24

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 - Envirolab

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

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

SAMPLE RECEIPT ADVICE

Client Details

Client	EI Australia
Attention	Alejandra Beltran

Sample Login Details

Your reference	E26038, 54-58 Beaconsfield Street, Newport NSW
Envirolab Reference	355090
Date Sample Received	27/06/2024
Date Instructions Received	27/06/2024
Date Results Expected to be Reported	04/07/2024

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	1 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	9
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	**Jacinta Hurst**
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Sample ID	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	HM in water - dissolved
GW-QT1	✓	✓	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info
Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Fiona Zhang
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	Fiona.zhang@eiaustralia.com.au
Project	**E26083 54-58 Beaconsfield Street Newport**
Order Number	**E26083**
Samples	6

LABORATORY DETAILS

Manager	Shane McDermott
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	**SE267354 R0**
Date Received	26/6/2024
Date Reported	5/7/2024

COMMENTS

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

SIGNATORIES

Akheeqar BENIAMEEN
Chemist

Bennet LO
Senior Chemist

Dong LIANG
Metals/Inorganics Team Leader

Kamrul AHSAN
Senior Chemist

Ly Kim HA
Organic Section Head

Shane MCDERMOTT
Laboratory Manager

Ying Ying ZHANG
Laboratory Technician

VOCs in Water [AN433] Tested: 28/6/2024

PARAMETER	UOM	LOR	BH1M WATER - 26/6/2024 SE267354.001	BH3M WATER - 26/6/2024 SE267354.002	GW_QD1 WATER - 26/6/2024 SE267354.003	GW_QR1 WATER - 26/6/2024 SE267354.004	GW_TS1 WATER - 26/6/2024 SE267354.005
Benzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	[90%]
Toluene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	[91%]
Ethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	[92%]
m/p-xylene	µg/L	1	<1	<1	<1	<1	[93%]
o-xylene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	[93%]
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	[88%]
Dichlorodifluoromethane (CFC-12)	µg/L	5	<5	<5	-	-	-
Chloromethane	µg/L	5	<5	<5	-	-	-
Vinyl chloride (Chloroethene)	µg/L	0.3	<0.3	<0.3	-	-	-
Bromomethane	µg/L	10	<10	<10	-	-	-
Chloroethane	µg/L	5	<5	<5	-	-	-
Trichlorofluoromethane	µg/L	1	<1	<1	-	-	-
Acetone (2-propanone)	µg/L	10	<10	<10	-	-	-
Iodomethane	µg/L	5	<5	<5	-	-	-
1,1-dichloroethene	µg/L	0.5	<0.5	<0.5	-	-	-
Acrylonitrile	µg/L	0.5	<0.5	<0.5	-	-	-
Dichloromethane (Methylene chloride)	µg/L	5	<5	<5	-	-	-
Allyl chloride	µg/L	2	<2	<2	-	-	-
Carbon disulfide	µg/L	2	<2	<2	-	-	-
trans-1,2-dichloroethene	µg/L	0.5	<0.5	<0.5	-	-	-
MtBE (Methyl-tert-butyl ether)	µg/L	0.5	<0.5	<0.5	-	-	-
1,1-dichloroethane	µg/L	0.5	<0.5	<0.5	-	-	-
Vinyl acetate*	µg/L	10	<10	<10	-	-	-
MEK (2-butanone)	µg/L	10	<10	<10	-	-	-
cis-1,2-dichloroethene	µg/L	0.5	<0.5	<0.5	-	-	-
Bromochloromethane	µg/L	0.5	<0.5	<0.5	-	-	-
Chloroform (THM)	µg/L	0.5	<0.5	<0.5	-	-	-
2,2-dichloropropane	µg/L	0.5	<0.5	<0.5	-	-	-
1,2-dichloroethane	µg/L	0.5	<0.5	<0.5	-	-	-
1,1,1-trichloroethane	µg/L	0.5	<0.5	<0.5	-	-	-
1,1-dichloropropene	µg/L	0.5	<0.5	<0.5	-	-	-
Carbon tetrachloride	µg/L	0.5	<0.5	<0.5	-	-	-
Dibromomethane	µg/L	0.5	<0.5	<0.5	-	-	-
1,2-dichloropropane	µg/L	0.5	<0.5	<0.5	-	-	-
Trichloroethene (Trichloroethylene,TCE)	µg/L	0.5	<0.5	<0.5	-	-	-
2-nitropropane	µg/L	100	<100	<100	-	-	-
Bromodichloromethane (THM)	µg/L	0.5	<0.5	<0.5	-	-	-
MIBK (4-methyl-2-pentanone)	µg/L	5	<5	<5	-	-	-
cis-1,3-dichloropropene	µg/L	0.5	<0.5	<0.5	-	-	-
trans-1,3-dichloropropene	µg/L	0.5	<0.5	<0.5	-	-	-
1,1,2-trichloroethane	µg/L	0.5	<0.5	<0.5	-	-	-
1,3-dichloropropane	µg/L	0.5	<0.5	<0.5	-	-	-
Dibromochloromethane (THM)	µg/L	0.5	<0.5	<0.5	-	-	-
2-hexanone (MBK)	µg/L	5	<5	<5	-	-	-
1,2-dibromoethane (EDB)	µg/L	0.5	<0.5	<0.5	-	-	-
Tetrachloroethene (Perchloroethylene,PCE)	µg/L	0.5	<0.5	<0.5	-	-	-
1,1,1,2-tetrachloroethane	µg/L	0.5	<0.5	<0.5	-	-	-
Chlorobenzene	µg/L	0.5	<0.5	<0.5	-	-	-
Bromoform (THM)	µg/L	0.5	<0.5	<0.5	-	-	-
Styrene (Vinyl benzene)	µg/L	0.5	<0.5	<0.5	-	-	-
1,1,2,2-tetrachloroethane	µg/L	0.5	<0.5	<0.5	-	-	-
1,2,3-trichloropropane	µg/L	0.5	<0.5	<0.5	-	-	-
trans-1,4-dichloro-2-butene	µg/L	1	<1	<1	-	-	-
Isopropylbenzene (Cumene)	µg/L	0.5	<0.5	<0.5	-	-	-

VOCs in Water [AN433] Tested: 28/6/2024 (continued)

PARAMETER	UOM	LOR	BH1M WATER - 26/6/2024 SE267354.001	BH3M WATER - 26/6/2024 SE267354.002	GW_QD1 WATER - 26/6/2024 SE267354.003	GW_QR1 WATER - 26/6/2024 SE267354.004	GW_TS1 WATER - 26/6/2024 SE267354.005
Bromobenzene	µg/L	0.5	<0.5	<0.5	-	-	-
n-propylbenzene	µg/L	0.5	<0.5	<0.5	-	-	-
2-chlorotoluene	µg/L	0.5	<0.5	<0.5	-	-	-
4-chlorotoluene	µg/L	0.5	<0.5	<0.5	-	-	-
1,3,5-trimethylbenzene	µg/L	0.5	<0.5	<0.5	-	-	-
tert-butylbenzene	µg/L	0.5	<0.5	<0.5	-	-	-
1,2,4-trimethylbenzene	µg/L	0.5	<0.5	<0.5	-	-	-
sec-butylbenzene	µg/L	0.5	<0.5	<0.5	-	-	-
1,3-dichlorobenzene	µg/L	0.5	<0.5	<0.5	-	-	-
1,4-dichlorobenzene	µg/L	0.3	<0.3	<0.3	-	-	-
p-isopropyltoluene	µg/L	0.5	<0.5	<0.5	-	-	-
1,2-dichlorobenzene	µg/L	0.5	<0.5	<0.5	-	-	-
n-butylbenzene	µg/L	0.5	<0.5	<0.5	-	-	-
1,2-dibromo-3-chloropropane	µg/L	0.5	<0.5	<0.5	-	-	-
1,2,4-trichlorobenzene	µg/L	0.5	<0.5	<0.5	-	-	-
Hexachlorobutadiene	µg/L	0.5	<0.5	<0.5	-	-	-
1,2,3-trichlorobenzene	µg/L	0.5	<0.5	<0.5	-	-	-
Total VOC	µg/L	10	<10	<10	-	-	-

VOCs in Water [AN433] Tested: 28/6/2024 (continued)

PARAMETER	UOM	LOR	GW_TB1 WATER - 26/6/2024 SE267354.006
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
Total Xylenes	µg/L	1.5	<1.5
Total BTEX	µg/L	3	<3
Naphthalene (VOC)*	µg/L	0.5	<0.5
Dichlorodifluoromethane (CFC-12)	µg/L	5	-
Chloromethane	µg/L	5	-
Vinyl chloride (Chloroethene)	µg/L	0.3	-
Bromomethane	µg/L	10	-
Chloroethane	µg/L	5	-
Trichlorofluoromethane	µg/L	1	-
Acetone (2-propanone)	µg/L	10	-
Iodomethane	µg/L	5	-
1,1-dichloroethene	µg/L	0.5	-
Acrylonitrile	µg/L	0.5	-
Dichloromethane (Methylene chloride)	µg/L	5	-
Allyl chloride	µg/L	2	-
Carbon disulfide	µg/L	2	-
trans-1,2-dichloroethene	µg/L	0.5	-
MtBE (Methyl-tert-butyl ether)	µg/L	0.5	-
1,1-dichloroethane	µg/L	0.5	-
Vinyl acetate*	µg/L	10	-
MEK (2-butanone)	µg/L	10	-
cis-1,2-dichloroethene	µg/L	0.5	-
Bromochloromethane	µg/L	0.5	-
Chloroform (THM)	µg/L	0.5	-
2,2-dichloropropane	µg/L	0.5	-
1,2-dichloroethane	µg/L	0.5	-
1,1,1-trichloroethane	µg/L	0.5	-
1,1-dichloropropene	µg/L	0.5	-
Carbon tetrachloride	µg/L	0.5	-
Dibromomethane	µg/L	0.5	-
1,2-dichloropropane	µg/L	0.5	-
Trichloroethene (Trichloroethylene,TCE)	µg/L	0.5	-
2-nitropropane	µg/L	100	-
Bromodichloromethane (THM)	µg/L	0.5	-
MIBK (4-methyl-2-pentanone)	µg/L	5	-
cis-1,3-dichloropropene	µg/L	0.5	-
trans-1,3-dichloropropene	µg/L	0.5	-
1,1,2-trichloroethane	µg/L	0.5	-
1,3-dichloropropane	µg/L	0.5	-
Dibromochloromethane (THM)	µg/L	0.5	-
2-hexanone (MBK)	µg/L	5	-
1,2-dibromoethane (EDB)	µg/L	0.5	-
Tetrachloroethene (Perchloroethylene,PCE)	µg/L	0.5	-
1,1,1,2-tetrachloroethane	µg/L	0.5	-
Chlorobenzene	µg/L	0.5	-
Bromoform (THM)	µg/L	0.5	-
Styrene (Vinyl benzene)	µg/L	0.5	-
1,1,2,2-tetrachloroethane	µg/L	0.5	-
1,2,3-trichloropropane	µg/L	0.5	-
trans-1,4-dichloro-2-butene	µg/L	1	-
Isopropylbenzene (Cumene)	µg/L	0.5	-

VOCs in Water [AN433] Tested: 28/6/2024 (continued)

			GW_TB1 WATER - 26/6/2024
PARAMETER	**UOM**	**LOR**	**SE267354.006**
Bromobenzene	µg/L	0.5	-
n-propylbenzene	µg/L	0.5	-
2-chlorotoluene	µg/L	0.5	-
4-chlorotoluene	µg/L	0.5	-
1,3,5-trimethylbenzene	µg/L	0.5	-
tert-butylbenzene	µg/L	0.5	-
1,2,4-trimethylbenzene	µg/L	0.5	-
sec-butylbenzene	µg/L	0.5	-
1,3-dichlorobenzene	µg/L	0.5	-
1,4-dichlorobenzene	µg/L	0.3	-
p-isopropyltoluene	µg/L	0.5	-
1,2-dichlorobenzene	µg/L	0.5	-
n-butylbenzene	µg/L	0.5	-
1,2-dibromo-3-chloropropane	µg/L	0.5	-
1,2,4-trichlorobenzene	µg/L	0.5	-
Hexachlorobutadiene	µg/L	0.5	-
1,2,3-trichlorobenzene	µg/L	0.5	-
Total VOC	µg/L	10	-

Volatile Petroleum Hydrocarbons in Water [AN433] Tested: 28/6/2024

			BH1M	BH3M	GW_QD1	GW_QR1
			WATER	WATER	WATER	WATER
			-	-	-	-
			26/6/2024	26/6/2024	26/6/2024	26/6/2024
PARAMETER	**UOM**	**LOR**	**SE267354.001**	**SE267354.002**	**SE267354.003**	**SE267354.004**
TRH C6-C9	µg/L	40	<40	<40	<40	<40
Benzene (F0)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
TRH C6-C10	µg/L	50	<50	<50	<50	<50
TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	<50	<50	<50

TRH (Total Recoverable Hydrocarbons) in Water [AN403] Tested: 27/6/2024

PARAMETER	UOM	LOR	BH1M WATER - 26/6/2024 SE267354.001	BH3M WATER - 26/6/2024 SE267354.002	GW_QD1 WATER - 26/6/2024 SE267354.003	GW_QR1 WATER - 26/6/2024 SE267354.004
TRH C10-C14	µg/L	50	<50	<50	<50	<50
TRH C15-C28	µg/L	200	<200	<200	<200	<200
TRH C29-C36	µg/L	200	<200	<200	<200	<200
TRH C37-C40	µg/L	200	<200	<200	<200	<200
TRH >C10-C16	µg/L	60	<60	<60	<60	<60
TRH >C10-C16 - Naphthalene (F2)	µg/L	60	<60	<60	<60	<60
TRH >C16-C34 (F3)	µg/L	500	<500	<500	<500	<500
TRH >C34-C40 (F4)	µg/L	500	<500	<500	<500	<500
TRH C10-C40	µg/L	320	<320	<320	<320	<320

PAH (Polynuclear Aromatic Hydrocarbons) in Water [AN420] Tested: 27/6/2024

PARAMETER	UOM	LOR	BH1M WATER - 26/6/2024 SE267354.001	BH3M WATER - 26/6/2024 SE267354.002
Naphthalene	µg/L	0.1	<0.1	<0.1
2-methylnaphthalene	µg/L	0.1	<0.1	<0.1
1-methylnaphthalene	µg/L	0.1	<0.1	<0.1
Acenaphthylene	µg/L	0.1	<0.1	<0.1
Acenaphthene	µg/L	0.1	<0.1	<0.1
Fluorene	µg/L	0.1	<0.1	<0.1
Phenanthrene	µg/L	0.1	<0.1	<0.1
Anthracene	µg/L	0.1	<0.1	<0.1
Fluoranthene	µg/L	0.1	<0.1	<0.1
Pyrene	µg/L	0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	0.1	<0.1	<0.1
Chrysene	µg/L	0.1	<0.1	<0.1
Benzo(b&j)fluoranthene	µg/L	0.1	<0.1	<0.1
Benzo(k)fluoranthene	µg/L	0.1	<0.1	<0.1
Benzo(a)pyrene	µg/L	0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	µg/L	0.1	<0.1	<0.1
Dibenzo(ah)anthracene	µg/L	0.1	<0.1	<0.1
Benzo(ghi)perylene	µg/L	0.1	<0.1	<0.1
Total PAH (18)	µg/L	1	<1	<1

Total Phenolics in Water [AN295] Tested: 28/6/2024

			BH1M WATER - 26/6/2024	BH3M WATER - 26/6/2024
PARAMETER	**UOM**	**LOR**	**SE267354.001**	**SE267354.002**
Total Phenols	mg/L	0.05	<0.05	<0.05

Anions by Ion Chromatography in Water [AN245] Tested: 28/6/2024

PARAMETER	UOM	LOR	BH1M WATER - 26/6/2024 SE267354.001
Chloride	mg/L	1	120
Sulfate, SO4	mg/L	1	96
Nitrate Nitrogen, NO3-N	mg/L	0.005	0.42
Bromide	mg/L	0.05	0.82
Fluoride	mg/L	0.1	<0.10

Nitrite in Water [AN277] Tested: 26/6/2024

PARAMETER	UOM	LOR	BH1M WATER - 26/6/2024 SE267354.001
Nitrite Nitrogen, NO2 as N	mg/L	0.005	<0.005
Total Oxidised Nitrogen, NOx-N	mg/L	0.005	**0.42**

TKN Kjeldahl Digestion by Discrete Analyser [AN292] Tested: 1/7/2024

PARAMETER	UOM	LOR	**BH1M** WATER - 26/6/2024 **SE267354.001**
Total Kjeldahl Nitrogen	mg/L	0.05	0.89
Total Nitrogen (calc)	mg/L	0.05	1.3

Ammonia Nitrogen by Discrete Analyser [AN291] Tested: 26/6/2024

			BH1M WATER - 26/6/2024
PARAMETER	**UOM**	**LOR**	**SE267354.001**
Ammonia Nitrogen, NH_3 as N	mg/L	0.01	0.03

Total Phosphorus by Kjeldahl Digestion DA in Water [AN279/AN293(Sydney only)] Tested: 1/7/2024

PARAMETER	UOM	LOR	BH1M WATER - 26/6/2024 SE267354.001
Total Phosphorus (Kjeldahl Digestion) as P	mg/L	0.02	0.29

Filterable Reactive Phosphorus (FRP) [AN278] Tested: 26/6/2024

PARAMETER	UOM	LOR	BH1M WATER - 26/6/2024 SE267354.001
Filterable Reactive Phosphorus as P	mg/L	0.005	<0.005

Conditivity and TDS by Calculation - Water [AN106] Tested: 26/6/2024

PARAMETER	UOM	LOR	BH1M WATER - 26/6/2024 SE267354.001	BH3M WATER - 26/6/2024 SE267354.002
Conductivity @ 25 C	µS/cm	2	1100	2200
Total Dissolved Solids (by calculation)	mg/L	10	650	1300

Total Dissolved Solids (TDS) in water [AN113] Tested: 1/7/2024

PARAMETER	UOM	LOR	BH1M WATER - 26/6/2024 SE267354.001	BH3M WATER - 26/6/2024 SE267354.002
Total Dissolved Solids Dried at 175-185°C	mg/L	10	650	1300

Alkalinity [AN135] Tested: 28/6/2024

PARAMETER	UOM	LOR	BH1M WATER - 26/6/2024 SE267354.001
Bicarbonate Alkalinity as CaCO3	mg/L	5	**33**
Carbonate Alkalinity as CaCO3	mg/L	1	<1
Hydroxide Alkalinity as CaCO3	mg/L	5	<5
Total Alkalinity as CaCO3	mg/L	5	**33**
Hydroxide Alkalinity as OH (meq/L)	meq/L	0.06	<0.06
Bicarbonate Alkalinity as HCO3 (meq/L)	meq/L	0.03	**0.66**
Carbonate Alkalinity as CO3 (meq/L)	meq/L	0.03	<0.03

Forms of Carbon [AN190] Tested: 27/6/2024

PARAMETER	UOM	LOR	BH1M WATER - 26/6/2024 SE267354.001
Total Organic Carbon as NPOC	mg/L	0.2	14

Turbidity [AN119] Tested: 26/6/2024

PARAMETER	UOM	LOR	BH1M WATER - 26/6/2024 SE267354.001	BH3M WATER - 26/6/2024 SE267354.002
Turbidity	NTU	0.5	470	210

Total and Volatile Suspended Solids (TSS / VSS) [AN114] Tested: 27/6/2024

PARAMETER	UOM	LOR	BH1M WATER - 26/6/2024 SE267354.001
Total Suspended Solids Dried at 103-105°C	mg/L	5	430

Total Cyanide in water by Discrete Analyser [AN077/AN287] Tested: 28/6/2024

			BH1M	BH3M
			WATER	WATER
			-	-
			26/6/2024	26/6/2024
PARAMETER	**UOM**	**LOR**	**SE267354.001**	**SE267354.002**
Total Cyanide	mg/L	0.004	<0.004	<0.004

Dissolved Oxygen by Membrane Electrode [AN176] Tested: 26/6/2024

PARAMETER	UOM	LOR	BH1M WATER - 26/6/2024 SE267354.001
Temperature*	°C	-	**18.8**
Dissolved Oxygen**	mg/L	0.5	**7.8**
Dissolved Oxygen (percent saturation)**	%	1	**83.8**

Metals in Water (Dissolved) by ICPOES [AN320] Tested: 28/6/2024

PARAMETER	UOM	LOR	BH1M WATER - 26/6/2024 SE267354.001	BH3M WATER - 26/6/2024 SE267354.002
Calcium, Ca	mg/L	0.1	9.7	1.9
Magnesium, Mg	mg/L	0.1	5.7	16
Total Hardness by Calculation	mg CaCO3/L	1	48	69
Sodium Adsorption Ratio	No unit	0.2	8.1	-
Sodium, Na	mg/L	0.5	130	-
Potassium, K	mg/L	0.1	2.9	-
Lithium, Li	mg/L	0.005	<0.005	-
Soluble Silicon as Silica, SiO2*	mg/L	0.1	8.7	-

Trace Metals (Dissolved) in Water by ICPMS [AN318] Tested: 27/6/2024

PARAMETER	UOM	LOR	BH1M WATER - 26/6/2024 SE267354.001	BH3M WATER - 26/6/2024 SE267354.002	GW_QD1 WATER - 26/6/2024 SE267354.003	GW_QR1 WATER - 26/6/2024 SE267354.004
Arsenic	μg/L	1	<1	<1	<1	<1
Cadmium	μg/L	0.1	<0.1	<0.1	<0.1	<0.1
Copper	μg/L	1	41	10	46	<1
Chromium	μg/L	1	2	3	1	<1
Nickel	μg/L	1	3	4	3	<1
Lead	μg/L	1	<1	<1	<1	<1
Zinc	μg/L	5	11	24	10	<5
Aluminium	μg/L	5	300	550	-	-
Antimony	μg/L	1	<1	-	-	-
Barium	μg/L	1	8	-	-	-
Beryllium	μg/L	1	<1	-	-	-
Boron	μg/L	5	110	-	-	-
Cobalt	μg/L	1	2	-	-	-
Iron	μg/L	5	1100	-	-	-
Manganese	μg/L	1	41	-	-	-
Molybdenum	μg/L	1	<1	-	-	-
Selenium	μg/L	1	<1	-	-	-
Silver	μg/L	1	<1	-	-	-
Strontium	μg/L	1	64	-	-	-
Uranium	μg/L	1	<1	-	-	-
Vanadium	μg/L	1	2	-	-	-

Mercury (dissolved) in Water [AN311(Perth)/AN312] Tested: 27/6/2024

			BH1M	BH3M	GW_QD1	GW_QR1
			WATER	WATER	WATER	WATER
			-	-	-	-
			26/6/2024	26/6/2024	26/6/2024	26/6/2024
PARAMETER	**UOM**	**LOR**	**SE267354.001**	**SE267354.002**	**SE267354.003**	**SE267354.004**
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001

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.
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos /cm or µS/cm @ 25°C. For soils, an extract with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Total Dissolved Salts can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. SGS use 0.6. Reference APHA 2510 B.
AN106	Salinity may be calculated in terms of NaCl from the sample conductivity. This assumes all soluble salts present, measured by the conductivity, are present as NaCl.
AN113	Total Dissolved Solids: A well-mixed filtered sample of known volume is evaporated to dryness at 180°C and the residue weighed. Approximate methods for correlating chemical analysis with dissolved solids are available. Reference APHA 2540 C.
AN113	The Total Dissolved Solids residue may also be ignited at 550 C and volatile TDS (Organic TDS) and non-volatile TDS (Inorganic) can be determined.
AN114	Total Suspended and Volatile Suspended Solids: The sample is homogenised by shaking and a known volume is filtered through a pre-weighed GF/C filter paper and washed well with deionised water. The filter paper is dried and reweighed. The TSS is the residue retained by the filter per unit volume of sample. Reference APHA 2540 D. Internal Reference AN114
AN119	Turbidity by Nephelometry: 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.
AN135	Alkalinity (and forms of) by Titration: The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN176	Dissolved Oxygen: Dissolved oxygen is measured directly using an oxygen permeable membrane electrode and meter. Under steady state conditions the current is directly proportional to the DO concentration. Samples with no headspace are required for this analysis and if headspace is observed this will be recorded on the report. Internal Reference is AN176 based on APHA 4500-O, C and G.
AN190	TOC and DOC in Water: A homogenised micro portion of sample is injected into a heated reaction chamber packed with an oxidative catalyst that converts organic carbon to carbon dioxide. The CO2 is measured using a non-dispersive infrared detector. The process is fully automated in a commercially available analyser. If required a sugar value can be calculated from the TOC result. Reference APHA 5310 B.
AN190	Chemical oxygen demand can be calculated/estimated based on the O2/C relation as 2.67*NPOC (TOC). This is an estimate only and the factor will vary with sample matrix so results should be interpreted with caution.
AN245	Anions by Ion Chromatography: A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO2, NO3 and SO4 are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B
AN277	Nitrite ions, when reacted with a reagent containing sulphanilamide and N-(1-naphthyl)-ethylenediamine dihydrochloride produce a highly coloured azo dye that is measured photometrically at 540nm.
AN278	Filterable Reactive Phosphorus by DA (determined on filtered sample): Orthophosphate reacts with ammonium molybdate (Mo VI) and potassium antimonyl tartrate (Sb III) in acid medium to form an antimony-phosphomolybdate complex. This complex is subsequently reduced with ascorbic acid to form a blue colour and the absorbance is read at 880 nm. The sensitivity of the automated method is 10-20 times that of the macro method. Reference APHA 4500-P F
AN279/AN293(Sydney)	The sample is digested with Sulphuric acid, K2SO4 and CuSO4. All forms of phosphorus are converted into orthophosphate. The digest is cooled and placed on the discrete analyser for colorimetric analysis.
AN281	An unfiltered water or soil sample is first digested in a block digestor with sulfuric acid, K2SO4 and CuSO4. The ammonia produced following digestion is then measured colourimetrically using the Discrete Analyser. A portion of the digested sample is buffered to an alkaline pH, and interfering cations are complexed. The ammonia then reacts with salicylate and hypochlorite to give a blue colour whose absorbance is measured at 660nm and compared with calibration standards. This is proportional to the concentration of Total Kjeldahl Nitrogen in the original sample.

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.
AN291	Ammonia in solution reacts with hypochlorite ions from Sodium Dichloroisocyanuate, and salicylate in the presence of Sodium Nitroprusside to form indophenol blue and measured at 660 nm by Discrete Analyser.
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).
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.
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.
Calculation	Free and Total Carbon Dioxide may be calculated using alkalinity forms only when the samples TDS is <500mg/L. If TDS is >500mg/L free or total carbon dioxide cannot be reported. APHA4500CO2 D.

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

SE267354 R0

CLIENT DETAILS

Contact	Fiona Zhang
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	Fiona.zhang@eiaustralia.com.au
Project	**E26083 54-58 Beaconsfield Street Newport**
Order Number	**E26083**
Samples	6

LABORATORY DETAILS

Manager	Shane McDermott
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	**SE267354 R0**
Date Received	26 Jun 2024
Date Reported	05 Jul 2024

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 with the exception of the following:

Analysis Date	Nitrite in Water	1 item

SAMPLE SUMMARY

Type of documentation received	COC	Date documentation received	26/6/2024
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	11.9°C	Sample container provider	SGS
Turnaround time requested	Standard	Samples received in correct containers	Yes
Sufficient sample for analysis	Yes	Sample cooling method	Ice Bricks
Samples clearly labelled	Yes	Complete documentation received	Yes

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

Alkalinity
Method: ME-(AU)-[ENV]AN135

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1M	SE267354.001	LB316308	26 Jun 2024	26 Jun 2024	10 Jul 2024	28 Jun 2024	10 Jul 2024	02 Jul 2024

Ammonia Nitrogen by Discrete Analyser
Method: ME-(AU)-[ENV]AN291

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1M	SE267354.001	LB316118	26 Jun 2024	26 Jun 2024	24 Jul 2024	26 Jun 2024	24 Jul 2024	26 Jun 2024

Anions by Ion Chromatography in Water
Method: ME-(AU)-[ENV]AN245

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1M	SE267354.001	LB316271	26 Jun 2024	26 Jun 2024	24 Jul 2024	28 Jun 2024	24 Jul 2024	02 Jul 2024

Conductivity and TDS by Calculation - Water
Method: ME-(AU)-[ENV]AN106

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1M	SE267354.001	LB316128	26 Jun 2024	26 Jun 2024	24 Jul 2024	26 Jun 2024	24 Jul 2024	26 Jun 2024
BH3M	SE267354.002	LB316128	26 Jun 2024	26 Jun 2024	24 Jul 2024	26 Jun 2024	24 Jul 2024	26 Jun 2024

Dissolved Oxygen by Membrane Electrode
Method: ME-(AU)-[ENV]AN176

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1M	SE267354.001	LB316123	26 Jun 2024	26 Jun 2024	27 Jun 2024	26 Jun 2024	27 Jun 2024	26 Jun 2024

Filterable Reactive Phosphorus (FRP)
Method: ME-(AU)-[ENV]AN278

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1M	SE267354.001	LB316118	26 Jun 2024	26 Jun 2024	24 Jul 2024	26 Jun 2024	24 Jul 2024	26 Jun 2024

Forms of Carbon
Method: ME-(AU)-[ENV]AN190

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1M	SE267354.001	LB316155	26 Jun 2024	26 Jun 2024	03 Jul 2024	27 Jun 2024	03 Jul 2024	28 Jun 2024

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
BH1M	SE267354.001	LB316137	26 Jun 2024	26 Jun 2024	24 Jul 2024	27 Jun 2024	24 Jul 2024	27 Jun 2024
BH3M	SE267354.002	LB316137	26 Jun 2024	26 Jun 2024	24 Jul 2024	27 Jun 2024	24 Jul 2024	27 Jun 2024
GW_QD1	SE267354.003	LB316137	26 Jun 2024	26 Jun 2024	24 Jul 2024	27 Jun 2024	24 Jul 2024	27 Jun 2024
GW_QR1	SE267354.004	LB316137	26 Jun 2024	26 Jun 2024	24 Jul 2024	27 Jun 2024	24 Jul 2024	27 Jun 2024

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
BH1M	SE267354.001	LB316254	26 Jun 2024	26 Jun 2024	23 Dec 2024	28 Jun 2024	23 Dec 2024	28 Jun 2024
BH3M	SE267354.002	LB316254	26 Jun 2024	26 Jun 2024	23 Dec 2024	28 Jun 2024	23 Dec 2024	28 Jun 2024

Nitrite in Water
Method: ME-(AU)-[ENV]AN277

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1M	SE267354.001	LB316118	26 Jun 2024	26 Jun 2024	30 Jun 2024	26 Jun 2024	30 Jun 2024	02 Jul 2024†

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
BH1M	SE267354.001	LB316181	26 Jun 2024	26 Jun 2024	03 Jul 2024	27 Jun 2024	06 Aug 2024	02 Jul 2024
BH3M	SE267354.002	LB316181	26 Jun 2024	26 Jun 2024	03 Jul 2024	27 Jun 2024	06 Aug 2024	02 Jul 2024
GW_QD1	SE267354.003	LB316181	26 Jun 2024	26 Jun 2024	03 Jul 2024	27 Jun 2024	06 Aug 2024	02 Jul 2024
GW_QR1	SE267354.004	LB316181	26 Jun 2024	26 Jun 2024	03 Jul 2024	27 Jun 2024	06 Aug 2024	02 Jul 2024

TKN Kjeldahl Digestion by Discrete Analyser
Method: ME-(AU)-[ENV]AN292

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1M	SE267354.001	LB316371	26 Jun 2024	26 Jun 2024	24 Jul 2024	01 Jul 2024	24 Jul 2024	02 Jul 2024

Total and Volatile Suspended Solids (TSS / VSS)
Method: ME-(AU)-[ENV]AN114

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1M	SE267354.001	LB316192	26 Jun 2024	26 Jun 2024	03 Jul 2024	27 Jun 2024	04 Jul 2024	28 Jun 2024

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

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
BH1M	SE267354.001	LB316262	26 Jun 2024	26 Jun 2024	10 Jul 2024	28 Jun 2024	10 Jul 2024	28 Jun 2024
BH3M	SE267354.002	LB316262	26 Jun 2024	26 Jun 2024	10 Jul 2024	28 Jun 2024	10 Jul 2024	28 Jun 2024

Total Dissolved Solids (TDS) in water

Method: ME-(AU)-[ENV]AN113

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1M	SE267354.001	LB316420	26 Jun 2024	26 Jun 2024	03 Jul 2024	01 Jul 2024	03 Jul 2024	02 Jul 2024
BH3M	SE267354.002	LB316420	26 Jun 2024	26 Jun 2024	03 Jul 2024	01 Jul 2024	03 Jul 2024	02 Jul 2024

Total Phenolics in Water

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

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1M	SE267354.001	LB316260	26 Jun 2024	26 Jun 2024	10 Jul 2024	28 Jun 2024	10 Jul 2024	28 Jun 2024
BH3M	SE267354.002	LB316260	26 Jun 2024	26 Jun 2024	10 Jul 2024	28 Jun 2024	10 Jul 2024	28 Jun 2024

Total Phosphorus by Kjeldahl Digestion DA in Water

Method: ME-(AU)-[ENV]AN279/AN293(Sydney only)

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1M	SE267354.001	LB316371	26 Jun 2024	26 Jun 2024	24 Jul 2024	01 Jul 2024	24 Jul 2024	02 Jul 2024

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
BH1M	SE267354.001	LB316130	26 Jun 2024	26 Jun 2024	23 Dec 2024	27 Jun 2024	23 Dec 2024	27 Jun 2024
BH3M	SE267354.002	LB316130	26 Jun 2024	26 Jun 2024	23 Dec 2024	27 Jun 2024	23 Dec 2024	27 Jun 2024
GW_QD1	SE267354.003	LB316130	26 Jun 2024	26 Jun 2024	23 Dec 2024	27 Jun 2024	23 Dec 2024	27 Jun 2024
GW_QR1	SE267354.004	LB316130	26 Jun 2024	26 Jun 2024	23 Dec 2024	27 Jun 2024	23 Dec 2024	27 Jun 2024

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
BH1M	SE267354.001	LB316181	26 Jun 2024	26 Jun 2024	03 Jul 2024	27 Jun 2024	06 Aug 2024	02 Jul 2024
BH3M	SE267354.002	LB316181	26 Jun 2024	26 Jun 2024	03 Jul 2024	27 Jun 2024	06 Aug 2024	02 Jul 2024
GW_QD1	SE267354.003	LB316181	26 Jun 2024	26 Jun 2024	03 Jul 2024	27 Jun 2024	06 Aug 2024	02 Jul 2024
GW_QR1	SE267354.004	LB316181	26 Jun 2024	26 Jun 2024	03 Jul 2024	27 Jun 2024	06 Aug 2024	02 Jul 2024

Turbidity

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

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1M	SE267354.001	LB316125	26 Jun 2024	26 Jun 2024	27 Jun 2024	26 Jun 2024	27 Jun 2024	26 Jun 2024
BH3M	SE267354.002	LB316125	26 Jun 2024	26 Jun 2024	27 Jun 2024	26 Jun 2024	27 Jun 2024	26 Jun 2024

VOCs in Water

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

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1M	SE267354.001	LB316259	26 Jun 2024	26 Jun 2024	10 Jul 2024	28 Jun 2024	10 Jul 2024	01 Jul 2024
BH3M	SE267354.002	LB316259	26 Jun 2024	26 Jun 2024	10 Jul 2024	28 Jun 2024	10 Jul 2024	01 Jul 2024
GW_QD1	SE267354.003	LB316259	26 Jun 2024	26 Jun 2024	10 Jul 2024	28 Jun 2024	10 Jul 2024	01 Jul 2024
GW_QR1	SE267354.004	LB316259	26 Jun 2024	26 Jun 2024	10 Jul 2024	28 Jun 2024	10 Jul 2024	01 Jul 2024
GW_TS1	SE267354.005	LB316259	26 Jun 2024	26 Jun 2024	10 Jul 2024	28 Jun 2024	10 Jul 2024	01 Jul 2024
GW_TB1	SE267354.006	LB316259	26 Jun 2024	26 Jun 2024	10 Jul 2024	28 Jun 2024	10 Jul 2024	01 Jul 2024

Volatile Petroleum Hydrocarbons in Water

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

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1M	SE267354.001	LB316259	26 Jun 2024	26 Jun 2024	10 Jul 2024	28 Jun 2024	10 Jul 2024	01 Jul 2024
BH3M	SE267354.002	LB316259	26 Jun 2024	26 Jun 2024	10 Jul 2024	28 Jun 2024	10 Jul 2024	01 Jul 2024
GW_QD1	SE267354.003	LB316259	26 Jun 2024	26 Jun 2024	10 Jul 2024	28 Jun 2024	10 Jul 2024	01 Jul 2024
GW_QR1	SE267354.004	LB316259	26 Jun 2024	26 Jun 2024	10 Jul 2024	28 Jun 2024	10 Jul 2024	01 Jul 2024
GW_TS1	SE267354.005	LB316259	26 Jun 2024	26 Jun 2024	10 Jul 2024	28 Jun 2024	10 Jul 2024	01 Jul 2024
GW_TB1	SE267354.006	LB316259	26 Jun 2024	26 Jun 2024	10 Jul 2024	28 Jun 2024	10 Jul 2024	01 Jul 2024

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)	BH1M	SE267354.001	%	40 - 130%	61
	BH3M	SE267354.002	%	40 - 130%	62
d14-p-terphenyl (Surrogate)	BH1M	SE267354.001	%	40 - 130%	65
	BH3M	SE267354.002	%	40 - 130%	72
d5-nitrobenzene (Surrogate)	BH1M	SE267354.001	%	40 - 130%	64
	BH3M	SE267354.002	%	40 - 130%	73

VOCs in Water

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

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	BH1M	SE267354.001	%	40 - 130%	80
	BH3M	SE267354.002	%	40 - 130%	79
	GW_QD1	SE267354.003	%	40 - 130%	80
	GW_QR1	SE267354.004	%	40 - 130%	81
	GW_TS1	SE267354.005	%	40 - 130%	82
	GW_TB1	SE267354.006	%	40 - 130%	83
d4-1,2-dichloroethane (Surrogate)	BH1M	SE267354.001	%	40 - 130%	90
	BH3M	SE267354.002	%	40 - 130%	85
	GW_QD1	SE267354.003	%	40 - 130%	79
	GW_QR1	SE267354.004	%	40 - 130%	78
	GW_TS1	SE267354.005	%	40 - 130%	73
	GW_TB1	SE267354.006	%	40 - 130%	76
d8-toluene (Surrogate)	BH1M	SE267354.001	%	40 - 130%	73
	BH3M	SE267354.002	%	40 - 130%	70
	GW_QD1	SE267354.003	%	40 - 130%	71
	GW_QR1	SE267354.004	%	40 - 130%	71
	GW_TS1	SE267354.005	%	40 - 130%	73
	GW_TB1	SE267354.006	%	40 - 130%	70

Volatile Petroleum Hydrocarbons in Water

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

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	BH1M	SE267354.001	%	40 - 130%	80
	BH3M	SE267354.002	%	40 - 130%	79
	GW_QD1	SE267354.003	%	40 - 130%	80
	GW_QR1	SE267354.004	%	40 - 130%	81
d4-1,2-dichloroethane (Surrogate)	BH1M	SE267354.001	%	60 - 130%	90
	BH3M	SE267354.002	%	60 - 130%	85
	GW_QD1	SE267354.003	%	60 - 130%	79
	GW_QR1	SE267354.004	%	60 - 130%	78
d8-toluene (Surrogate)	BH1M	SE267354.001	%	40 - 130%	73
	BH3M	SE267354.002	%	40 - 130%	70
	GW_QD1	SE267354.003	%	40 - 130%	71
	GW_QR1	SE267354.004	%	40 - 130%	71

METHOD BLANKS

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.

Alkalinity

Method: ME-(AU)-[ENV]AN135

Sample Number	Parameter	Units	LOR	Result
LB316308.001	Bicarbonate Alkalinity as CaCO3	mg/L	5	<5
	Carbonate Alkalinity as CaCO3	mg/L	1	<1
	Total Alkalinity as CaCO3	mg/L	5	<5

Ammonia Nitrogen by Discrete Analyser

Method: ME-(AU)-[ENV]AN291

Sample Number	Parameter	Units	LOR	Result
LB316118.001	Ammonia Nitrogen, NH_3 as N	mg/L	0.01	<0.01

Anions by Ion Chromatography in Water

Method: ME-(AU)-[ENV]AN245

Sample Number	Parameter	Units	LOR	Result
LB316271.001	Fluoride	mg/L	0.1	<0.10
	Chloride	mg/L	1	<0.05
	Bromide	mg/L	0.05	<0.05
	Nitrate Nitrogen, NO3-N	mg/L	0.005	<0.005
	Sulfate, SO4	mg/L	1	<1.0

Conductivity and TDS by Calculation - Water

Method: ME-(AU)-[ENV]AN106

Sample Number	Parameter	Units	LOR	Result
LB316128.001	Conductivity @ 25 C	µS/cm	2	<2
	Total Dissolved Solids (by calculation)	mg/L	10	<10

Dissolved Oxygen by Membrane Electrode

Method: ME-(AU)-[ENV]AN176

Sample Number	Parameter	Units	LOR	Result
LB316123.001	Dissolved Oxygen**	mg/L	0.5	<0.5

Filterable Reactive Phosphorus (FRP)

Method: ME-(AU)-[ENV]AN278

Sample Number	Parameter	Units	LOR	Result
LB316118.001	Filterable Reactive Phosphorus as P	mg/L	0.005	<0.005

Forms of Carbon

Method: ME-(AU)-[ENV]AN190

Sample Number	Parameter	Units	LOR	Result
LB316155.001	Total Organic Carbon as NPOC	mg/L	0.2	<0.2

Mercury (dissolved) in Water

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

Sample Number	Parameter	Units	LOR	Result
LB316137.001	Mercury	mg/L	0.0001	<0.0001

Metals in Water (Dissolved) by ICPOES

Method: ME-(AU)-[ENV]AN320

Sample Number	Parameter	Units	LOR	Result
LB316254.001	Calcium, Ca	mg/L	0.1	<0.1
	Magnesium, Mg	mg/L	0.1	<0.1
	Potassium, K	mg/L	0.1	<0.1
	Sodium, Na	mg/L	0.5	<0.5

Nitrite in Water

Method: ME-(AU)-[ENV]AN277

Sample Number	Parameter	Units	LOR	Result
LB316118.001	Nitrite Nitrogen, NO2 as N	mg/L	0.005	<0.005

PAH (Polynuclear Aromatic Hydrocarbons) in Water

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

Sample Number	Parameter	Units	LOR	Result
LB316181.001	Naphthalene	µg/L	0.1	<0.1
	2-methylnaphthalene	µg/L	0.1	<0.1
	1-methylnaphthalene	µg/L	0.1	<0.1

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.

PAH (Polynuclear Aromatic Hydrocarbons) in Water (continued)

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

Sample Number		Parameter	Units	LOR	Result
LB316181.001		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)	%	-	76
		2-fluorobiphenyl (Surrogate)	%	-	74
		d14-p-terphenyl (Surrogate)	%	-	78

Total and Volatile Suspended Solids (TSS / VSS)

Method: ME-(AU)-[ENV]AN114

Sample Number	Parameter	Units	LOR	Result
LB316192.001	Total Suspended Solids Dried at 103-105°C	mg/L	5	<5

Total Cyanide in water by Discrete Analyser

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

Sample Number	Parameter	Units	LOR	Result
LB316262.001	Total Cyanide	mg/L	0.004	<0.004

Total Dissolved Solids (TDS) in water

Method: ME-(AU)-[ENV]AN113

Sample Number	Parameter	Units	LOR	Result
LB316420.001	Total Dissolved Solids Dried at 175-185°C	mg/L	10	<10

Total Phenolics in Water

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

Sample Number	Parameter	Units	LOR	Result
LB316260.001	Total Phenols	mg/L	0.05	<0.05

Total Phosphorus by Kjeldahl Digestion DA in Water

Method: ME-(AU)-[ENV]AN279/AN293(Sydney only)

Sample Number	Parameter	Units	LOR	Result
LB316371.001	Total Phosphorus (Kjeldahl Digestion) as P	mg/L	0.02	<0.02

Trace Metals (Dissolved) in Water by ICPMS

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

Sample Number	Parameter	Units	LOR	Result
LB316130.001	Aluminium	µg/L	5	<5
	Antimony	µg/L	1	<1
	Arsenic	µg/L	1	<1
	Barium	µg/L	1	<1
	Beryllium	µg/L	1	<1
	Boron	µg/L	5	<5
	Cadmium	µg/L	0.1	<0.1
	Chromium	µg/L	1	<1
	Cobalt	µg/L	1	<1
	Copper	µg/L	1	<1
	Iron	µg/L	5	<5
	Lead	µg/L	1	<1
	Manganese	µg/L	1	<1
	Molybdenum	µg/L	1	<1
	Nickel	µg/L	1	<1

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.

Trace Metals (Dissolved) in Water by ICPMS (continued)

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

Sample Number	Parameter	Units	LOR	Result
LB316130.001	Selenium	µg/L	1	<1
	Silver	µg/L	1	<1
	Strontium	µg/L	1	<1
	Uranium	µg/L	1	<1
	Vanadium	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	Result
LB316181.001	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
LB316125.001	Turbidity	NTU	0.5	<0.5

VOCs in Water

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

Sample Number		Parameter	Units	LOR	Result
LB316259.001	Fumigants	2,2-dichloropropane	µg/L	0.5	<0.5
		1,2-dichloropropane	µg/L	0.5	<0.5
		cis-1,3-dichloropropene	µg/L	0.5	<0.5
		trans-1,3-dichloropropene	µg/L	0.5	<0.5
		1,2-dibromoethane (EDB)	µg/L	0.5	<0.5
	Halogenated Aliphatics	Dichlorodifluoromethane (CFC-12)	µg/L	5	<5
		Chloromethane	µg/L	5	<5
		Vinyl chloride (Chloroethene)	µg/L	0.3	<0.3
		Bromomethane	µg/L	10	<10
		Chloroethane	µg/L	5	<5
		Trichlorofluoromethane	µg/L	1	<1
		1,1-dichloroethene	µg/L	0.5	<0.5
		Iodomethane	µg/L	5	<5
		Dichloromethane (Methylene chloride)	µg/L	5	<5
		Allyl chloride	µg/L	2	<2
		trans-1,2-dichloroethene	µg/L	0.5	<0.5
		1,1-dichloroethane	µg/L	0.5	<0.5
		cis-1,2-dichloroethene	µg/L	0.5	<0.5
		Bromochloromethane	µg/L	0.5	<0.5
		1,2-dichloroethane	µg/L	0.5	<0.5
		1,1,1-trichloroethane	µg/L	0.5	<0.5
		1,1-dichloropropene	µg/L	0.5	<0.5
		Carbon tetrachloride	µg/L	0.5	<0.5
		Dibromomethane	µg/L	0.5	<0.5
		Trichloroethene (Trichloroethylene,TCE)	µg/L	0.5	<0.5
		1,1,2-trichloroethane	µg/L	0.5	<0.5
		1,3-dichloropropane	µg/L	0.5	<0.5
		Tetrachloroethene (Perchloroethylene,PCE)	µg/L	0.5	<0.5
		1,1,1,2-tetrachloroethane	µg/L	0.5	<0.5
		1,1,2,2-tetrachloroethane	µg/L	0.5	<0.5
		1,2,3-trichloropropane	µg/L	0.5	<0.5
		trans-1,4-dichloro-2-butene	µg/L	1	<1
		1,2-dibromo-3-chloropropane	µg/L	0.5	<0.5
		Hexachlorobutadiene	µg/L	0.5	<0.5
	Halogenated Aromatics	Chlorobenzene	µg/L	0.5	<0.5
		Bromobenzene	µg/L	0.5	<0.5
		2-chlorotoluene	µg/L	0.5	<0.5
		4-chlorotoluene	µg/L	0.5	<0.5
		1,3-dichlorobenzene	µg/L	0.5	<0.5
		1,4-dichlorobenzene	µg/L	0.3	<0.3

METHOD BLANKS

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.

VOCs in Water (continued)

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

Sample Number		Parameter	Units	LOR	Result
LB316259.001	Halogenated Aromatics	1,2-dichlorobenzene	µg/L	0.5	<0.5
		1,2,4-trichlorobenzene	µg/L	0.5	<0.5
		1,2,3-trichlorobenzene	µg/L	0.5	<0.5
	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
		Styrene (Vinyl benzene)	µg/L	0.5	<0.5
		o-xylene	µg/L	0.5	<0.5
		Isopropylbenzene (Cumene)	µg/L	0.5	<0.5
		n-propylbenzene	µg/L	0.5	<0.5
		1,3,5-trimethylbenzene	µg/L	0.5	<0.5
		tert-butylbenzene	µg/L	0.5	<0.5
		1,2,4-trimethylbenzene	µg/L	0.5	<0.5
		sec-butylbenzene	µg/L	0.5	<0.5
		p-isopropyltoluene	µg/L	0.5	<0.5
		n-butylbenzene	µg/L	0.5	<0.5
	Nitrogenous Compounds	Acrylonitrile	µg/L	0.5	<0.5
	Oxygenated Compounds	Acetone (2-propanone)	µg/L	10	<10
		MtBE (Methyl-tert-butyl ether)	µg/L	0.5	<0.5
		Vinyl acetate*	µg/L	10	<10
		MEK (2-butanone)	µg/L	10	<10
		MIBK (4-methyl-2-pentanone)	µg/L	5	<5
		2-hexanone (MBK)	µg/L	5	<5
	Polycyclic VOCs	Naphthalene (VOC)*	µg/L	0.5	<0.5
	Sulphonated	Carbon disulfide	µg/L	2	<2
	Surrogates	d4-1,2-dichloroethane (Surrogate)	%	-	95
		d8-toluene (Surrogate)	%	-	107
		Bromofluorobenzene (Surrogate)	%	-	91
	Trihalomethanes	Chloroform (THM)	µg/L	0.5	<0.5
		Bromodichloromethane (THM)	µg/L	0.5	<0.5
		Dibromochloromethane (THM)	µg/L	0.5	<0.5
		Bromoform (THM)	µg/L	0.5	<0.5

Volatile Petroleum Hydrocarbons in Water

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

Sample Number		Parameter	Units	LOR	Result
LB316259.001		TRH C6-C9	µg/L	40	<40
	Surrogates	d4-1,2-dichloroethane (Surrogate)	%	-	95
		d8-toluene (Surrogate)	%	-	107
		Bromofluorobenzene (Surrogate)	%	-	91

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

Ammonia Nitrogen by Discrete Analyser

Method: ME-(AU)-[ENV]AN291

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267302.001	LB316118.014	Ammonia Nitrogen, NH_3 as N	mg/L	0.01	4.3	4.2	15	2
SE267354.001	LB316118.021	Ammonia Nitrogen, NH_3 as N	mg/L	0.01	0.03	0.03	46	12

Anions by Ion Chromatography in Water

Method: ME-(AU)-[ENV]AN245

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267365.001	LB316271.014	Nitrate Nitrogen, NO3-N	mg/L	0.005	0.33	0.33	16	0
SE267365.009	LB316271.023	Fluoride	mg/L	0.1	0.11	0.12	102	1
		Chloride	mg/L	1	630	620	15	1
		Nitrate Nitrogen, NO3-N	mg/L	0.005	<0.025	<0.025	200	0
		Sulfate, SO4	mg/L	1	3.4	3.0	46	10

Conductivity and TDS by Calculation - Water

Method: ME-(AU)-[ENV]AN106

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267354.002	LB316128.015	Conductivity @ 25 C	µS/cm	2	2200	2200	15	1
		Total Dissolved Solids (by calculation)	mg/L	10	1300	1300	15	1

Filterable Reactive Phosphorus (FRP)

Method: ME-(AU)-[ENV]AN278

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267354.001	LB316118.021	Filterable Reactive Phosphorus as P	mg/L	0.005	<0.005	<0.005	200	0

Forms of Carbon

Method: ME-(AU)-[ENV]AN190

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267365.004	LB316155.015	Total Organic Carbon as NPOC	mg/L	0.2	61	62	15	1
SE267365.009	LB316155.021	Total Organic Carbon as NPOC	mg/L	0.2	57	56	15	1

Mercury (dissolved) in Water

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

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267354.002	LB316137.014	Mercury	µg/L	0.0001	<0.0001	0.0000	200	195
SE267354.004	LB316137.017	Mercury	µg/L	0.0001	<0.0001	<0.0001	158	0

Metals in Water (Dissolved) by ICPOES

Method: ME-(AU)-[ENV]AN320

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267400.001	LB316254.009	Calcium, Ca	mg/L	0.1	250	250	15	1

Nitrite in Water

Method: ME-(AU)-[ENV]AN277

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267354.001	LB316118.021	Nitrite Nitrogen, NO2 as N	mg/L	0.005	<0.005	<0.005	200	0

PAH (Polynuclear Aromatic Hydrocarbons) in Water

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

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267354.002	LB316181.028	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	199	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

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

PAH (Polynuclear Aromatic Hydrocarbons) in Water (continued)

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

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267354.002	LB316181.028		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	4
			2-fluorobiphenyl (Surrogate)	µg/L	-	0.3	0.3	30	5
			d14-p-terphenyl (Surrogate)	µg/L	-	0.4	0.3	30	6

TKN Kjeldahl Digestion by Discrete Analyser

Method: ME-(AU)-[ENV]AN292

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267448.001	LB316371.022	Total Kjeldahl Nitrogen	mg/L	0.05	6.5	6.0	16	8

Total and Volatile Suspended Solids (TSS / VSS)

Method: ME-(AU)-[ENV]AN114

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267399.001	LB316192.013	Total Suspended Solids Dried at 103-105°C	mg/L	5	230	260	17	10

Total Cyanide in water by Discrete Analyser

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

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267325.001	LB316262.018	Total Cyanide	mg/L	0.004	<0.004	<0.004	200	0

Total Dissolved Solids (TDS) in water

Method: ME-(AU)-[ENV]AN113

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267493.001	LB316420.013	Total Dissolved Solids Dried at 175-185°C	mg/L	10	2200	2200	15	1
SE267510.010	LB316420.024	Total Dissolved Solids Dried at 175-185°C	mg/L	10	3200	3200	15	1

Total Phenolics in Water

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

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267354.001	LB316260.014	Total Phenols	mg/L	0.05	<0.05	<0.05	200	0
SE267427.002	LB316260.022	Total Phenols	mg/L	0.05	<0.05	<0.05	200	0

Total Phosphorus by Kjeldahl Digestion DA in Water

Method: ME-(AU)-[ENV]AN279/AN293(Sydney only)

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267365.006	LB316371.014	Total Phosphorus (Kjeldahl Digestion) as P	mg/L	0.02	0.39	0.41	20	5
SE267448.001	LB316371.022	Total Phosphorus (Kjeldahl Digestion) as P	mg/L	0.02	1.7	1.8	16	3

Trace Metals (Dissolved) in Water by ICPMS

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

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267243.001	LB316130.014	Aluminium	µg/L	5	210	220	17	2
		Arsenic	µg/L	1	1	1	102	0
		Cadmium	µg/L	0.1	<0.1	<0.1	200	0
		Chromium	µg/L	1	<1	<1	200	0
		Copper	µg/L	1	2	2	58	2
		Iron	µg/L	5	470	480	16	0
		Lead	µg/L	1	<1	<1	200	0
		Manganese	µg/L	1	12	12	24	1
		Nickel	µg/L	1	1	1	93	0
		Zinc	µg/L	5	6	6	103	4
SE267328.010	LB316130.022	Arsenic	µg/L	1	<1	<1	200	0
		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

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

Trace Metals (Dissolved) in Water by ICPMS (continued)

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

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267328.010	LB316130.022		Lead	µg/L	1	<1	<1	200	0
			Nickel	µg/L	1	<1	<1	200	0
			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 %
SE267268.001	LB316181.029		TRH C10-C14	µg/L	50	<50	<50	195	0
			TRH C15-C28	µg/L	200	230	230	117	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	152	0
		TRH F Bands	TRH >C10-C16	µg/L	60	<60	<60	163	0
			TRH >C10-C16 - Naphthalene (F2)	µg/L	60	<60	<60	163	0
			TRH >C16-C34 (F3)	µg/L	500	<500	<500	200	0
			TRH >C34-C40 (F4)	µg/L	500	<500	<500	200	0
SE267354.002	LB316181.028		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 %
SE267354.002	LB316125.008		Turbidity	NTU	0.5	210	200	15	5

VOCs in Water

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

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267424.001	LB316259.026	Monocyclic Aromatic	Benzene	µg/L	0.5	<0.5	<0.5	200	0
			Toluene	µg/L	0.5	<0.5	<0.5	200	0
			Ethylbenzene	µg/L	0.5	<0.5	<0.5	200	0
			m/p-xylene	µg/L	1	<1	<1	200	0
			o-xylene	µg/L	0.5	<0.5	<0.5	200	0
		Polycyclic	Naphthalene (VOC)*	µg/L	0.5	<0.5	<0.5	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	9.3	9.6	30	4
			d8-toluene (Surrogate)	µg/L	-	7.3	9.5	30	26
			Bromofluorobenzene (Surrogate)	µg/L	-	7.9	7.4	30	7
		Totals	Total BTEX	µg/L	3	<3	<3	200	0
SE267429.018	LB316259.022	Monocyclic Aromatic	Benzene	µg/L	0.5	<0.5	<0.5	200	0
			Toluene	µg/L	0.5	<0.5	<0.5	200	0
			Ethylbenzene	µg/L	0.5	<0.5	<0.5	200	0
			m/p-xylene	µg/L	1	<1	<1	200	0
			o-xylene	µg/L	0.5	<0.5	<0.5	200	0
		Polycyclic	Naphthalene (VOC)*	µg/L	0.5	<0.5	<0.5	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	8.1	7.9	30	2
			d8-toluene (Surrogate)	µg/L	-	7.2	8.3	30	14
			Bromofluorobenzene (Surrogate)	µg/L	-	8.4	7.9	30	5
		Totals	Total BTEX	µg/L	3	<3	<3	200	0

Volatile Petroleum Hydrocarbons in Water

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

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267424.001	LB316259.026		TRH C6-C10	µg/L	50	<50	<50	200	0
			TRH C6-C9	µg/L	40	<40	<40	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	9.3	9.6	30	4
			d8-toluene (Surrogate)	µg/L	-	7.3	9.5	30	26
			Bromofluorobenzene (Surrogate)	µg/L	-	7.9	7.4	30	7
		VPH F Bands	Benzene (F0)	µg/L	0.5	<0.5	<0.5	200	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

Volatile Petroleum Hydrocarbons in Water (continued)

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

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267424.001	LB316259.026	VPH F Bands	TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	<50	200	0
SE267429.018	LB316259.024		TRH C6-C10	µg/L	50	<50	<50	200	0
			TRH C6-C9	µg/L	40	<40	<40	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	8.1	7.9	30	2
			d8-toluene (Surrogate)	µg/L	-	7.2	8.3	30	14
			Bromofluorobenzene (Surrogate)	µg/L	-	8.4	7.9	30	5
		VPH F Bands	Benzene (F0)	µg/L	0.5	<0.5	<0.5	200	0
			TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	<50	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.

Ammonia Nitrogen by Discrete Analyser

Method: ME-(AU)-[ENV]AN291

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB316118.002	Ammonia Nitrogen, NH_3 as N	mg/L	0.01	2.7	2.5	80 - 120	106

Anions by Ion Chromatography in Water

Method: ME-(AU)-[ENV]AN245

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB316271.002	Fluoride	mg/L	0.1	2.0	2	80 - 120	100
	Chloride	mg/L	1	19	20	80 - 120	96
	Bromide	mg/L	0.05	2.0	2	80 - 120	98
	Nitrate Nitrogen, NO3-N	mg/L	0.005	2.0	2	80 - 120	100
	Sulfate, SO4	mg/L	1	19	20	80 - 120	97

Conductivity and TDS by Calculation - Water

Method: ME-(AU)-[ENV]AN106

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB316128.002	Conductivity @ 25 C	µS/cm	2	290	303	90 - 110	96
	Total Dissolved Solids (by calculation)	mg/L	10	170	181	85 - 115	96

Filterable Reactive Phosphorus (FRP)

Method: ME-(AU)-[ENV]AN278

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB316118.002	Filterable Reactive Phosphorus as P	mg/L	0.005	0.096	0.1	80 - 120	96

Forms of Carbon

Method: ME-(AU)-[ENV]AN190

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB316155.002	Total Organic Carbon as NPOC	mg/L	0.2	19	20	80 - 120	93

Metals in Water (Dissolved) by ICPOES

Method: ME-(AU)-[ENV]AN320

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB316254.002	Calcium, Ca	mg/L	0.1	51	50.5	80 - 120	101
	Lithium, Li	mg/L	0.005	0.11	0.1	80 - 120	108
	Magnesium, Mg	mg/L	0.1	51	50.5	80 - 120	101
	Potassium, K	mg/L	0.1	55	55	80 - 120	99
	Sodium, Na	mg/L	0.5	52	50.5	80 - 120	103

Nitrite in Water

Method: ME-(AU)-[ENV]AN277

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB316118.002	Nitrite Nitrogen, NO2 as N	mg/L	0.005	0.11	0.1	80 - 120	108

PAH (Polynuclear Aromatic Hydrocarbons) in Water

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

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB316181.002		Naphthalene	µg/L	0.1	35	40	60 - 140	88
		Acenaphthylene	µg/L	0.1	33	40	60 - 140	81
		Acenaphthene	µg/L	0.1	36	40	60 - 140	90
		Phenanthrene	µg/L	0.1	34	40	60 - 140	86
		Anthracene	µg/L	0.1	33	40	60 - 140	83
		Fluoranthene	µg/L	0.1	34	40	60 - 140	86
		Pyrene	µg/L	0.1	30	40	60 - 140	76
		Benzo(a)pyrene	µg/L	0.1	39	40	60 - 140	98
	Surrogates	d5-nitrobenzene (Surrogate)	µg/L	-	0.4	0.5	40 - 130	84
		2-fluorobiphenyl (Surrogate)	µg/L	-	0.4	0.5	40 - 130	84
		d14-p-terphenyl (Surrogate)	µg/L	-	0.4	0.5	40 - 130	82

Total and Volatile Suspended Solids (TSS / VSS)

Method: ME-(AU)-[ENV]AN114

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB316192.002	Total Suspended Solids Dried at 103-105°C	mg/L	5	99	100	80 - 120	99

LABORATORY CONTROL SAMPLES

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.

Total Cyanide in water by Discrete Analyser

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

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB316262.002	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 %
LB316260.002	Total Phenols	mg/L	0.05	0.20	0.2	80 - 120	102

Total Phosphorus by Kjeldahl Digestion DA in Water

Method: ME-(AU)-[ENV]AN279/AN293(Sydney only)

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB316371.002	Total Phosphorus (Kjeldahl Digestion) as P	mg/L	0.02	1.1	1	80 - 120	107

Trace Metals (Dissolved) in Water by ICPMS

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

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB316130.002	Aluminium	µg/L	5	22	20	80 - 120	109
	Antimony	µg/L	1	20	20	80 - 120	98
	Arsenic	µg/L	1	20	20	80 - 120	98
	Barium	µg/L	1	21	20	80 - 120	107
	Beryllium	µg/L	1	20	20	80 - 120	98
	Boron	µg/L	5	20	20	80 - 120	102
	Cadmium	µg/L	0.1	20	20	80 - 120	98
	Chromium	µg/L	1	20	20	80 - 120	98
	Cobalt	µg/L	1	20	20	80 - 120	99
	Copper	µg/L	1	20	20	80 - 120	101
	Iron	µg/L	5	21	20	80 - 120	104
	Lead	µg/L	1	20	20	80 - 120	101
	Manganese	µg/L	1	21	20	80 - 120	103
	Molybdenum	µg/L	1	20	20	80 - 120	99
	Nickel	µg/L	1	20	20	80 - 120	99
	Selenium	µg/L	1	20	20	80 - 120	100
	Silver	µg/L	1	18	20	80 - 120	89
	Strontium	µg/L	1	20	20	80 - 120	100
	Uranium	µg/L	1	20	20	80 - 120	102
	Vanadium	µg/L	1	20	20	80 - 120	100
	Zinc	µg/L	5	21	20	80 - 120	107

TRH (Total Recoverable Hydrocarbons) in Water

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

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB316181.002		TRH C10-C14	µg/L	50	1200	1200	60 - 140	101
		TRH C15-C28	µg/L	200	1400	1200	60 - 140	114
		TRH C29-C36	µg/L	200	1400	1200	60 - 140	116
	TRH F Bands	TRH >C10-C16	µg/L	60	1300	1200	60 - 140	109
		TRH >C16-C34 (F3)	µg/L	500	1400	1200	60 - 140	117
		TRH >C34-C40 (F4)	µg/L	500	690	600	60 - 140	115

VOCs in Water

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

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB316259.002	Halogenated Aliphatics	1,1-dichloroethene	µg/L	0.5	41	45.45	60 - 140	90
		1,2-dichloroethane	µg/L	0.5	57	45.45	60 - 140	126
		Trichloroethene (Trichloroethylene,TCE)	µg/L	0.5	50	45.45	60 - 140	110
	Halogenated	Chlorobenzene	µg/L	0.5	61	45.45	60 - 140	134
	Monocyclic Aromatic	Benzene	µg/L	0.5	54	45.45	60 - 140	118
		Toluene	µg/L	0.5	52	45.45	60 - 140	115
		Ethylbenzene	µg/L	0.5	49	45.45	60 - 140	108
		m/p-xylene	µg/L	1	98	90.9	60 - 140	108
		o-xylene	µg/L	0.5	49	45.45	60 - 140	108
	Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	9.5	10	60 - 140	95
		d8-toluene (Surrogate)	µg/L	-	10.4	10	70 - 130	104
		Bromofluorobenzene (Surrogate)	µg/L	-	10.6	10	70 - 130	106

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 %
LB316259.002	Trihalomethan	Chloroform (THM)	µg/L	0.5	52	45.45	60 - 140	114

Volatile Petroleum Hydrocarbons in Water

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

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB316259.002		TRH C6-C10	µg/L	50	840	946.63	60 - 140	88
		TRH C6-C9	µg/L	40	730	818.71	60 - 140	89
	Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	9.5	10	60 - 140	95
		d8-toluene (Surrogate)	µg/L	-	10.4	10	70 - 130	104
		Bromofluorobenzene (Surrogate)	µg/L	-	10.6	10	70 - 130	106
	VPH F Bands	TRH C6-C10 minus BTEX (F1)	µg/L	50	530	639.67	60 - 140	84

MATRIX SPIKES

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.

Ammonia Nitrogen by Discrete Analyser

Method: ME-(AU)-[ENV]AN291

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE267173.001	LB316118.004	Ammonia Nitrogen, NH_3 as N	mg/L	0.01	4.3	1.9	2.5	100

Mercury (dissolved) in Water

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

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE267298.001	LB316137.004	Mercury	mg/L	0.0001	0.0024	-0.046	0.008	122

Nitrite in Water

Method: ME-(AU)-[ENV]AN277

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE267276.001	LB316118.023	Nitrite Nitrogen, NO2 as N	mg/L	0.005	0.12	<0.005	0.1	120

Total Cyanide in water by Discrete Analyser

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

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE267354.002	LB316262.017	Total Cyanide	mg/L	0.004	0.027	<0.004	0.025	101

Total Phenolics in Water

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

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE267243.001	LB316260.004	Total Phenols	mg/L	0.05	0.20	<0.05	0.2	102

Trace Metals (Dissolved) in Water by ICPMS

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

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE267298.001	LB316130.004	Arsenic	µg/L	1	20	0.18	20	100
		Cadmium	µg/L	0.1	23	4.202	20	96
		Chromium	µg/L	1	21	0.337	20	101
		Copper	µg/L	1	27	5.792	20	104
		Lead	µg/L	1	20	0.221	20	101
		Nickel	µg/L	1	130	112.788	20	99

VOCs in Water

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

QC Sample	Sample Number		Parameter	Units	LOR	Original	Spike	Recovery%
SE267354.003	LB316259.023	Monocyclic Aromatic	Benzene	µg/L	0.5	<0.5	45.45	87
			Toluene	µg/L	0.5	<0.5	45.45	85
			Ethylbenzene	µg/L	0.5	<0.5	45.45	88
			m/p-xylene	µg/L	1	<1	90.9	87
			o-xylene	µg/L	0.5	<0.5	45.45	86
		Polycyclic	Naphthalene (VOC)*	µg/L	0.5	<0.5	-	-
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	7.9	-	70
			d8-toluene (Surrogate)	µg/L	-	7.1	-	69
			Bromofluorobenzene (Surrogate)	µg/L	-	8.0	-	78
		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%
SE267354.003	LB316259.025		TRH C6-C10	µg/L	50	<50	946.63	81
			TRH C6-C9	µg/L	40	<40	818.71	83
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	7.9	-	70
			d8-toluene (Surrogate)	µg/L	-	7.1	-	69
			Bromofluorobenzene (Surrogate)	µg/L	-	8.0	-	78
		VPH F Bands	Benzene (F0)	µg/L	0.5	<0.5	-	-
			TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	639.67	83

MATRIX SPIKE DUPLICATES

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.

FOOTNOTES

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.

Sheet 1 of 1

Site: 54-58 Beaconsfield Street, Newport NSW

Project No: E26038

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	SOIL	WATER	0.45 µm field filtered	OTHER	HM ^{A} /TRH/BTEX/PAHs OCP/OP/PCB/Asbestos	HM ^{A} /TRH/BTEX/PAHs	HM ^{A} /TRH/BTEX	BTEX
BH1M	1	S,P,2VC	26/6/24	am		x	x					
BH3M	2	↓	↓	↓		↓	x					
GW-QD1	3	S,P,2VC					x				x	
GW-QT1							x					
GW-QR1	4										x	
GW-QRB1		↓										
GW-TS1	5	lab provide										x
GW-TB1	6	↓	↓	↓		↓						x

Sample ID	Cations: Calcium (Ca), magnesium (Mg), sodium (Na), potassium (K)	Anions: Sulfate (SO4), chloride (Cl), carbonates (CO3), bromide (Br), fluoride (F)	Sb, Ba, Be, B, Co, Fe, Li, Mn, Mo, Se, silica (dissolved SiO2), Ag, Sr, U, V	Ammonia (NH3), nitrate (NO3), total nitrogen (N), oxidised nitrogen (N), total phosphorus (P), reactive phosphorus (P)	Faecal coliforms, faecal streptococci, Escherichia coli	DO (in % and mg/L)	ENM Suite - Stockpile composite (HM ^{A} /pH / EC / Foreign Materials)	Dewatering Suite	pH / pH peroxide	sPOCAS	Chromium Reducible Sulfur (CrS)	~~PFAS~~ TSS / TOC / SAR	pH / CEC (cation exchange)	pH / EC (electrical conductivity)	Sulphate / Chloride	~~[illegible]~~ VOCs	TCLP HM ^{B} / PAH
BH1M	x	x	x	x	x	x		x				x				x	
BH3M								x								x	
GW-QD1																	
GW-QT1																	
GW-QR1																	
GW-QRB1																	
GW-TS1																	
GW-TB1																	

Comments

HM ^{A}
Arsenic
Cadmium
Chromium
Copper
Lead
Mercury
Nickel
Zinc

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

SGS EHS Sydney COC
SE267354

LABORATORY TURNAROUND

- ☒ Standard
- ☐ 24 Hours
- ☐ 48 Hours
- ☐ 72 Hours
- ☒ Other pH in 24h

Container Type:
J = solvent washed, acid rinsed, Tefton sealed glass jar
S = solvent washed, acid rinsed glass botlle
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.

Sampler's Name (EI):
Print Fiona
Signature
Date 26/6/24

Received by (SGS):
Print
Signature
Date 26-6-24 2.50.

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

Report with EI Waste Classification Table ☐

Sampler's Comments:
Please CC Alejandra

QT samples to Envirolab

SAMPLE RECEIPT ADVICE

SE267354

CLIENT DETAILS

Contact	Fiona Zhang
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	Fiona.zhang@eiaustralia.com.au
Project	**E26083 54-58 Beaconsfield Street Newport**
Order Number	**E26083**
Samples	6

LABORATORY DETAILS

Manager	Shane McDermott
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 26/6/2024
Report Due	Wed 3/7/2024
SGS Reference	**SE267354**

SUBMISSION DETAILS

This is to confirm that 6 samples were received on Wednesday 26/6/2024. Results are expected to be ready by COB Wednesday 3/7/2024. Please quote SGS reference SE267354 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Type of documentation received	COC	Date documentation received	26/6/2024
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	11.9°C	Sample container provider	SGS
Turnaround time requested	Standard	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

pH reported in SE267354A.
Micros subcontracted to Symbio Laboratories, 2 Sirius Road, Lane Cove West NSW 2066, NATA Accreditation Number 2455.
1 water sample has been placed on hold as no tests have been assigned for it. This sample will not be processed.

SAMPLE RECEIPT ADVICE

SE267354

CLIENT DETAILS

Client EI AUSTRALIA

Project E26083 54-58 Beaconsfield Street Newport

SUMMARY OF ANALYSIS

No.	Sample ID	Anions by Ion Chromatography in Water	Nitrite in Water	PAH (Polynuclear Aromatic Hydrocarbons) in Water	TKN Kjeldahl Digestion by Discrete Analyser	Total Phenolics in Water	TRH (Total Recoverable Hydrocarbons) in Water	VOCs in Water	Volatile Petroleum Hydrocarbons in Water
001	BH1M	5	2	22	2	1	9	77	7
002	BH3M	-	-	22	-	1	9	77	7
003	GW_QD1	-	-	-	-	-	9	11	7
004	GW_QR1	-	-	-	-	-	9	11	7
005	GW_TS1	-	-	-	-	-	-	11	-
006	GW_TB1	-	-	-	-	-	-	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

CLIENT DETAILS

Client	EI AUSTRALIA
Project	E26083 54-58 Beaconsfield Street Newport

SUMMARY OF ANALYSIS

No.	Sample ID	Alkalinity	Ammonia Nitrogen by Discrete Analyser	Conductivity and TDS by Calculation - Water	Filterable Reactive Phosphorus (FRP)	Forms of Carbon	Total and Volatile Suspended Solids (TSS /	Total Cyanide in water by Discrete Analyser	Total Dissolved Solids (TDS) in water	Total Phosphorus by Kjeldahl Digestion DA in	Turbidity
001	BH1M	7	1	2	1	1	1	1	1	1	1
002	BH3M	-	-	2	-	-	-	1	1	-	1

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

CLIENT DETAILS

Client	EI AUSTRALIA	Project	E26083 54-58 Beaconsfield Street Newport

SUMMARY OF ANALYSIS

No.	Sample ID	Dissolved Oxygen by Membrane Electrode	Mercury (dissolved) in Water	Metals in Water (Dissolved) by ICPOES	Trace Metals (Dissolved) in Water by ICPMS
001	BH1M	3	1	8	21
002	BH3M	-	1	3	8
003	GW_QD1	-	1	-	7
004	GW_QR1	-	1	-	7

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

SE267354

CLIENT DETAILS

Client EI AUSTRALIA

Project E26083 54-58 Beaconsfield Street Newport

SUMMARY OF ANALYSIS

No.	Sample ID	Sample Subcontracted
001	BH1M	1

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 .

HPC Holdings Pty Ltd trading as Symbio Alliance ABN 93 621 286 928
52 Brandl St (PO Box 4312) Email : admin@symbioalliance.com.au
Eight Mile Plains Qld 4113 ☎ 07 32190333 *www.symbioalliance.com.au*

Symbio ALLIANCE

CHAIN OF CUSTODY FORM

Customer: SGS Sydney email:
Address: Unit 16, 33 Maddox St, Alexandria 2015
Contact: Alejandra Beltran
Project Id: E26038 54-58 Beaconsfield Street Newport
Prurchase Order: 50588909
Sampled By:
Phone No.
Con Note
Esky Condition:
Sample Temp:

Report Email: AU.Environmental.Sydney@sgs.com ph:
Send Invoice to: (if different from customer addrss:

Sample Site			Date	Time	No. Bottles	Total Coliforms M8.5.3	E.coli	HPC M2.1W	Faecal Coliforms	Salmonella M16.1W	Staphylococcus M18.6	Listeria M13.2	Sulphate Reducing Bacte	Faecal Streptococci	Escherichia			Comments
SE267354.001		BH1M	26/06/2024		1		X		X					X				

SGS Alexandria Environmental
SE267354 SUBCON
Received: 26-Jun-2024

Special Instructions:

Results required: 3/07/2024

Relinquished By:	Date	Signature	Received By:	Date	Signature
Emily Yin	27/06/2024				
Relinquished By:	Date	Signature	Received By:	Date	Signature

EI Australia
Suite 6.01, 55 Miller St
Pyrmont NSW 2009

Bottle Codes: B:Blue = unpreserved G:Green = Nitric Acidified Red:R = Sulfuric Acid P:Purple = Hydrochloric Acid, White:W = Sodium Hydroxide

MICRO SYD
Date/Time: 27/06 1pm
ML
Temperature: 16.6
Reviewed:

SGS_SYDNEY
S1563153

Symbio LABORATORIES

CERTIFICATE OF ANALYSIS

Certificate Number	S1563153 [R00]	**Page**	1/2
Client	SGS Environmental Services - Sydney	**Registering Laboratory**	Sydney
Contact	Tim Meeyan	**Contact**	Customer Service Team
Address	16/33 Maddox St Alexandria NSW 2015	**Address**	2 Sirius Rd, Lane Cove West, NSW 2066
		Email	admin@symbiolabs.com.au
Telephone	02 8594 0400	**Telephone**	1300 703 166
Order Number	50588909	**Date Samples Received**	27/06/2024 13:00
Project ID	Water SE267354	**Date Analysis Commenced**	27/06/2024
Sampler	Customer	**Issue Date**	28/06/2024
Client Job Reference	SE267354	**Receipt Temperature (°C)**	16
No. of Samples Registered	1 | Sampler: Customer	**Storage Temperature (°C)**	4
Priority	Normal	**Quote Number**	---

Symbio LABORATORIES
quality solutions assured
ABN: 82 079 645 015

NATA
Accreditation No: 2455
Accredited for compliance
with ISO/IEC 17025 - Testing

This report supersedes any previous revision with this reference. This document must not be reproduced, except in full. If samples were provided by the customer, results apply only to the samples 'as received' and responsibility for representative sampling rests with the customer. Water results are reported on an 'as is' basis. Soil and sediment results are reported on a 'dry weight' basis. For other matrices the basis of reporting will be confirmed in the 'Report Comments' section. Measurement Uncertainty is available upon request. If the laboratory was authorised to conduct testing on samples received outside of the specified conditions, all test results may be impacted. Details of samples received outside of the specified conditions are mentioned in the sample description section of this test report.

Definitions

| <: Less Than | >: Greater Than | RP: Result Pending | MPN: Most Probable Number | CFU: Colony Forming Units | ---: Not Received/Not Requested | NA: Not Applicable | ND: Not Detected | LOR: Limit of Reporting | [NT]: Not Tested |

| ~: Estimated | ^ Subcontracted Analysis | TBA: To Be Advised | + Client Specified Limit | ** Potential Holding Time Concern | * Test not covered by NATA scope of accreditation | # Result derived from a calculation and includes results equal to or greater than the LOR |

Authorised By

Name	Position	Accreditation Category
Melissa Gan	Microbiology Laboratory Manager, Sydney	Environmental and Food Microbiology

Sample Information *- Client/Sampler Supplied*

Sample ID	S1563153/1
Sample Description	**SE267354.001 BH1M**
Sample Date/Time	**2024-06-26 00:00**

Client	SGS Environmental Services - Sydney	**Project ID**	Water SE267354
Certificate Number	S1563153 [R00]	**Sampler**	Customer
Page	2/2	**Order Number**	50588909

Analytical Results

Client Sample Description				SE267354.001 BH1M
Client Sampling date/time				26/06/2024 00:00
Compound/Analyte	**LOR**	**Limit Range+**	**Units**	**S1563153/1** **Results**
M23.4 - Enterococci in Water by MF (AS 4276.9)				
AS 4276.9				
Intestinal Enterococci*	1	---	CFU/10mL	<1
M8.5 - Enumeration of Coliforms/TT Coliforms/E.coli in Water by MF (AS 4276.5)				
AS 4276.5				
Thermotolerant Coliforms	1	---	CFU/10mL	40
Escherichia coli	1	---	CFU/10mL	2

Analysis Location

All in-house analysis was completed by Symbio Laboratories - Sydney.

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Fiona Zhang
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	Fiona.zhang@eiaustralia.com.au
Project	**E26038 54-58 Beaconsfield St Newport-pH**
Order Number	**E26038**
Samples	6

LABORATORY DETAILS

Manager	Shane McDermott
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	**SE267354A R0**
Date Received	26/6/2024
Date Reported	27/6/2024

COMMENTS

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

SIGNATORIES

yingying zhang

Ying Ying ZHANG

Laboratory Technician

pH in water [AN101] Tested: 26/6/2024

PARAMETER	UOM	LOR	BH1M WATER - 26/6/2024 SE267354A.001	BH3M WATER - 26/6/2024 SE267354A.002
pH**	No unit	-	5.8	4.5

METHOD	METHODOLOGY SUMMARY
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+.

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.

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law .

This report must not be reproduced, except in full.

STATEMENT OF QA/QC PERFORMANCE

SE267354A R0

CLIENT DETAILS

Contact	Fiona Zhang
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	Fiona.zhang@eiaustralia.com.au
Project	**E26038 54-58 Beaconsfield St Newport-pH**
Order Number	**E26038**
Samples	6

LABORATORY DETAILS

Manager	Shane McDermott
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	**SE267354A R0**
Date Received	26 Jun 2024
Date Reported	27 Jun 2024

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

Type of documentation received	COC	Date documentation received	26/6/2024
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	11.9°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

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

pH in water

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

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1M	SE267354A.001	LB316128	26 Jun 2024	26 Jun 2024	27 Jun 2024	26 Jun 2024	27 Jun 2024	26 Jun 2024
BH3M	SE267354A.002	LB316128	26 Jun 2024	26 Jun 2024	27 Jun 2024	26 Jun 2024	27 Jun 2024	26 Jun 2024

SURROGATES

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.

METHOD BLANKS

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.

No method blanks were required for this job.

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

pH in water

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

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE267354A.002	LB316128.014	pH**	pH Units	-	4.5	4.4	17	1

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.

pH in water

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

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB316128.003	pH**	No unit	-	7.4	7.415	98 - 102	99

MATRIX SPIKES

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.

No matrix spikes were required for this job.

MATRIX SPIKE DUPLICATES

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.

FOOTNOTES

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.

Sheet 1 of 1

Site:
54-58 Beaconsfield Street, Newport NSW

Project No:
E26038

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	Cations: Calcium (Ca), magnesium (Mg), sodium (Na), potassium (K)	Anions: Sulfate (SO4), chloride (Cl), carbonates (CO3), bromide (Br), fluoride (F)	Sb, Ba, Be, B, Co, Fe, Li, Mn, Mo, Se, silica (dissolved SiO2), Ag, Sr, U, V	Ammonia (NH3), nitrate (NO3), total nitrogen (N), oxidised nitrogen (N), total phosphorus (P), reactive phosphorus (P)	Faecal coliforms, faecal streptococci, Escherichia coli	DO (in % and mg/L)	ENM Suite - Stockpile composite (HM ^A /pH / EC / Foreign Materials)	Dewatering Suite	pH / pH peroxide	sPOCAS	Chromium Reducible Sulfur (CrS)	~~PFAS~~ TSS / TOC / SAR	pH / CEC (cation exchange)	pH / EC (electrical conductivity)	Sulphate / Chloride	~~[illegible]~~ VOCs	TCLP HM ^B / PAH
BH1M	1	S, 2P, 2VC	26/6/24	am		X	X						X	X	X	X	X	X		X				X				X	
BH3M	2	↓	↓	↓		↓	X													X								X	
GW-QD1	3	S, P, 2VC	↓	↓		↓	X				X																		
GW-QT1		↓	↓	↓		↓	X																						
GW-QR1	4	↓	↓	↓		↓					X																		
GW-QRB1		↓	↓	↓		↓																							
GW-TS1	5	lab provide	↓	↓		↓						X																	
GW-TB1	6	↓	↓	↓		↓						X																	

Comments

HM ^A
Arsenic
Cadmium
Chromium
Copper
Lead
Mercury
Nickel
Zinc

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
☐ 72 Hours
☒ Other pH in 24h

SGS EHS Alexandria Laboratory
SE267354A COC
Received: 26 – Jun – 2024

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

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

Sampler's Name (EI):	Received by (SGS):
Print Fiona	Print Zhi Ben
Signature	Signature
Date 26/6/24	Date 26.6.24 2.50.

Report with EI Waste Classification Table ☐

Sampler's Comments:
Please CC Alejandra

QT samples to Envirolab

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

eiaustralia

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

COC June 2021 FORM v.5 - SGS

SAMPLE RECEIPT ADVICE

SE267354A

CLIENT DETAILS

Contact	Fiona Zhang
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	Fiona.zhang@eiaustralia.com.au
Project	**E26083 54-58 Beaconsfield St Newport-pH**
Order Number	**E26083**
Samples	6

LABORATORY DETAILS

Manager	Shane McDermott
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 26/6/2024
Report Due	Thu 27/6/2024
SGS Reference	**SE267354A**

SUBMISSION DETAILS

This is to confirm that 6 samples were received on Wednesday 26/6/2024. Results are expected to be ready by COB Thursday 27/6/2024. Please quote SGS reference SE267354A when making enquiries. Refer below for details relating to sample integrity upon receipt.

Type of documentation received	COC	Date documentation received	26/6/2024
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	11.9°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

SE267354A

CLIENT DETAILS

Client EI AUSTRALIA

Project E26083 54-58 Beaconsfield St Newport-pH

SUMMARY OF ANALYSIS

No.	Sample ID	pH in water
001	BH1M	1
002	BH3M	1

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 .

Appendix G – Methodology

METHODOLOGY

G.1 Sampling, Analytical and Quality Plan (SAQP)

The SAQP for this water quality assessment played a crucial role in ensuring that the data collected were representative and provided a robust basis for decisions. The SAQP included:

- Data quality objectives (DQOs), including a summary of the objectives of the assessment;
- Investigation methodology, including media sampled, a description of the sampling points and the analytes to be monitored;
- Sampling methods;
- Field screening methods;
- Analysis methods;
- Sample handling, preservation and storage; and
- Analytical quality assurance and quality control (QA/QC).

The DQOs were determined in accordance with US EPA (2006) *Data Quality Assessment: A Reviewer's Guide* and the DEC (2006) *Guidelines for the NSW Site Auditor Scheme*. They helped identify the appropriate scope and level of quality needed for the specific requirements of the project.

The DQO process that was applied for this assessment is documented in **Table G-1**. This process fed into the Quality Assurance program. QA comprised an assessment of the reliability of the field procedures and laboratory results against standard industry practices and the SAQP.

Table G-1 Summary of Project Data Quality Objectives

DQO Step	Details
1. State the problem	Dewatering of the site is required to allow redevelopment of the property for a proposed three-storey residential building overlying a single-level basement. The purpose of this groundwater sampling event was to establish the existing quality, to assist management of the extracted water during the basement construction process.
2. Identify the decisions	The required management measure(s) for the water extracted during dewatering will be determined by initial assessment and on-going monitoring. For this assessment, the required decision related to answering the following question: ▪ What is the existing (baseline / pre-dewatering water quality)?
3. Identify inputs to decision	Information inputs to the decision included: a) Investigation of groundwater quality, including observation, primary and quality control duplicate sampling and laboratory analyses; b) Assessment of groundwater analytical results in relation to the adopted criteria; c) Detailed design drawings for proposed basement construction.
4. Define the boundaries of the study	The assessment involved a groundwater monitoring event (GME), utilising two wells identified as BH1M and BH3M (**Figure 2, Appendix A**). The findings of this assessment will hold true for as long as the site use remains passive in nature; that is, for as long as the site is used for the proposed use and there are no activities taking place onsite or on immediately adjacent (upgrading) properties that may compromise onsite environmental conditions.
5. Develop a decision rule	The decision rule was: ▪ If the concentrations of contaminants in the groundwater exceed the adopted criteria, then assess the need for additional testing and/or treatment.
6. Specify limits on decision errors	Specific limits for this project were in accordance with National and EPA guidance for contaminated sites. Errors were limited by: ▪ The field sampling design, frequency, and methodology, sample preservation techniques and laboratory analytical procedures being in accordance with industry-accepted / NATA accredited methodologies; and ▪ Field and laboratory primary and quality control analytical results were compared against Data Quality Indicators for precision, accuracy, representativeness, completeness and comparability as outlined in NEPC (2013) *Schedule B2, Site Characterisation*.
7. Optimise the design for obtaining data	To ensure resource-effective sampling, analysis and data collection for the study that is expected to satisfy the DQOs, the following were performed: ▪ Field works and analyses were undertaken in accordance with this SAQP; ▪ Written instructions guided personnel in the required fieldwork activities; ▪ Field notes were reviewed by the project team to keep abreast of project activities. ▪ Three representative sample was collected from BH1M and BH3M, and analysed for characterisation; ▪ Field and laboratory data were tabulated for review.

G.2 Data Quality Indicators

The data quality indicators (DQIs) identified in **Table G-2** were integrated into the QA/QC program for the assessment.

Table G-2 Data Quality Indicators

QA/QC Component	Data Quality Indicators	Acceptable Range
Accuracy – A quantitative measure of the closeness of reported data to the "true" value	Field – Split duplicate Field – Rinsate blank Laboratory – Laboratory duplicate and matrix spike duplicate	< 30% RPD < laboratory LOR Prescribed by the laboratories
Precision – A quantitative measure of the variability (or reproducibility) of data	Field – Blind duplicate Laboratory – Laboratory duplicate and matrix spike duplicate	< 30% RPD Prescribed by the laboratories
Representativeness – The confidence (expressed qualitatively) that data are representative of each medium present onsite	Field – Rinsate blank Laboratory – Method blank	< laboratory LOR Prescribed by the laboratories
Completeness – A measure of the amount of useable data from a data collection activity	Completion (%)	Analytical data sets acquired during the assessment will be evaluated as complete upon confirmation that SOPs for sampling protocols were adhered to and copies of all COC documentation are presented and found to be properly completed. It can therefore be considered whether the proportion of "useable data" generated in the data collection activities is sufficient for the purposes of the land use assessment.

Notes:
LOR = limit of reporting
RPD = relative percentage difference
SOP = standard operating procedure
COC = Chain-of-Custody

G.3 Sampling

Sample collection and analysis were required for the assessment. The corresponding methodology is outlined in Table **G-3**.

Table G-3 Groundwater Sampling

Activity/Item	Details
Drilling Locations	Two groundwater monitoring wells (BH1M and BH3M) were installed during the previous geotechnical investigation (EI, 2024a). ▪ BH1M at the south-west of the site, outside of the proposed basement; and ▪ BH3M at the south-east of the site, inside of the proposed basement.
Drilling Methodology	Drilling at the location of groundwater monitoring well was advanced using a track-mounted, mechanical, solid-flight auger rig.
Well Construction	Well construction involved the following:

Activity/Item	Details
	▪ Ø50 mm, Class 18 uPVC, threaded, machine-slotted screen and casing, with slotted intervals set to screen to at least 1 m above the standing water level to allow sampling of phase-separated hydrocarbon product, if present; ▪ Base and top of each well is to sealed with a uPVC cap; ▪ Annular, graded sand filter was to be approximately 500 mm above top of screen interval; ▪ Granular bentonite to be applied above annular filter to seal the screened interval; ▪ Cement slurry to be used to backfill the bore annulus to just below ground level; and ▪ Surface completion to comprise of Ø50 mm uPVC casing to approximately 0.8 m above ground level.
Well Development	Well development was conducted for newly installed well following installation. This involved agitation within the full length of the water column using a dedicated, HDPE, disposable bailer, followed by removal of water and accumulated sediment until no further reduction in suspended sediment is observed (i.e. after removal of several well volumes).
Well Survey (Elevation)	Well elevations at ground level were surveyed during the Groundwater Monitoring (EI, 2024b) and Groundwater Seepage Analysis (EI, 2024c) in metres relative to Australian Height Datum (mAHD).
Well Gauging	Monitoring wells were gauged for standing water level (SWL, depth to groundwater) prior to well purging at the commencement of the GME.
Well Purging and Field Testing	Measurement of water quality parameters was conducted repeatedly during well purging and were recorded onto field data sheets until water quality parameters stabilise in accordance with NEPC (2013) guidelines (to within ± 10% for DO, ± 3% for EC , ± 0.2 for pH, ± 0.2° for temperature and ± 20 for redox). Field measurements for Dissolved Oxygen (DO), Electrical Conductivity (EC) and pH of the purged water are to be recorded during well purging. Purged water volumes removed from each well and field test results are to be summarised**.**
Sampling Frequency	One groundwater monitoring event (GME) was conducted.
Groundwater Sampling	Groundwater samples (BH1M and BH3M) were sampled by a low-flow / minimal draw-down method, using a peristaltic pump with dedicated tubing. Water was measured for field parameters (Temperature, EC, Redox, DO and pH). Once stabilised groundwater field parameters were achieved, groundwater sampling was undertaken.
Decontamination Procedure	Dedicated gloves were used for the collection of each sample. Sampling equipment (interface probe and water quality kit probes) were decontaminated between uses by washing in a solution of potable water and PFAS-free detergent (Decon 90®), then rinsed with potable water. Decontamination was not required for the sampling pump, as dedicated disposal tubing were used for sampling at each individual well. Dedicated gloves were used for the collection of each sample. New tubing was used at each individual well. All sample containers were supplied by the laboratory for the particular project and only opened once immediately prior to sampling. Ice packs were used to keep the samples cool when kept in an insulated chest.
Sample Containers, Preservation and Handling Time	Laboratory supplied containers. ▪ Metals: 60 mL plastic, nitric acid, chill to 12 °C; Metals: 180 days; Mercury: 28 days; Hexavalent Chromium: 14 days ▪ TRH/VOC: 2 x 40 mL amber glass vials, sulfuric acid or sodium bisulfate for airfreight, chill to 12 °C; TRH: 7 days VOC: 7-14 days

Activity/Item	Details
	▪ SVOC: 100 mL amber glass, no preservative, 2 Additional bottles for lab QA/QC, chill to 12 °C; SVOC: 7 days Samples for metals analysis were field-filtered using 0.45 µm pore-size filter. All containers were filled with zero headspace, then capped and stored in ice-filled chests, until completion of the fieldwork and during sample transit to the laboratory. Sample containers were labelled with individual and unique identification including Project No., Sample No., and date of sampling.
Sample Transport	After sampling, refrigerated sample chests were transported to the primary laboratory using COC procedures. SRA documentation is to be provided by each laboratory to document sample condition upon receipt.
Laboratory Analyses	Groundwater samples were submitted for the following analysis: ▪ Metals (aluminium (Al), antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), boron (B), cadmium (Cd), total chromium (Cr), cobalt (Co), copper (Cu), iron (Fe), lead (Pb), lithium (Li), manganese (Mn), mercury (Hg), molybdenum (Mo), nickel (Ni), selenium (Se), silica (dissolved SiO2), silver (Ag), strontium (Sr), uranium (U), vanadium (V), zinc (Zn)) ▪ TRH/BTEX ▪ PAHs ▪ Total VOCs ▪ Total Phenols ▪ Total Cyanide ▪ Major Anions (sulfate (SO4), chloride (Cl), carbonates (CO3), bromide (Br), fluoride (F)); ▪ Major Cations (calcium (Ca), magnesium (Mg), sodium (Na), potassium (K)); ▪ Nutrients (ammonia (NH3), nitrate (NO3), total nitrogen (N), oxidised nitrogen (N), total phosphorus (P), reactive phosphorus (P)); ▪ Microbiological organisms (Faecal coliforms, faecal streptococci, Escherichia Coli); ▪ Electrical Conductivity ▪ pH ▪ Total Dissolved Solids ▪ Hardness ▪ Dissolved oxygen
Field QA/QC	Field QA/QC involved: ▪ Sampling in accordance with EI's *Standard Operating Procedures Manual;* ▪ A site safety plan was developed prior to works commencement; ▪ The analysis of blind / split field duplicates; ▪ The analysis of one VOC trip blank sample and one equipment wash blank sample; ▪ Samples were stored under secure, temperature controlled conditions; ▪ Chain of custody documentation was completed, to confirm the handling, transport and delivery of samples to the contracted environmental laboratories.
Laboratory QA/QC	The contract laboratory conducted in-house QA/QC procedures involving the analysis of: ▪ Reagent blanks; ▪ Spike recoveries; ▪ Laboratory duplicates; and ▪ Calibration / control standards and blanks.

G.4 QA/QC Program

A summary of the QA/QC measures incorporated into the assessment is given in **Table G-4.**

Table G-4 Assessment QA/QC Measures

Task	Description	Project
Field QA/QC		
General	Work was to be undertaken following standard field procedures which are based on industry accepted standard practice.	Groundwater samples were used sample bottles/vials provided by the laboratory.
	All fieldwork was completed by a suitably qualified and experienced person	Yes
Equipment Decontamination	Sampling equipment to be decontaminated after the collection of each soil sample by washing with phosphate-free detergent and potable water, followed by a final distilled water rinse. One rinsate blank would be collected and analysed for the primary contaminants. All results should be non-detect.	Yes One rinsate blank sample (GW-QR1) was collected 0n 26 June 2024. All results were reported as below the detection limits.
Transport	Samples stored in a chilled cooler and transported to the laboratories by courier under 'chain of custody' procedures, describing sample preservation and transport duration.	Yes. See sample receipt documentation, **Appendix F**.
Trip Blanks	Trip blank samples were to be prepared and analysed by the primary laboratory for BTEX. Analytical results to be below the laboratory LOR, indicating satisfactory sample transport and handling conditions were achieved.	One trip blank sample prepared by the primary laboratory was analysed for BTEX during groundwater investigation. All results were reported below the laboratory LOR, indicating that no cross-contamination of volatiles occurred during sample transport and subsequent handling.
Trip Spikes	Trip spike samples were to be prepared and analysed by the primary laboratory for BTEX. Analytical results to be within 80-120% recovery, indicating satisfactory sample transport and handling conditions were achieved.	One trip spike samples prepared by the primary laboratory was analysed for BTEX during groundwater investigation. All results met the required DQIs.
Duplicates	Field duplicate samples were to be analysed as follows (as per NEPM): ▪ intra-laboratory duplicates at a rate of 1 in 20 primary samples; and ▪ inter-laboratory duplicates at a rate of 1 in 20 primary samples. Field and laboratory acceptable limits between 30-50% RPD as stated by AS4482.1–2005. RPDs that exceed this range may be considered acceptable where: ▪ Results are less than 10 times the limits of reporting (LOR); ▪ Results are less than 20 times the LOR and the RPD is less than 50%; or ▪ Heterogeneous materials or volatile compounds are encountered. Non-compliance is to be documented in the report and the sample re-analysed or	Laboratory duplicates were prepared and analysed for the groundwater investigation. The RPD values calculated for the field duplicates were compliant with the DQIs. The data was fit for use. Non-conformance included: - chromium for sample BH1M and GW-QD1, BH1M and GW-QT1. Field QC samples and calculated RPD values are presented in **Table B-3**. Copies of laboratory reports are included in **Appendix F**.

Task	Description	Project
	a higher level conservatively adopted.	
Laboratory QA/QC		
Laboratory Analysis	The laboratories selected are NATA accredited for the analytes selected and perform their own internal QA/QC programs.	Yes SGS - primary laboratory Laboratory QA/QC analyses are included in **Appendix G.**
	Appropriate detection limits were used for the analyses to be undertaken.	Limits of reporting for all tested parameters are presented in laboratory analytical reports in **Appendix G.**
Holding Times	Holding times are the maximum permissible elapsed time in days from the collection of the sample to its extraction and/or analysis, in line with standard guidelines.	Assessment of holding times has been undertaken by the laboratory. Minor non-conformance (one groundwater sample for nitrite with 2 days outside the holding time), with negligible effects on data use for interpretative purposes.
Method Blanks	Method blanks identify contamination in the reagent materials and assess potential bias in the sample analysis due to contaminated reagents. The QC criterion aims to find no detectable contamination in the reagents.	Yes
Laboratory Duplicates	Laboratory duplicates are field samples that are split in the laboratory and subsequently analysed a number of times in the same batch. These sub-samples are selected by the laboratory to assess the accuracy and precision of the analytical method. The selected laboratories should undertake QA/QC procedures at a frequency of 1 in 10 samples.	Assessment of laboratory duplicates has been undertaken by the laboratory. Duplicate RPD were within acceptable range for all tested analytes.
Laboratory Control Standard	A laboratory control standard is a standard reference material used in preparing primary standards. The concentration should be equivalent to a mid-range standard to confirm the primary calibration, and should be analysed at a rate of 1 per 20 samples (min 1 per batch)	Assessment of laboratory control standard has been undertaken by the laboratory. All laboratory control standards were within acceptable ranges.
Matrix Spikes	Matric spikes are field samples to which a predetermined stock solution of known concentration has been added. The samples are then analysed for recovery of the known addition. Recoveries should be within the stated laboratory control limits of 70 to 130% and duplicates should have RPDs of less than 50%.	Assessment of matrix spikes has been undertaken by the laboratory.
Surrogate Spikes	Surrogate spikes provide a means of checking, for every analysis that no gross errors have occurred at any stage of the procedure leading to significant analyte loss. Recoveries should be within the stated laboratory control limits of 70 to 130%.	Assessment of surrogate spikes has been undertaken by the laboratory.
Conclusion	The QA/QC indicators should either all	Assessment of the investigation QA/QC

Task	Description	Project
	comply with the required standards or showed no variations that would have no significant effect on the quality of the data.	is presented in the following sections.

Field QA/QC

The field (intra- / inter- laboratory) duplicate samples collected during the assessment are summarised in **Table G-5**.

Table G-5 Field QC Samples

Matrix	Primary QA Sample	Duplicate (Primary Lab)	Triplicate (Secondary Lab)	Total Duplicates
Groundwater	BH1M	GW_QD1	GW-QT1	2

Review of the field data quality indicators is presented in **Table G-6** below.

Table G-6 Field Data Quality Indicators

QA Component	Data Quality Indicator(s)	Conformance
Accuracy – a quantitative measure of the closeness of reported data to the “true” value	SOPs appropriate and complied with	Yes
	Results for inter-laboratory (split field) duplicates acceptable	Yes
Precision – A quantitative measure of the variability (or reproducibility) of data	SOPs appropriate and complied with	Yes
	Results for intra-laboratory (blind field) duplicates acceptable	Not applicable
Completeness – A measure of the amount of useable data from a data collection activity	Each critical location sampled	Yes
	Samples collected at targeted locations and depth	Yes
	SAQP appropriate and complied with	Yes
	Experienced sampler	Yes
	Field documentation correct	Yes
Comparability – The confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event	Same sampling method used on each occasion/location	Yes
	Experienced sampler	Yes
	Same type of samples collected (filtered, size, fractions)	Yes
Representativeness – The confidence (expressed qualitatively) that data are representative of each medium present onsite	Appropriate media sampled according to SAQP	Yes
	Each media identified in SAQP sampled	Yes
	Appropriate sample collection methodologies, handling, storage and preservation techniques used	Yes

Conclusion for the Field QA/QC

All field work, including equipment decontamination and sample preservation and transport, was conducted in accordance with the SAQP, which were devised with reference to industry-approved guidelines. Appropriate QC measures were integrated into each sampling event and the DQIs were met.

All samples, including field QC samples, were transported to the primary and secondary laboratories under refrigerated conditions, using strict COC procedures. Relevant documents (COC forms) were presented with the samples at the times of delivery. All supporting documents (COCs and SRAs) were completed in full and signed, where appropriate. EI considered the field QA/QC program carried out during the assessment to be appropriate.

Laboratory QA/QC

Laboratory Accreditation

Primary and intra-laboratory duplicate samples were analysed by SGS (located in Alexandria NSW). All laboratories are accredited by NATA for the analyses undertaken.

Laboratory QC Summary

Review of the laboratory data quality indicators is presented in **Table G-7** below.

Table G-7 Laboratory Data Quality Indicators

QA Component	Item	Conformance
Completeness A measure of the amount of useable data (expressed as %) from a data collection activity	All critical samples analysed according to SAQP and proposal	Yes
	All analytes analysed according to SAQP in proposal	Yes
	Appropriate methods and PQLs	Yes
	Sample documentation complete	Yes
	Sample holding times complied with	Yes
Comparability The confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event	Sample analytical methods used (including clean-up)	Yes
	Sample PQLs (justify/ quantify if different)	Yes
	Same laboratories (justify/ quantify if different)	Yes
	Same units (justify/ quantify if different)	Yes
Representativeness Confidence that data are representative of each media	All key samples analysed according to SAQP in the proposal	Yes
Precision A quantitative measure of the variability (or reproducibility) of data	Analysis of laboratory duplicates	Yes
	Analysis of field duplicates	Yes
	Analysis of laboratory-prepared volatile trip spikes	Yes

QA Component	Item	Conformance
Accuracy A quantitative measure of the closeness of reported data to the true value	Analysis of field blanks	Yes
	Analysis of rinsate/ rinsate blanks	Yes
	Analysis of method blanks	Yes
	Analysis of matrix spikes (MS)	Yes
	Analysis of surrogate spikes	Yes
	Analysis of laboratory control samples	Yes

Conclusion for the Laboratory QA/QC

All contracted laboratories (SGS and Envirolab) were accredited by NATA for the analyses undertaken. All analytical procedures used were industry recognised and endorsed standard methods. Appropriate QC measures were integrated into each testing batch and the DQIs were met, or if not, the variability was suitably justified.

All final reports were submitted in full and included all requested analyses, as per the signed COC forms. EI considered the laboratory QA/QC programs carried out during the assessment to be appropriate.

Conclusion for the Assessment QA/QC

The sampling procedures and laboratory methods used for the assessment were consistent with EI protocols. The project DQOs and DQIs specified in **Sections G1 to G3** were achieved, and ensured that the data collated were accurate, precise and representative of the site condition. It was therefore considered results were appropriate for interpretative use.