Douglas PARTNERS

GROUNDED EXPERTISE

Dewatering Management Plan

Proposed Mixed Use Development

79-81 Queens Rd & 2-8 Spencer St, Five Dock NSW

Prepared for DPG Project 37 Pty Ltd

Project 224583.01

16 February 2026

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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

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Douglas Partners acknowledges Australia's First Peoples as the Traditional Owners of the Land and Sea on which we operate. We pay our respects to Elders past and present and to all Aboriginal and Torres Strait Islander peoples across the many communities in which we live, visit and work. We recognise and respect their ongoing cultural and spiritual connection to Country.

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Dewatering Management Plan
Proposed Mixed Use Development

79-81 Queens Rd & 2-8 Spencer St, Five Dock NSW

1. Introduction

This report prepared by Douglas Partners Pty Ltd (Douglas) presents a Dewatering Management Plan (DMP) and hydrogeological assessment undertaken for a Proposed Mixed-Use Development at 79-81 Queens Rd & 2-8 Spencer St, Five Dock NSW (the site). The DMP was commissioned by email instructing to proceed dated 16 April 2024 from Alexander Lekovski of DPG Project 37 Pty Ltd and was undertaken in accordance with Douglas' proposal 224583.01.P.001.Rev1 dated 5 April 2024.

It is understood that the proposed development of the site includes the demolition of the existing site structures and construction of new 5 storey and 26 storey buildings with five levels of basement.

The aim of this DMP is to provide advice for dewatering activities during construction of the proposed development.

This DMP is based upon the recent geotechnical investigation undertaken by Douglas at the site, complemented by additional measurements of groundwater levels, in-situ permeability tests and numerical modelling to estimate groundwater inflow rates and drawdown of groundwater levels associated with dewatering activities during construction.

This report must be read in conjunction with all appendices including the notes provided in Appendix A.

2. Previous investigations

Information used to develop the conceptual groundwater model was obtained from the previous investigation undertaken by Douglas:

- Douglas Partners Pty Ltd: "Report on Geotechnical Investigation: Proposed Mixed-Use Development", report ref.: 224583.01.R.001.Rev0, dated 26 June 2024.

The locations of groundwater monitoring wells installed as part of the aforementioned works are shown on Drawing 1 in Appendix B.

3. Site description

The site located at 79-81 Queens Road & 2-8 Spencer Street, Five Dock, and includes Lot 1 DP540151, Lot 18 DP 651570, and Lots 17, 20-22 DP117. The site is rectangular in shape and covers an area of approximately 3,158.4 m^2. The site is located within the Local Government Area of City of Canada Bay Council.

Based on the supplied detailed survey plans prepared by C&A Surveyors NSW Pty Ltd (Ref.: 30163-23 DET, Rev1, dated 24 August 2023), ground surface levels across the site range between RL 1.9 m AHD and RL 2.3 m AHD.

The site is currently occupied by light industrial facilities including vehicle workshops, warehouses, and a micro-brewery across most of the site, with on-grade pavements elsewhere.

4. Geotechnical and hydrogeological model

4.1 Subsurface profile

Reference to the Sydney 1:100 000 Seamless Geology Sheet indicates that the site is underlain by Anthropogenic deposits described as deposits varying from large man-made clasts (concrete blocks to building demolition rubble) to quarried natural boulders, with interstitial sand-sized to clay matrix; overlying Ashfield Shale of the Wianamatta Group described as black to dark-grey shale and laminite. The results of the investigation differed from the regional mapping, instead indicating that the site is underlain by the Mittagong Formation, followed by Hawkesbury Sandstone.

The previous investigation identified shallow depths of fill overlying alluvial soils, followed by residual clay soil, then sandstone bedrock to depth of the boreholes.

The general strata encountered in the boreholes is summarised as follows:

PAVEMENT	-	Concrete slab at some locations between 150 mm and 160 mm thick.
FILL	-	Typically sandy clay with various proportions of gravel with variable thickness in a range of 0.8 m to 1.1 m. Some ash was logged in BH110 and BH112.
ALLUVIAL SOIL	-	Comprising medium plasticity, soft, silty clay and organic peaty clay varying in thickness between 0.2 m and 0.5 m, overlying fine to medium grained loose silty sand or clayey sand to depths ranging from 1.2 m to 2.2 m. The peaty clay was absent from boreholes BH105, BH109, BH110, and BH112.
RESIDUAL SOIL	-	Medium to high plasticity clay to depths ranging from 5.6 m to 7.1 m. The consistency of the soil was assessed to range from firm to hard but was typically stiff to very stiff.
SHALE and LAMINITE BEDROCK	-	Generally low to medium strength, moderately weathered to fresh, dark grey and grey shale and laminite (Mittagong Formation) encountered in boreholes BH105, BH106, and BH107 to depths between 7.4 m and 7.7 m. The shale and laminite was absent within other boreholes.
SANDSTONE BEDROCK	-	Generally medium to high strength, slightly weathered to fresh, pale grey to grey, medium to coarse grained sandstone (Hawkesbury Sandstone) to the termination depth of boreholes. Some very high strength bands were noted within BH101 and BH102 between 13.0 m and 18.0 m depth.

4.2 Groundwater

Five groundwater monitoring wells were installed during the previous geotechnical investigation. Groundwater seepage was observed at depths of between 1.2 m and 1.5 m below the existing ground surface, or RL 0.2 m AHD and RL 0.4 m AHD, during augering of the boreholes.

After installation, the groundwater monitoring wells were purged of drilling fluid using a submersible pump and digital data loggers were installed to monitor recharge of the groundwater. A summary of the well construction details, and groundwater measurements taken following installation of the groundwater wells are presented in Table 1 and Table 2.

Table 1: Well Construction Details

Borehole	Ground Surface Level (m AHD)	Filter Zone Depth (m)	Filter Zone Material
BH103/MW1	1.9	11.5 – 30.0	Sandstone
BH103S/MW2	1.9	1.0 – 6.0	Clayey Sand, and Clay
BH105/MW3	2.0	11.5 – 19.0	Sandstone
BH107/MW4	2.1	11.5 – 19.0	Sandstone
BH107S/MW5	2.1	0.5 – 1.5	Fill, Silty Sand, Silty Clay

Table 2: Summary of Manual Groundwater Measurements

Borehole	Water Level (depth m) [RL m AHD]	Date of Reading	Comments
BH103/MW1	(10.14) [-8.24]	31 May 2024	31 days after well installation prior to purging
	(10.21) [-8.31]	7 June 2024	6 days after purging
	(10.41) [-8.51]	5 July 2024	34 days after purging
	(10.63) [-8.73]	6 August	61 days after purging
BH103S/MW2	3.25 [-1.35]	31 May 2024	31 days after well installation prior to purging
	(1.07) [0.83]	7 June 2024	6 days after purging
	(0.74) [1.16]	5 July 2024	34 days after purging

Borehole	Water Level (depth m) [RL m AHD]	Date of Reading	Comments
BH105/MW3	9.65 [-7.65]	31 May 2024	16 days after well installation prior to purging
	10.16 [-8.16]	7 June 2024	6 days after purging
	(10.36) [-8.36]	5 July 2024	34 days after purging
	(10.84) [-8.84]	6 August	61 days after purging
	(11.02) [-9.02]	20 September	106 days after purging
BH107/MW4	10.12 [-8.02]	31 May 2024	8 days after well installation prior to purging
	10.10 [-8.00]	7 June 2024	6 days after purging
	(10.00) [-7.90]	5 July 2024	34 days after purging
	(11.68) [-9.58]	6 August	61 days after purging
	(11.90) [-9.80]	20 September	106 days after purging
BH107S/MW5	DRY to 1.5	31 May 2024	8 days after well installation
	DRY to 1.5	7 June 2024	15 days after well installation
	DRY to 1.5	5 July 2024	43 days after well installation

The continuous readings of ground water level captured by the data loggers between 31/05/2024 and 20/09/2024 are presented within Appendix C of this report and include daily rainfall. These readings are summarised in Table 3 below.

Table 3: Summary of Continuous Groundwater Readings (Data-loggers)

Borehole	Groundwater Readings (depth, m) [RL m AHD]			
	Minimum	Maximum	Median	Average
BH103/MW1	9.47 [-8.41]	10.31 [-7.57]	9.76 [-7.70]	9.77 [-7.87]

Borehole	Groundwater Readings (depth, m) [RL m AHD]			
	Minimum	Maximum	Median	Average
BH105/MW3	9.88 [-9.16]	11.16 [-7.88]	10.88 [-8.88]	10.60 [-8.60]
BH107/MW4	9.38 [-9.48]	11.58 [-7.28]	9.81 [-7.71]	9.82 [-7.72]

Note: Data-logger was not installed within groundwater monitoring bores BH103S/MW2 and BH107S/MW5.
Data excluded if interpreted to be influenced by the removal of water as part of the hydraulic conductivity testing.

4.3 Permeability testing

Rising head and falling head permeability tests were carried out in the monitoring wells. This was carried out by dropping a "slug" into the well to raise the water level then measuring the fall in water level at regular time intervals using a data logger. The "slug" was then removed from the well and the rise in water level measured.

Permeability tests were analysed with Horslev (1951) solution for slug test interpretation. The results of the permeability testing are presented in Table 4. The detailed results are attached in Appendix C.

Table 4: Interpreted Permeability Test Results

Borehole	Material over Screened Zone	Reduced Level of Screened Section (m AHD)	Permeability Rate (m/s)
BH103/MW1	Sandstone	-9.6 to -28.1	4.5×10^{-7}
BH103S/MW2	Alluvial/Residual Clay	0.9 to -4.1	1.3×10^{-6}
BH105/MW3	Sandstone	-9.5 to -17.0	4.9×10^{-7}
BH107/MW4	Sandstone	-9.4 to -16.9	4.3×10^{-7}

4.4 Potential receptors

4.4.1 Surface waters

The surface waters in the vicinity of the site include two unnamed canal-drains located around 95 m north and 780 m west of the site which drain into Kings Bay located around 490 m north of the site. No other surface waters are mapped within 1 km of the site to the east or south.

4.4.2 Groundwater dependant ecosystems

Reference to the Australian Bureau of Meteorology GDE Atlas indicates that there are no mapped groundwater dependant ecosystems (GDEs) in proximity to the site. The nearest being a Sydney Turpentine Ironbark Forest 3.5 km to the northwest.

4.4.3 Groundwater extraction bores

No groundwater extraction bores are located within 1 km of the site.

Four groundwater monitoring wells are located within 1 km of the site. Details of these bores from the available WaterNSW records do not record standing water levels and as such have been disregarded.

5. Proposed development

It is understood that the proposed development of the site includes the demolition of the existing structures and the construction of two shop top housing buildings, including a 5-storey building along Queens Road, and a 26-storey building along William Street, comprising a shared single storey non-residential podium, with 134 dwellings above. In addition, the proposed development will include the construction of a shared basement carpark accessed from Spencer Street with five levels of basement, anticipated to require excavations of up to 16.3 m depth, or to RL – 13.3 m AHD. It is understood the development will also public domain and landscaping upgrades, including landscaped street setbacks to all boundaries, provision of part of a shared through site link connecting Queens Road to Spencer Street, and associated infrastructure upgrades and diversions.

6. Groundwater modelling

6.1 Methodology

Numerical modelling was undertaken to assess the potential inflow rates into the proposed excavation in the short-term during construction and in the long-term (if the basement is constructed as fully drained). The extent of drawdown likely to be induced by potential dewatering activities required for construction was also assessed.

A 2-dimensional (2D) numerical groundwater model was developed for the site. The modelling was carried out using the 2D finite element hydrogeological software SEEP/W, developed by GEOSLOPE International Ltd. Transient flow conditions were modelled over a 1 year period to assess inflow rates during construction.

6.2 Model geometry

For the purpose of the analysis, Douglas selected a cross-section in the east-west direction, through the centre of the basement footprint. Details of the general basement shape and orientation were adapted from the Architectural Design Drawings (Drawing No.: 20830-DA-0101, RevB, dated 19 January 2026).

The subsurface materials were subdivided into three layers corresponding to the fill and alluvial soil, residual soil and rock units. The aquifer boundaries of the model were extended 60 m and 83 m from the western and eastern edges of the proposed excavation, respectively. The ground surface level was modelled based on the provided survey plan by C&A Surveyors (ref: 30163-23 DET, dated 24 August 2023).

The model geometry is show in Drawing M1, Appendix B.

6.3 Boundary condition and hydraulic parameters

The constant head boundary conditions were based on the highest hydraulic heads measured in monitoring wells screened in soil and rock.

A shallow groundwater table exists within the upper alluvial soils, and it is likely that the residual clayey soil acts as an aquitard between the alluvial soil and deeper groundwater table within the underlying bedrock. To simulate these conditions, a constant water pressure head boundary condition was applied to the base of the sandstone bedrock and alluvial soil geometries to achieve two separate groundwater systems.

Hydraulic parameters required for the multi-layer model include horizontal (K_h) and vertical (K_v) hydraulic conductivities, as well as volumetric water content curves, for each material.

The hydraulic conductivity assigned to the residual clay was estimated based on literature and DP's experience with similar materials in Sydney.

The hydraulic conductivity value of the alluvial soil was calculated based on the weighted average hydraulic conductivity of the in-situ permeability testing within BH103S, as the monitoring well was screened in both the alluvial soil and residual clay.

A hydraulic conductivity value was assigned to the sandstone bedrock and selected based on the highest result of in-situ permeability testing undertaken on the site for sandstone bedrock. This is considered moderately conservative based on Douglas's experience with other similar developments in this material.

The hydraulic conductivity of the rock unit will vary with changes in the secondary structural features (defects), such as joints, bedding planes, faults, etc. along which groundwater will flow. Changes in the clay or silt content within defect apertures, as well as the orientation and interconnection of defects, will cause changes in the rock mass permeability. Given that the structure of Hawkesbury Sandstone commonly contains intersecting horizontal bedding planes and subvertical or steeply dipping joint / fault features which control the rock mass permeability, ratios of vertical and horizontal hydraulic conductivity (k_v / k_h) between 0.33 and 0.66 in the rock have been considered in the model.

The properties adopted in the model are summarised in Table 5.

Table 5: Summary of Material Parameters

Material	Saturated Hydraulic Conductivity, K (m/sec)	Material Model Adopted	Assumed Saturated Water Content	Assumed Residual Water Content
Alluvial Clayey and Silty Sand / Peaty Sand	2.0×10^{-5}	Unsaturated / saturated	0.15	0.045

Material	Saturated Hydraulic Conductivity, K (m/sec)	Material Model Adopted	Assumed Saturated Water Content	Assumed Residual Water Content
Residual Clay	1×10^{-8}	Unsaturated / saturated	0.15	0.045
Sandstone Bedrock	4.9×10^{-7}	Unsaturated / saturated	0.05	0.045

The hydraulic conductivity curves for unsaturated material types were estimated using the Van Genuchten formulae, included as a built-in function in SEEP/W.

6.4 Basement shoring and dewatering

For the purpose of preparing this DMP at pre-DA stage, it has been assumed that the basement shoring will comprise a relatively water-tight secant pile wall cutoff (or similar) at least 1 m into the sandstone around the basement perimeter. If the aforementioned assumption differs from the proposed structural design prepared at a later date, this model should be revised, and inflow rates recalculated.

The concrete secant pile wall was assumed to have a horizontal and vertical hydraulic conductivity of 1×10^{-8}m/s. The interior of the shoring wall and excavation floor were simulated as 'Seepage Faces' in SEEP/W with zero hydraulic pressure head. Note that the assessment of the stability of the shoring wall / excavation is out of the scope of this report. It has been assumed that any seepage / groundwater inflow into the excavation will be pumped out using pumps connected to spear-points within the excavation, sumps within the excavation, or a combination of the two.

The proposed sides of excavation and subsoil drainage / sump(s) were simulated as 'Seepage Faces' in SEEP/W with zero hydraulic pressure head.

6.5 Groundwater modelling simulations

The model was run under transient conditions to assess the dewatering flow rates during construction, and under steady-state conditions to assess the long-term dewatering flow rates required for a drained basement, and the effect on the water table in the long term.

6.6 Sensitivity analysis

Separate sensitivity analysis was undertaken based on the sandstone bedrock with a higher permeability of 1×10^{-6} m/s to account for a greater degree of fracturing in the shallower bedrock not captured by the permeability testing in the monitoring wells. It should be noted that this value is one order of magnitude greater than that of estimated hydraulic conductivity in literature and based on DP's experience with similar materials in Sydney. Additional sensitivity analysis was also undertaken simulating deeper shoring piles to a termination depth of RL -9 m AHD.

7. Results

7.1 Groundwater inflow

Groundwater inflow into the excavation along seepage face boundaries on the excavation faces, and along the basement floor, was evaluated using a mesh cross-section through the elements adjacent to the excavation. The predicted inflow rates represent the estimated total rate of groundwater flowing into the excavation, and the volume (per unit time) requiring extraction via the dewatering system (sump-and-pump) in order to dewater the basement excavation during construction and in the long-term. The simulated results from the baseline analysis are summarised in Table 6 and Table 7.

Given that the selected long section represents a slice along the primary flow direction, the unit width flows have been multiplied by the width of the overall excavation as well as the length of the sides of the excavation.

Table 6: Simulated Inflow Results from Baseline Model with k_v / k_h = 0.33

Time	Estimated Dewatering Flow Rate		
	L/sec	m³/day	ML/year
Transient (first year)	0.06 to 0.09	4.9 to 7.4	1.8
Long term (steady state)	0.06	4.9	1.8

Table 7: Simulated Inflow Results from Baseline Model with k_v / k_h = 0.66

Time	Estimated Dewatering Flow Rate		
	L/sec	m³/day	ML/year
Transient (first year)	0.10 to 0.14	9.2 to 11.8	3.4
Long term (steady state)	0.10	9.2	3.4

The estimated inflows from the sensitivity analyses are summarised in Table 8 and Table 9.

Table 8: Simulated Inflow Results from Sensitivity Model with k_v / k_h = 0.33

Time	Estimated Dewatering Flow Rate		
	L/sec	m³/day	ML/year
Transient (first year)	0.12 to 0.17	10.8 to 14.5	4.0
Long term (steady state)	0.12	10.8	3.9

Table 9: Simulated Inflow Results from Sensitivity Model with k_v / k_h = 0.66

Time	Estimated Dewatering Flow Rate

	L/sec	m³/day	ML/year
Transient (first year)	0.23 to 0.27	19.7 to 23.3	7.2
Long term (steady state)	0.23	19.7	7.2

The results of the SEEP/W analyses were checked using established simplified analytical methods for calculating flow rates into excavations.

Predicted inflow rates are very sensitive to the clay content in defect apertures and the degree of fracturing in the bedrock. The estimates provided are based on available information and typical conditions encountered during the investigation, however the actual seepage rate will only be known once excavation is complete and may vary significantly to the predicted value. Flows can also be expected to vary temporally in response to rainfall conditions, with higher flows following rainfall events and reduced flows in dryer periods. It is recommended that appropriate allowance and redundancy be included in the design and planning for changes in inflow rates.
The results of the sensitivity analysis case indicate that inflow rates will increase should the permeability of the rock be higher. The sensitivity analysis also indicates that increasing shoring pile termination depths to RL -9 m AHD has a negligible effect on inflow rates and therefore has not been reported.

7.2 Drawdown and settlement

The magnitudes of the potential changes to the groundwater levels resulting from the construction of a drained basement (drawdown) were estimated by subtracting the predicted long-term groundwater levels from the original groundwater levels. The maximum estimated drawdowns at various distances from the east and west excavation faces are summarised in Table 10.

It is noted that the changes in water levels predicted by the two dimensional SEEP/W analysis are exaggerated due to the assumption that the length of the excavation perpendicular to the plane of analysis is infinitely long. In reality, it is expected that due to the limited length of the excavation, groundwater will readily flow around the basement and the impact to the groundwater level will be less than predicted.

Table 10: Estimated Drawdown from Eastern Excavation Face

Location	Original Water Level (m AHD)	Final Water Level (m AHD)	Drawdown (m)
Immediately adjacent to basement	-8.3	-14.0	5.7
20 m away from basement	-8.3	-10.9	2.6
50 m away from basement	-8.3	-9.7	1.4

The groundwater drawdown is expected to occur within the sandstone bedrock only as no drawdown was noted in the upper alluvial soils. Settlements induced by drawdown in the bedrock are expected to be negligible.

8. Aquifer interference policy consideration

The NSW Aquifer Interference Policy (AIP) indicates that the term "aquifer" is commonly understood to mean a groundwater system that is sufficiently permeable to allow water to move within it, and which can yield productive volumes of groundwater. A groundwater system is defined as any type of saturated geological formation that can yield low or high volumes of water. However, for the purpose of the AIP, the term aquifer has the same meaning as groundwater system and includes low yielding and saline systems.

The site is underlain by shallow silty sand and clayey soils, and rock that is typically fractured to unbroken with some highly fractured zones. The soil and rock profile in the site is of relatively low permeability with potentially low yield and is considered to be a 'less productive groundwater source' as outlined in the AIP.

Table 1 in Section 3.2.1 of the AIP outlines minimal impact considerations. The AIP indicates that *"if predicted impacts are less than the Level 1 minimal impact considerations, then these impacts will be considered as acceptable"*. The following minimal impact considerations are outlined for less productive porous and fractured rock groundwater sources:

- Less than or equal to 10% cumulative variation in water table 40 m from any high priority groundwater dependent ecosystem (GDE), high priority culturally significant site, or less than a 2 m decline at any water supply work;
- A cumulative pressure head decline of not more than a 2 m at any water supply work; and
- Any change in groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity.

The surface waters in the vicinity of the site include two unnamed canal-drains located about 95 m north and 780 m west of the site which drain into Kings Bay located around 490 m north of the site. No other surface waters are mapped within 1 km of the site to the east or south.

It is noted that none of the identified surface water sources are mapped as Groundwater Dependent Ecosystems (GDEs) based on data provided by the Australian Bureau of Meteorology GDE Atlas.

Four groundwater monitoring bores are located within 1 km of the site. Details of these bores extracted from the available WaterNSW records do not record standing water levels and as such are not considered to be in use groundwater monitoring bores.

Given the distance from the subject site to the nearest surface water source and registered groundwater well, as well as the absence of GDEs in the vicinity of the site, it is considered unlikely that the impact of the proposed development will exceed the minimum impact consideration outlines by the AIP.

9. Ambient groundwater conditions

As part of the additional field work undertaken for this DMP, groundwater samples were collected on 11 June 2024 from three of the wells installed on the site during Douglas's previous investigation. The wells were developed by removing a minimum of three well volumes prior to sampling. A summary of the groundwater quality results is given below.

Samples from each well were analysed at a National Association of Testing Authorities (NATA) accredited laboratory, for a combination of the following common contaminants and parameters as an initial screening:

- Heavy metals (dissolved and total);
- Total recoverable hydrocarbons (TRH);
- Monocyclic aromatic hydrocarbons - benzene, toluene, ethylbenzene, xylene (BTEX);
- Polycyclic aromatic hydrocarbons (PAH);
- Organochlorine pesticides and organophosphate pesticides (OCP/OPP);
- Polychlorinated biphenyls (PCB);
- Volatile organic compounds (VOC); and
- Per and Poly-fluoroalkyl substances (PFAS).

For screening purposes, the laboratory results were compared against the assessment criteria provided in *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018), HEPA (2020), *NHMRC (2018) Australian Drinking Water Guidelines*, and *National Environment Protection (Assessment of Site Contamination) Measure* (NEPC 2013). The results of PFAS testing were compered to the PFAS National Environmental Management Plan (NEMP) (HEPA, 2020).

Summaries of the results are provided in Tables 11 to 17 below. Laboratory certificates and chain of custody documentation are included in Appendix D.

Table 11: Results of Laboratory Analysis for Heavy Metals

Sample ID	Arsenic µg/L	Cadmium µg/L	Chromium µg/L	Copper µg/L	Lead µg/L	Mercury µg/L	Nickel µg/L	Zinc µg/L
BH103	<1	<0.1	<1	4	<1	<0.05	4	50
BH105	1	<0.1	<1	2	1	<0.05	2	58
BH107	1	<0.1	<1	<1	<1	<0.05	10	34
Guideline Values								
ANZG (2018)	13	0.2	1	1.4	3.4	0.06	13	0.2
NHMRC (2018)	10	2	-	2,000	10	1	20	-

Note: Blue shading indicates values exceed one or more of the listed guideline

Table 12: Results of Laboratory Analysis for Monocyclic Aromatic Hydrocarbons (BTEX)

Sample ID	Benzene µg/L	Toluene µg/L	Ethyl-benzene µg/L	O-Xylene µg/L	M+P-Xylene µg/L	C6-C10 less BTEX (F1) mg/L
BH103	<1	<1	<1	<1	<2	<10

Sample ID	Benzene	Toluene	Ethyl-benzene	O-Xylene	M+P-Xylene	C6-C10 less BTEX (F1)
	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L
BH105	<1	<1	<1	<1	<2	<10
BH107	<1	<1	<1	<1	<2	<10
Guideline Values						
ANZG (2018)	950	180	80	350	75 (m-xylene)/ 200 (p-xylene)	-
NHMRC (2018)	1	800	300	-	-	-
NEPC (2013)	5,000	-	-	-	-	-

Note: Blue shading indicates values exceed one or more of the listed guideline

Table 13: Results of Laboratory Analysis for PAH/Phenols

Analyte	Results (µg/L)			ANZG (2018)	NHMRC (2018)
	Sample ID				
	BH103	BH105	BH107		
Acenaphthene	<0.1	<0.1	<0.1	-	-
Acenaphthylene	<0.1	<0.1	<0.1	-	-
Anthracene	<0.1	<0.1	<0.1	0.01	-
Benz(a)anthracene	<0.1	<0.1	<0.1	-	-
Benzo(a) pyrene	<0.1	<0.1	<0.1	0.1	0.01
Benzo(b)&(k)fluoranthene	<0.2	<0.2	<0.2	-	-
Benzo(g,h,i)perylene	<0.1	<0.1	<0.1	-	-
Chrysene	<0.1	<0.1	<0.1	-	-
Dibenzo(a,h)anthracene	<0.1	<0.1	<0.1	-	-
Fluoranthene	<0.1	<0.1	<0.1	1.0	-
Fluorene	<0.1	<0.1	<0.1	-	-
Indeno(1,2,3-c,d)pyrene	<0.1	<0.1	<0.1	-	-
Naphthalene	<0.1	<0.1	<0.1	2.5	-
PAHs (Sum of total +'ve)	<0.1	<0.1	<0.1	-	-
Phenanthrene	<0.1	<0.1	<0.1	0.6	-
Pyrene	<0.1	<0.1	<0.1	-	-

Note: Blue shading indicates values exceed one or more of the listed guideline values

Table 14: Results of Laboratory Analysis for OCP/OPP's

Analyte	Results (µg/L)			ANZG (2018)	NHMRC (2018)
	Sample ID				
	BH103	BH105	BH107		
DDT	<0.2	<0.2	<0.2	0.006	9
DDD	<0.2	<0.2	<0.2	-	-
Aldrin	<0.2	<0.2	<0.2	0.001	-
Dieldrin	<0.2	<0.2	<0.2	0.01	-
Aldrin + Dieldrin (calculated)	<0.2	<0.2	<0.2	-	0.3
alpha-chlordane	<0.2	<0.2	<0.2	-	-
gamma-Chlordane	<0.2	<0.2	<0.2	-	-
Endosulfan I	<0.2	<0.2	<0.2	-	-
Endosulfan II	<0.2	<0.2	<0.2	-	-
Endosulfan Sulphate	<0.2	<0.2	<0.2	-	-
Endrin	<0.2	<0.2	<0.2	0.01	-
Endrin Aldehyde	<0.2	<0.2	<0.2	-	-
Heptachlor	<0.2	<0.2	<0.2	0.01	0.3
Heptachlor Epoxide	<0.2	<0.2	<0.2	-	-
Hexachlorobenzene	<0.2	<0.2	<0.2	0.05	-
Methoxychlor	<0.2	<0.2	<0.2	0.005	-
Mirex	<0.2	<0.2	<0.2	0.04	-
alpha-BHC	<0.2	<0.2	<0.2	-	-
beta-BHC	<0.2	<0.2	<0.2	-	-
delta-BHC	<0.2	<0.2	<0.2	-	-
Lindane	<0.2	<0.2	<0.2	0.07	10
Sum of detected OCP	<0.2	<0.2	<0.2	-	-
Azinphos methyl (Guthion)	<0.2	<0.2	<0.2	0.01	30
Bromophos-ethyl	<0.2	<0.2	<0.2	-	10
Chlorpyriphos	<0.2	<0.2	<0.2	0.00004	10
Chlorpyriphos-methyl	<0.2	<0.2	<0.2	-	-
Diazinon	<0.2	<0.2	<0.2	0.00003	4
Dichlorvos	<0.2	<0.2	<0.2	-	5
Dimethoate	<0.2	<0.2	<0.2	0.1	7

Analyte	Results (µg/L)			ANZG (2018)	NHMRC (2018)
	Sample ID				
	BH103	BH105	BH107		
Ethion	<0.2	<0.2	<0.2	-	4
Ronnel (fenchlorphos)	<0.2	<0.2	<0.2	-	-
Fenitrothion	<0.2	<0.2	<0.2	0.1	7
Fenthion	<0.2	<0.2	<0.2	-	7
Malathion	<0.2	<0.2	<0.2	0.002	70
Parathion	<0.2	<0.2	<0.2	0.0007	20
Parathion-methyl	<0.2	<0.2	<0.2	-	0.7
Methidathion	<0.2	<0.2	<0.2	-	6
Fenamiphos	<0.2	<0.2	<0.2	-	0.5

Note: Blue shading indicates values exceed one or more of the listed guideline values

Table 15: Results of Laboratory Analysis for Volatile Organic Compounds (VOC)

Analyte	Results (µg/L)			ANZG (2018)	NHMRC (2018)
	Sample ID				
	BH103	BH105	BH107		
1,1,1-trichloroethane	<1	<1	<1	130	-
1,1,2,2-tetrachloroethane	<1	<1	<1	200	-
tetrachloroethene	<1	<1	<1	40	50
1,1,2-trichloroethane	<1	<1	<1	5,400	-
1,1,2-trichloroethylene	<1	<1	<1	220	-
1,1-Dichloroethene	<1	<1	<1	500	30
1,2,3-trichlorobenzene	<1	<1	<1	3	-
1,2,4-trichlorobenzene	<1	<1	<1	85	-
1,2-dichlorobenzene	<1	<1	<1	120	1,500
1,2-dichloroethane	<1	<1	<1	1000	3
1,2-dichloropropane	<1	<1	<1	600	-
1,3-dichlorobenzene	<1	<1	<1	160	-
1,3-dichloropropane	<1	<1	<1	700	-
1,4-dichlorobenzene	<1	<1	<1	40	40
carbon tetrachloride	<1	<1	<1	150	3
Vinyl Chloride	<10	<10	<10	70	0.3

Analyte	Results (µg/L)			ANZG (2018)	NHMRC (2018)
	Sample ID				
	BH103	BH105	BH107		
Chloroform	<1	5	2	370	-
Isopropylbenzene (cumene)	<1	<1	<1	20	-
1,2-dibromoethane	<1	<1	<1	-	1
hexachlorobutadiene	<1	<1	<1	-	0.7
Bromomethane	<10	<10	<10	-	1
Monochlorobenzene	<1	<1	<1	5	300
Styrene (vinylbenzene)	<1	<1	<1	-	30

Note: Blue shading indicates values exceed one or more of the listed guideline

Table 16: Results of Laboratory Analysis for Polychlorinated biphenyls (PCB)

Analyte	Results (µg/L)			ANZG (2018)
	Sample ID			
	BH103	BH105	BH107	
Arochlor 1242	< 2	< 2	< 2	0.3
Arochlor 1254	< 2	< 2	< 2	0.01

Note: Blue shading indicates values exceed one or more of the listed guideline

Table 17: Results of Laboratory Analysis for Per and Poly-fluoroalkyl substances (PFAS)

Analyte	Results (µg/L)			HEPA (2020) Interim marine water DGV	NHMRC (2018)
	Sample ID				
	BH103	BH105	BH107		
PFOS 99% LOP	0.01	<0.01	<0.01	0.00023	0.07
PFOA 99% LOP	<0.01	<0.01	<0.01	19	0.56

Note: Blue shading indicates values exceed one or more of the listed guideline

All groundwater samples tested recorded low concentrations for the contaminants analysed. All samples recorded concentrations of benzene, toluene, ethylbenzene, xylene, long-chain TRH, OCP/OPPs, VOCs, PCB, PAH, and phenols below laboratory reporting limits.

Detections of copper, nickel, zinc, and PFOS were recorded in all samples at concentrations above the site acceptance criteria (SAC). Elevated concentrations of heavy metals are common in urban environments due to roadway run-off, stormwater and underground services and other diffuse urban impacts, and can often be regarded as background levels.

Groundwater requiring disposal may need to be treated to reduce the heavy metal (and suspended solids) and PFAS concentrations prior to disposal to stormwater depending on the levels of contaminants in the collected water. Engagement with Council will be required to confirm their stormwater disposal requirements.

10. Groundwater disposal and council requirements

All collected groundwater requiring disposal will need to be tested against the requirements of the receiving authority. For example, disposal to stormwater will require Council approval and be subject to their water quality requirements for discharge to stormwater.

Ongoing monitoring of groundwater quality will be required to check that the groundwater quality complies with the nominated criteria for disposal. Suggested monitoring and reporting requirements are given in Section 12.

Where groundwater does not comply with the nominated requirements some form of groundwater treatment will be required prior to disposal. The treatment system will be determined and adjusted based on the groundwater test results prior to disposal and may include a combination of the following:

- Use of settlement tanks with addition of a flocculation agent to control heavy metals;
- Use of carbon filters to control hydrocarbons; and
- Use of specialist treatment systems to control PFAS, heavy metals and hydrocarbons.

11. Potential effects on neighbouring properties

An assessment of the potential effects of dewatering on neighbouring properties and groundwater dependent ecosystems has been summarised in Table 18.

Table 18: Assessment of Potential Effects of Dewatering.

Item	Comment
Proximity of Groundwater Dependent Ecosystems (GDEs)	No GDEs mapped within 500m of the site
Water supply losses by neighbouring groundwater users	A review of registered bores within a 500 m radius of the surrounding site was undertaken. The search identified no extraction bores within the search area.
Potential subsidence of neighbouring structures	Drawdown is expected within rock only and is not expected to result in any significant settlement. As no drawdown is expected within the upper alluvial and residual soils, exposure of acid sulfate soils is not considered likely.

12. Monitoring and reporting

The following monitoring and associated reporting is suggested during initial construction and should be undertaken during excavation and construction works on-site.

Table 19: Monitoring and Reporting requirements

Item	Monitoring	Monitoring Frequency	Reporting
Assess effect of excavation on groundwater	Monitoring of groundwater levels in three monitoring wells outside the excavation footprint, during and following completion of construction. The locations will be subject to access and approvals and will be determined prior to construction. Existing wells could be used where possible.	Daily for the first two weeks then weekly. This can be relaxed to monthly once steady groundwater levels are established, during construction	Weekly then monthly during construction
Groundwater Quality Sampling and Testing	Sampling and testing of water from wells and the excavation, or at the point of discharge. Contaminant and physical properties tested to be nominated by the authority accepting water but to include: • Heavy Metals • TRH / BTEX; • Phenols; • VOC; and • PFAS • PAH; and • OCP/OPP/PCB; • pH & conductivity • Suspended Solids • Dissolved Oxygen Levels • Turbidity	pH and turbidity to be measured daily for the first week and then weekly. Two rounds of groundwater sampling and testing initially. Subject to relatively uniform results groundwater testing to be carried out fortnightly or as otherwise agreed with the authority accepting the water.	
Groundwater inflow rates	Groundwater inflow to be measured in collection tanks, of a pre-determined size or using a calibrated flow meter connected to the dewatering system.	Twice daily, or once collection point is filled (whichever is more frequent), for the first two weeks. After steady groundwater inflow rates are established then daily.	Weekly

Item	Monitoring	Monitoring Frequency	Reporting
Quantity of water disposed off-site (includes rainwater)	Calibrated Flowmeter connected to any pump-out system	Automatically	Weekly

13. Conclusion

The geotechnical investigation on the site has identified fill, alluvial soil and residual clays to relatively shallow depths, overlying mostly Hawkesbury Sandstone bedrock at the site with some Mittagong Formation (shale and laminite) to about 7-8 m in some areas . Groundwater has been recorded in monitoring wells at the site, at elevations between RL -7.45 m AHD and RL - 9.16 m AHD within the bedrock, and between RL 1.16 m and RL -1.35 m within the surficial alluvial soils and residual clay soil.

The proposed basement excavation is expected to extend up to about 6.5 m below the measured groundwater levels within the bedrock and about 15 m below the measured groundwater levels within the alluvial soils in some locations.

Groundwater modelling has been undertaken which predicts that annual groundwater inflow rates of between 1.8 ML/year and 3.4 ML/year during the first year of construction and in the long term may be expected for a drained basement construction and is dependent on the clay content in defect apertures and the degree of fracturing in the bedrock. This prediction is an estimate based on the information available; actual flow rates may vary from these and will only be known once the excavation is complete and inflow rates can be measured. The sensitivity analysis undertaken predicts an annual groundwater inflow rate of between 3.9 ML/year and 7.2 ML/year for higher permeability rock.

Given that the predicted inflow is less than 3 ML/year, the proposed excavation may comply with an exemption for a Water Access Licence from Water NSW. A Water Supply Works Approval will still be required from WaterNSW and if measured inflows are actually greater than 3 ML/yr then a Water Access License would be required. It is recommended that additional permeability testing for the residual soil and bedrock be undertaken within boreholes for detailed design.

From a geotechnical point of view, it is considered that a drained basement is feasible without any significant impact to surrounding properties. In addition, the use of a drained basement is not considered likely to influence any GDEs or groundwater supply works in accordance with the AIP minimal impact considerations. Construction of a drained basement will be subject to review and approval from Council and relevant authorities.

14. References

Australian Government, Bureau of Meteorology,. (n.d.). *Groundwater Dependent Ecosystems Atlas*. Retrieved from http://www.bom.gov.au/water/groundwater/gde/

ANZG. (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Canberra, ACT: Australian and New Zealand Governments and Australian state and territory governments.

Hvorslev, M. J. (1951). *Time Lag and Soil Permeability in Groundwater Observations.* Bulleton No 36, Vicksburg, Mississippi: Waterways Experiment Station, Corps of Engineers, US Army.

Kavvadas M, G. A. (1992). Drainage of Supported Excavations. *Geotechnical and Geological Engineering,*, 10 p141-157 Technical Note.

National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013), NEPC 2013, Canberra. (n.d.).

NSW Office of Water. (2012). *NSW Aquifer Interference Policy.*

15. **Limitations**

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project at 79-81 Queens Road & 2-8 Spencer Street, Five Dock NSW in accordance with Douglas' proposal 224583.01.P.001.Rev1 dated 5 April 2024 and acceptance received from Alexander Lekovski dated 16 April 2024. The work was carried out under Douglas' Engagement Terms. This report is provided for the exclusive use of DPG Project 37 Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and / or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and / or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after Douglas' field testing has been completed.

Douglas' advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by Douglas in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and / or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed ‘safety in design’ assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. Douglas cannot be held responsible for

interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by Douglas. This is because this report has been written as advice and opinion rather than instructions for construction.

Appendix A

About this Report

About this Report

November 2023

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

continued next page

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

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Appendix B

Drawings

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	19.06.2024	EC

SCALE: 0 5 10 15 20 m
1:400 @ A3

Douglas PARTNERS
OFFICE: SYDNEY
96-98 Hermitage Rd, West Ryde NSW 2114
(02)9809 0666

CLIENT:
Proposed Mixed Use Development

NOTE:
1: Basemap from Metromap (Dated 25.03.2024)

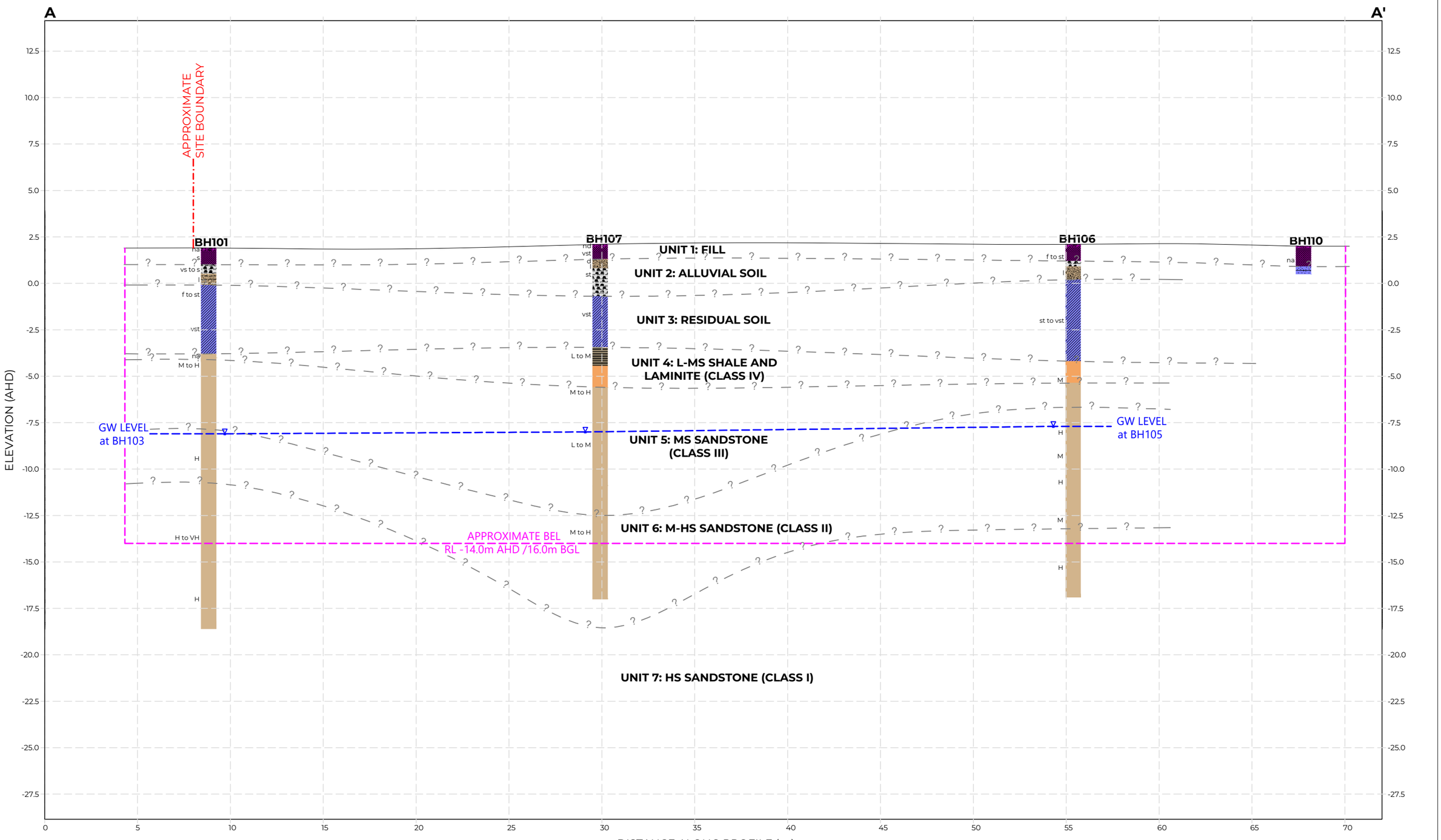
COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 56

PROJECT NAME:
DPG Project 37 Pty Ltd

PROJECT ADRESS:
79-85 Queens Road & 2-16 Spencer Street, Five Dock

DRAWING TITLE:
TEST LOCATION PLAN

PROJECT NO: **224583.01**
DRAWING NO: **1**
REVISION: **0**



LEGEND

- ASPHALTIC CONCRETE
- CONCRETE
- Clayey PEAT
- SANDSTONE
- CI-CH - Medium to High Plasticity CLAY
- FILL
- Clayey SAND
- Shale
- Sandy CLAY
- Laminite
- Silty SAND

TESTS / OTHER

- N - Standard penetration test value
- ? - Interpreted geotechnical boundary
- - Water level

ROCK STRENGTH

- VL- Very Low
- L - Low
- M - Medium
- H - High

SOIL CONSISTENCY

- vs - Very Soft
- s - Soft
- f - Firm
- st - Stiff
- vst - Very Stiff
- h - Hard

SOIL DENSITY

- vl - Very Loose
- l - Loose
- md - Medium Dense
- d - Dense
- vd - Very Dense

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	12.06.2024	EC

SCALE: 0 1 2 3 4 6 8 10
1:200 @ A3
Vertical Exaggeration = 1.0

Douglas PARTNERS
OFFICE: SYDNEY
96-98 Hermitage Rd, West Ryde NSW 2114
(02) 9809 0666

CLIENT:
DPG Project 37 Pty Ltd

NOTES
1. Subsurface conditions are accurate at the borehole locations only. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
2. Summary logs only and should be read in conjunction with detailed logs.
3. Horizontal and vertical scales are not equal.

PROJECT NAME:
DPG Project 37 Pty Ltd

PROJECT ADDRESS:
79-85 Queens Rd & 2-16 Spencer St, Five Dock

DRAWING TITLE:
INTERPRETED GEOTECHNICAL CROSS SECTION A-A'

PROJECT No: **224583.01**
DRAWING No: **2**
REVISION: **0**

B

B'

APPROXIMATE SITE BOUNDARY

UNIT 2: ALLUVIAL SOIL

UNIT 1: FILL

UNIT 3: RESIDUAL SOIL

UNIT 4: L-MS SHALE AND LAMINITE (CLASS IV)

UNIT 5: MS SANDSTONE (CLASS III)

UNIT 6: M-HS SANDSTONE (CLASS II)

UNIT 7: HS SANDSTONE (CLASS I)

APPROXIMATE BEL RL -14.0m AHD /16.0m BGL

BH103 BH111 BH104 BH101 BH107

ELEVATION (AHD)

DISTANCE ALONG PROFILE (m)

LEGEND

- ASPHALTIC CONCRETE
- CONCRETE
- Laminite
- Silty SAND
- SILTSTONE
- CI - Medium Plasticity CLAY
- NO CORE
- Clayey PEAT
- SANDSTONE
- CI-CH - Medium to High Plasticity CLAY
- FILL
- Clayey SAND
- Shale

TESTS / OTHER
- N - Standard penetration test value
- Interpreted geotechnical boundary
- Water level

ROCK STRENGTH
- VL- Very Low
- L - Low
- M - Medium
- H - High

SOIL CONSISTENCY
- vs - Very Soft
- s - Soft
- f - Firm
- st - Stiff
- vst - Very Stiff
- h - Hard

SOIL DENSITY
- vl - Very Loose
- l - Loose
- md - Medium Dense
- d - Dense
- vd - Very Dense

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	12.06.2024	EC

SCALE: 0 1 2 3 4 6 8 10
1:200 @ A3
Vertical Exaggeration = 1.0

Douglas PARTNERS
OFFICE: SYDNEY
96-98 Hermitage Rd, West Ryde NSW 2114
(02) 9809 0666

CLIENT: **DPG Project 37 Pty Ltd**

NOTES
1. Subsurface conditions are accurate at the borehole locations only. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
2. Summary logs only and should be read in conjunction with detailed logs.
3. Horizontal and vertical scales are not equal.

PROJECT NAME: **DPG Project 37 Pty Ltd**

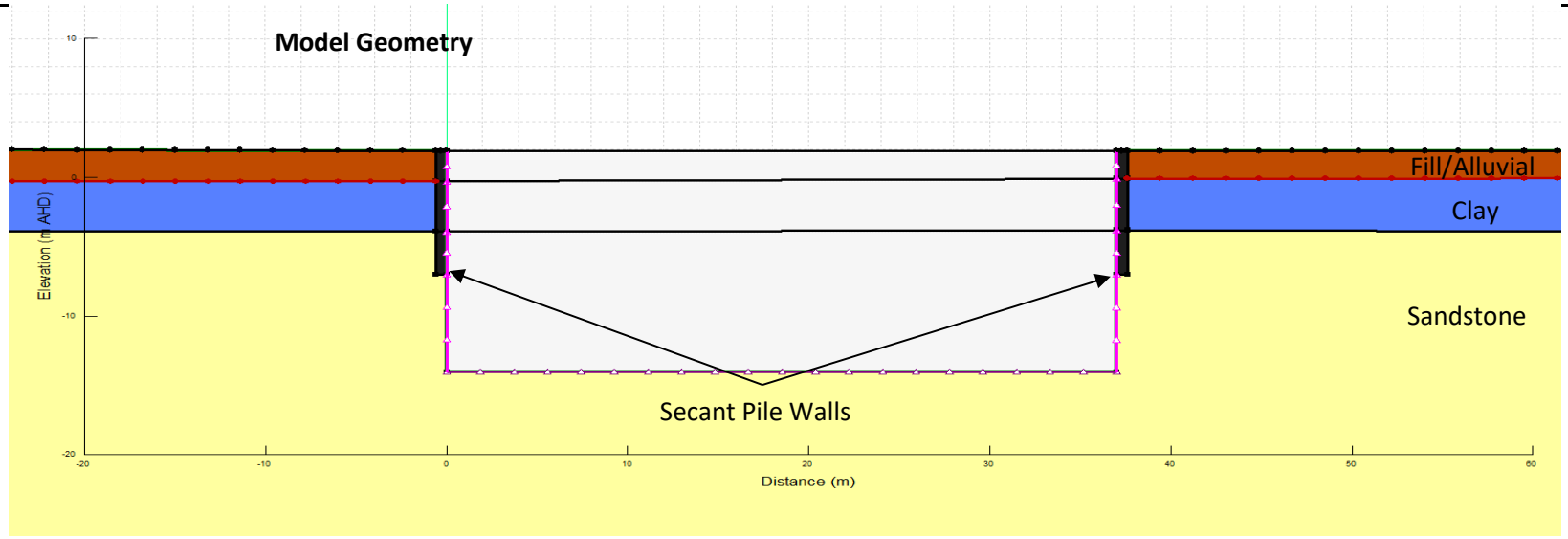
PROJECT ADDRESS: **79-85 Queens Rd & 2-16 Spencer St, Five Dock**

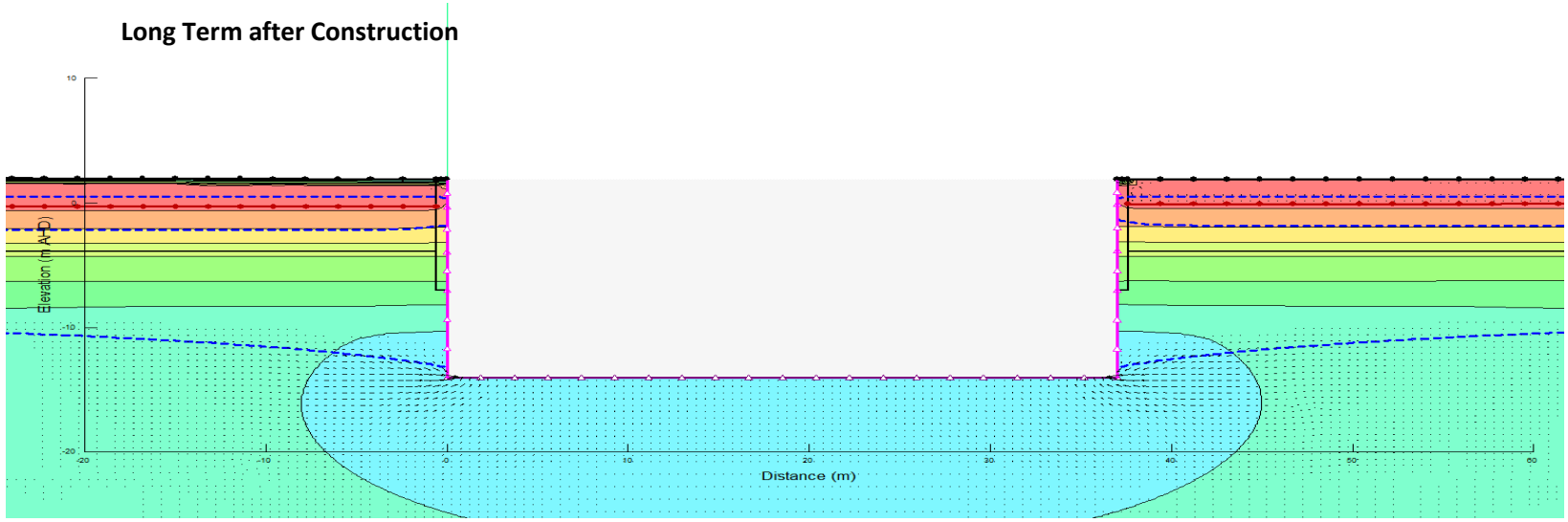
DRAWING TITLE: **INTERPRETED GEOTECHNICAL CROSS SECTION B-B'**

PROJECT No: **224583.01**

DRAWING No: **3**

REVISION: **0**



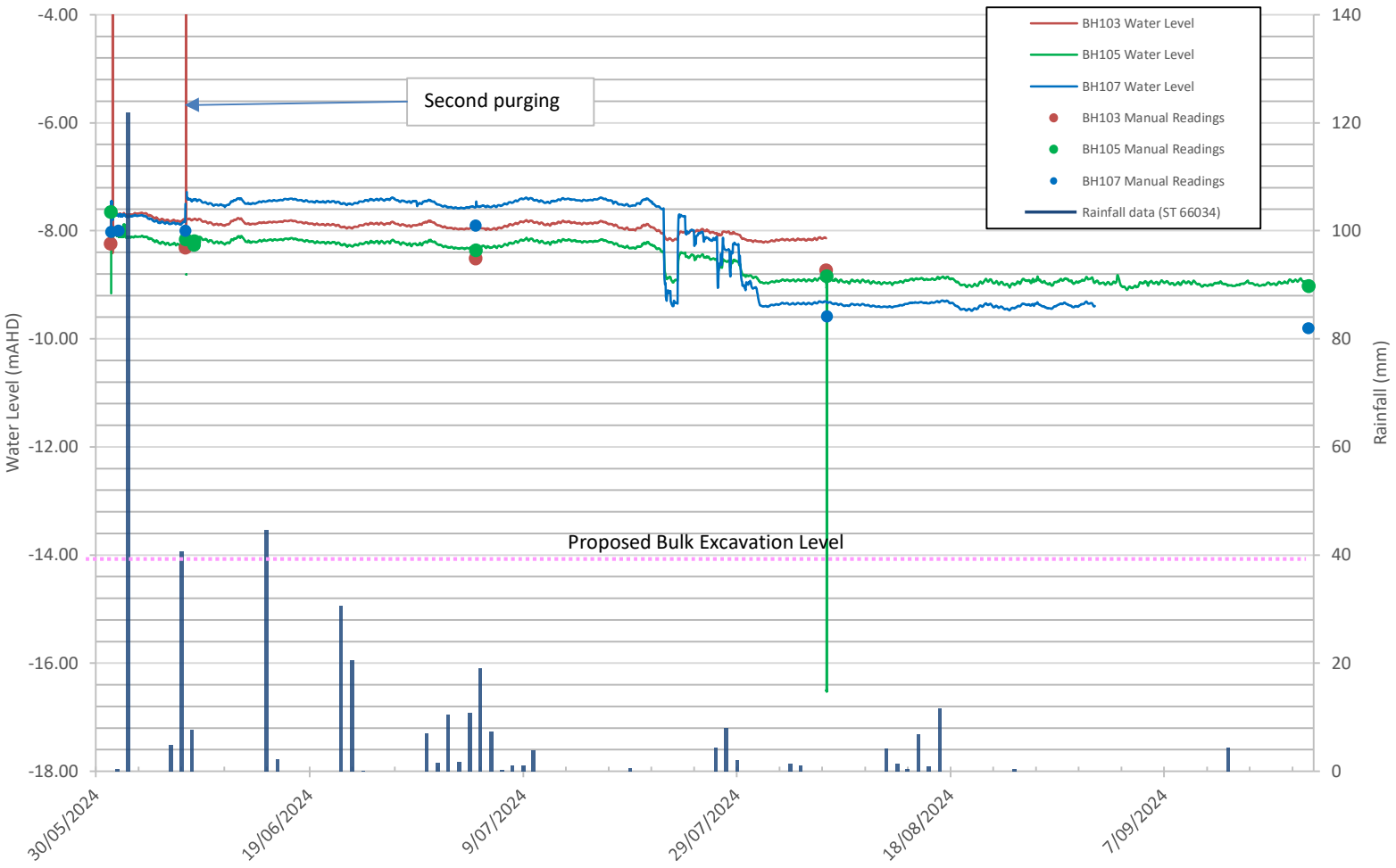


Douglas PARTNERS GROUNDED EXPERTISE	CLIENT: DPG Project 37 Pty Ltd	**Adopted Model Geometry and Model Results**	PROJECT No: 224583.01
	OFFICE: Sydney	**Proposed Mixed-use Development**	DWG No: M1
	DATE: 20 Aug 2024	**79-85 Queens Road, Five Dock**	REVISION: 0

Appendix C

Groundwater Monitoring Data and Permeability Testing

Groundwater Level Monitoring Summary



Note: Reading interval 1-second for 10 minutes, 5-minute for one hour after that and then 1-hour intervals thereafter

Douglas PARTNERS

Date:	From	Drawn:
16/02/2026	31/05/2024	AG
	To	Checked:
	20/09/2024	SE

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	DPG Project 37 Pty Ltd	Project No:	224583.01
Project:	Mixed Use Development	Test date:	7-Jun-24
Location:	79-85 Queens Road, Five Dock, NSW	Tested by:	AG

Test Location

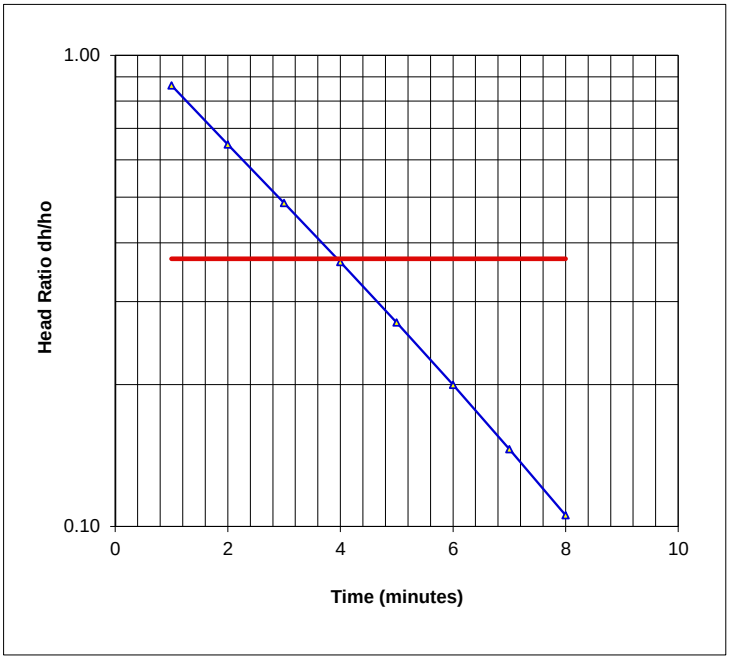
Description:	Standpipe in borehole	**Test No.**	BH103	
Material type:	Sandstone	Easting:	325956	m
Slotted Pipe From 12.0-30.0, Gravel 11.5-30.0		Northing	6250755.5	m
		Surface Level:	1.9	m AHD

Details of Well Installation

Well casing diameter (2r)	50	mm	Depth to water before test	10.21	m
Well screen diameter (2R)	76	mm	Depth to water at start of test	1.5	m
Length of well screen (Le)	18	m			

Test Results

Time (min)	Depth (m)	Change in Head: dH (m)	dH/Ho
0	1.50	8.71	1.000
1	2.69	7.52	0.863
2	4.58	5.63	0.646
3	5.98	4.23	0.486
4	7.04	3.17	0.364
5	7.85	2.36	0.271
6	8.47	1.74	0.200
7	8.94	1.27	0.146
8	9.29	0.92	0.106



To = 4 mins
240 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**4.5E-07**	m/sec
	=	**0.160**	cm/hour

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	DPG Project 37 Pty Ltd	Project No:	224583.01
Project:	Mixed Use Development	Test date:	7-Jun-24
Location:	79-85 Queens Road, Five Dock, NSW	Tested by:	AG

Test Location

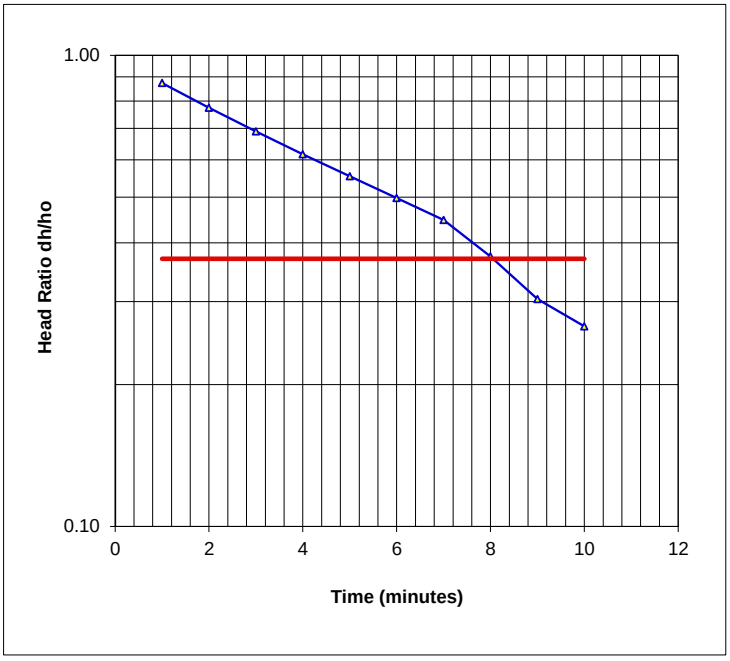
Description:	Standpipe in borehole	**Test No.**	BH105	
Material type:	Sandstone	Easting:	325961.7	m
Slotted Pipe From 12.0-19.0, Gravel 11.5-19.0		Northing	6250700.0	m
		Surface Level:	2	m AHD

Details of Well Installation

Well casing diameter (2r)	50	mm	Depth to water before test	10.16	m
Well screen diameter (2R)	76	mm	Depth to water at start of test	1.4	m
Length of well screen (Le)	7	m			

Test Results

Time (min)	Depth (m)	Change in Head: dH (m)	dH/Ho
0	1.40	8.76	1.000
1	2.51	7.65	0.873
2	3.38	6.78	0.774
3	4.12	6.04	0.689
4	4.76	5.40	0.616
5	5.31	4.85	0.554
6	5.80	4.36	0.498
7	6.24	3.92	0.447
8	6.88	3.28	0.374
9	7.50	2.66	0.304
10	7.83	2.33	0.266



To = 8 mins
480 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**4.9E-07**	m/sec
	=	**0.175**	cm/hour

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	DPG Project 37 Pty Ltd	Project No:	224583.01
Project:	Mixed Use Development	Test date:	7-Jun-24
Location:	79-85 Queens Road, Five Dock, NSW	Tested by:	AG

Test Location

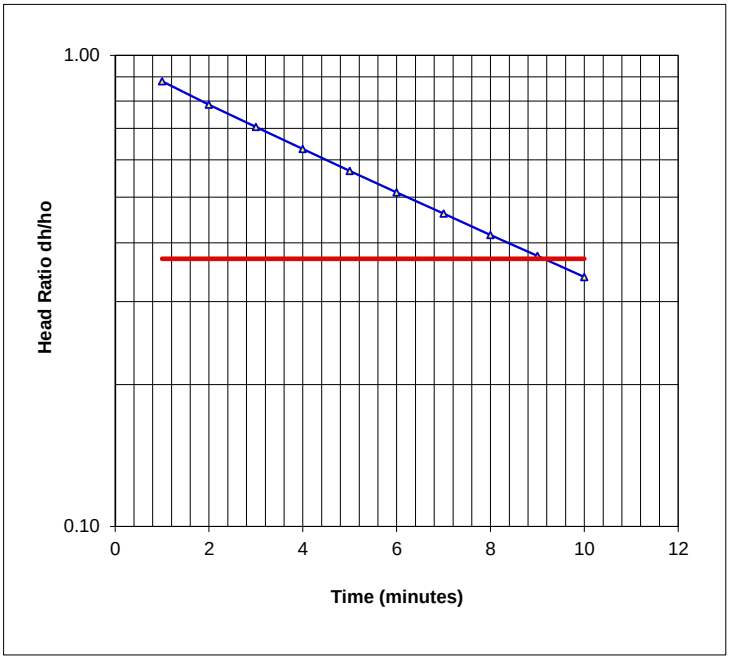
Description:	Standpipe in borehole	**Test No.**	BH107	
Material type:	Sandstone	Easting:	325989.6	m
Slotted Pipe From 12.0-19.0, Gravel 11.5-19.0		Northing	6250729.5	m
		Surface Level:	2.1	m AHD

Details of Well Installation

Well casing diameter (2r)	50	mm	Depth to water before test	10.1	m
Well screen diameter (2R)	76	mm	Depth to water at start of test	0.35	m
Length of well screen (Le)	7	m			

Test Results

Time (min)	Depth (m)	Change in Head: dH (m)	dH/Ho
0	0.35	9.75	1.000
1	1.51	8.59	0.881
2	2.44	7.66	0.786
3	3.23	6.87	0.705
4	3.93	6.17	0.633
5	4.56	5.54	0.568
6	5.11	4.99	0.512
7	5.60	4.50	0.462
8	6.05	4.05	0.415
9	6.44	3.66	0.375
10	6.80	3.30	0.338



To = 9 mins
540 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**4.3E-07**	m/sec
	=	**0.155**	cm/hour

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Permeability Testing - Rising or Falling Head Test Report

Client:	DPG Project 37 Pty Ltd	Project No:	224583.01
Project:	Mixed Use Development	Test date:	4-Jul-24
Location:	79-85 Queens Road, Five Dock, NSW	Tested by:	AG

Test Location

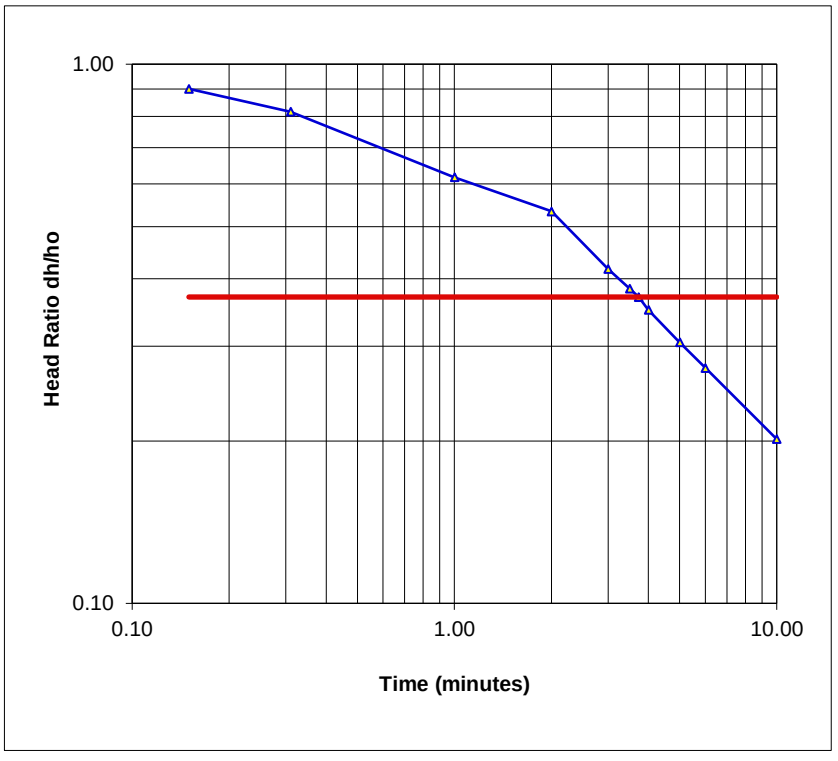
Description:	Standpipe in borehole	**Test No.**	BH103S	
Material type:	Clay, Clayey Sand	Easting:	325956	m
Slotted Pipe From 1.5-6.0, Gravel 1.0-6.0		Northing	6250755.5	m
		Surface Level:	1.9	m AHD

Details of Well Installation

Well casing diameter (2r)	50	mm	Depth to water before test	0.74	m
Well screen diameter (2R)	76	mm	Depth to water at start of test	0.14	m
Length of well screen (Le)	5	m			

Test Results

Time (min)	Depth (m)	Change in Head: dH (m)	dH/Ho
0	0.14	0.60	1.000
0.15	0.20	0.54	0.900
0.31	0.25	0.49	0.817
1.00	0.37	0.37	0.617
2.00	0.42	0.32	0.533
3.00	0.49	0.25	0.417
3.50	0.51	0.23	0.383
3.73	0.518	0.22	0.370
4.00	0.53	0.21	0.350
5.00	0.56	0.18	0.305
6.00	0.58	0.16	0.273
10.00	0.62	0.12	0.202



To = 3.73 mins
223.8 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**1.4E-06**	m/sec
	=	**0.491**	cm/hour

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	DPG Project 37 Pty Ltd	Project No:	224583.01
Project:	Mixed Use Development	Test date:	7-Jun-24
Location:	79-85 Queens Road, Five Dock, NSW	Tested by:	AG

Test Location

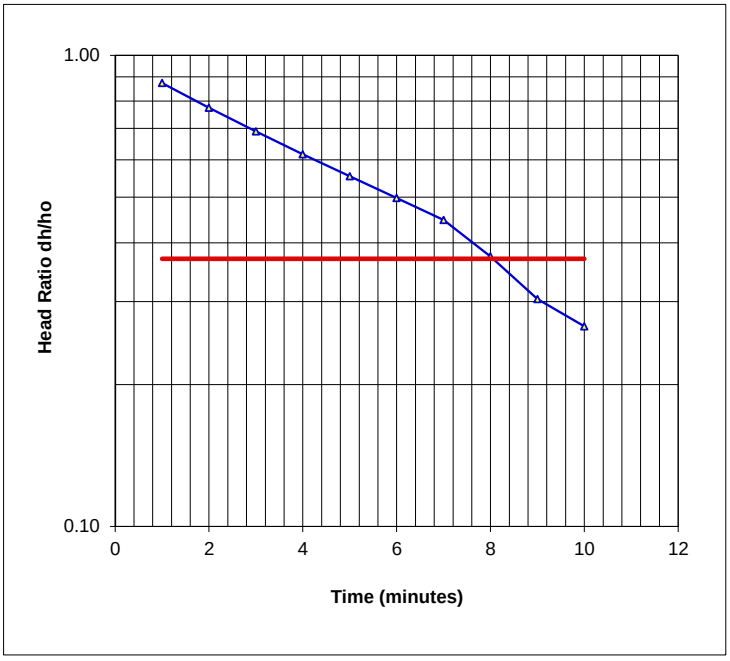
Description:	Standpipe in borehole	**Test No.**	BH105	
Material type:	Sandstone	Easting:	325961.7	m
Slotted Pipe From 12.0-19.0, Gravel 11.5-19.0		Northing	6250700.0	m
		Surface Level:	2	m AHD

Details of Well Installation

Well casing diameter (2r)	50	mm	Depth to water before test	10.16	m
Well screen diameter (2R)	76	mm	Depth to water at start of test	1.4	m
Length of well screen (Le)	7	m			

Test Results

Time (min)	Depth (m)	Change in Head: dH (m)	dH/Ho
0	1.40	8.76	1.000
1	2.51	7.65	0.873
2	3.38	6.78	0.774
3	4.12	6.04	0.689
4	4.76	5.40	0.616
5	5.31	4.85	0.554
6	5.80	4.36	0.498
7	6.24	3.92	0.447
8	6.88	3.28	0.374
9	7.50	2.66	0.304
10	7.83	2.33	0.266



To = 8 mins
480 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**4.9E-07**	m/sec
	=	**0.175**	cm/hour

Douglas Partners Pty Ltd
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www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	DPG Project 37 Pty Ltd	Project No:	224583.01
Project:	Mixed Use Development	Test date:	7-Jun-24
Location:	79-85 Queens Road, Five Dock, NSW	Tested by:	AG

Test Location

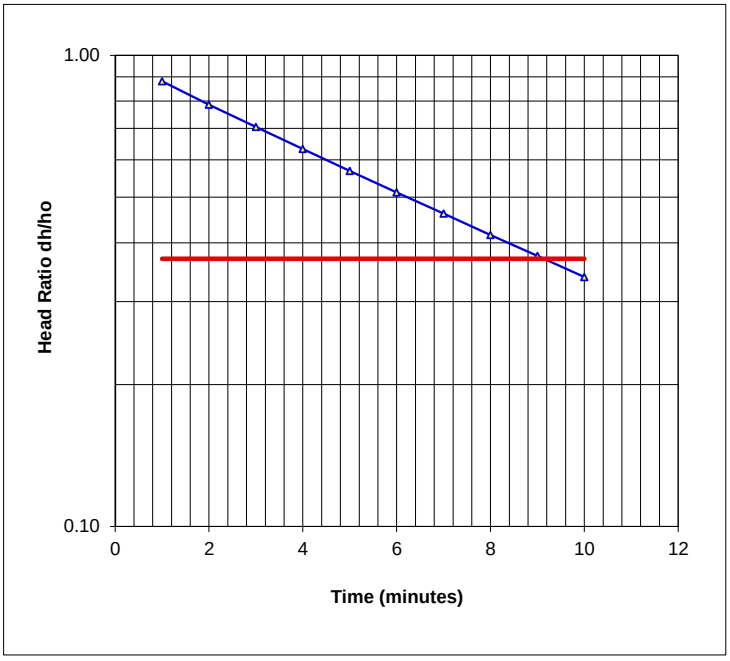
Description:	Standpipe in borehole	**Test No.**	BH107	
Material type:	Sandstone	Easting:	325989.6	m
Slotted Pipe From 12.0-19.0, Gravel 11.5-19.0		Northing	6250729.5	m
		Surface Level:	2.1	m AHD

Details of Well Installation

Well casing diameter (2r)	50	mm	Depth to water before test	10.1	m
Well screen diameter (2R)	76	mm	Depth to water at start of test	0.35	m
Length of well screen (Le)	7	m			

Test Results

Time (min)	Depth (m)	Change in Head: dH (m)	dH/Ho
0	0.35	9.75	1.000
1	1.51	8.59	0.881
2	2.44	7.66	0.786
3	3.23	6.87	0.705
4	3.93	6.17	0.633
5	4.56	5.54	0.568
6	5.11	4.99	0.512
7	5.60	4.50	0.462
8	6.05	4.05	0.415
9	6.44	3.66	0.375
10	6.80	3.30	0.338



To = 9 mins
540 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**4.3E-07**	m/sec
	=	**0.155**	cm/hour

Appendix D

Laboratory Results

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 353486

Client Details

Client	Douglas Partners Pty Ltd
Attention	Kurt Plambeck
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**224583.02 - Five Dock**
Number of Samples	7 Water
Date samples received	07/06/2024
Date completed instructions received	07/06/2024

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.

Report Details

Date results requested by	17/06/2024
Date of Issue	14/06/2024

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Results Approved By
Amanda Chui, LC/Air Toxics Supervisor
Diego Bigolin, Inorganics Supervisor
Dragana Tomas, Senior Chemist
Loren Bardwell, Development Chemist
Timothy Toll, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

VOCs in water					
Our Reference		353486-1	353486-2	353486-3	353486-5
Your Reference	UNITS	BH103	BH105	BH107	RINS1/20240607
Date Sampled		07/06/2024	07/06/2024	07/06/2024	07/06/2024
Type of sample		Water	Water	Water	Water
Date Extracted	-	11/06/2024	11/06/2024	11/06/2024	11/06/2024
Date Analysed	-	12/06/2024	12/06/2024	12/06/2024	12/06/2024
Dichlorodifluoromethane	µg/L	<10	<10	<10	<10
Chloromethane	µg/L	<10	<10	<10	<10
Vinyl Chloride	µg/L	<10	<10	<10	<10
Bromomethane	µg/L	<10	<10	<10	<10
Chloroethane	µg/L	<10	<10	<10	<10
Trichlorofluoromethane	µg/L	<10	<10	<10	<10
1,1-Dichloroethene	µg/L	<1	<1	<1	<1
Trans-1,2-dichloroethene	µg/L	<1	<1	<1	<1
1,1-dichloroethane	µg/L	<1	<1	<1	<1
Cis-1,2-dichloroethene	µg/L	<1	<1	<1	<1
Bromochloromethane	µg/L	<1	<1	<1	<1
Chloroform	µg/L	<1	5	2	5
2,2-dichloropropane	µg/L	<1	<1	<1	<1
1,2-dichloroethane	µg/L	<1	<1	<1	<1
1,1,1-trichloroethane	µg/L	<1	<1	<1	<1
1,1-dichloropropene	µg/L	<1	<1	<1	<1
Cyclohexane	µg/L	<1	<1	<1	<1
Carbon tetrachloride	µg/L	<1	<1	<1	<1
Benzene	µg/L	<1	<1	<1	<1
Dibromomethane	µg/L	<1	<1	<1	<1
1,2-dichloropropane	µg/L	<1	<1	<1	<1
Trichloroethene	µg/L	<1	<1	<1	<1
Bromodichloromethane	µg/L	<1	<1	<1	<1
trans-1,3-dichloropropene	µg/L	<1	<1	<1	<1
cis-1,3-dichloropropene	µg/L	<1	<1	<1	<1
1,1,2-trichloroethane	µg/L	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1
1,3-dichloropropane	µg/L	<1	<1	<1	<1
Dibromochloromethane	µg/L	<1	<1	<1	<1
1,2-dibromoethane	µg/L	<1	<1	<1	<1
Tetrachloroethene	µg/L	<1	<1	<1	<1
1,1,1,2-tetrachloroethane	µg/L	<1	<1	<1	<1
Chlorobenzene	µg/L	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1

VOCs in water					
Our Reference		353486-1	353486-2	353486-3	353486-5
Your Reference	UNITS	BH103	BH105	BH107	RINS1/20240607
Date Sampled		07/06/2024	07/06/2024	07/06/2024	07/06/2024
Type of sample		Water	Water	Water	Water
Bromoform	µg/L	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2
Styrene	µg/L	<1	<1	<1	<1
1,1,2,2-tetrachloroethane	µg/L	<1	<1	<1	<1
o-xylene	µg/L	<1	<1	<1	<1
1,2,3-trichloropropane	µg/L	<1	<1	<1	<1
Isopropylbenzene	µg/L	<1	<1	<1	<1
Bromobenzene	µg/L	<1	<1	<1	<1
n-propyl benzene	µg/L	<1	<1	<1	<1
2-chlorotoluene	µg/L	<1	<1	<1	<1
4-chlorotoluene	µg/L	<1	<1	<1	<1
1,3,5-trimethyl benzene	µg/L	<1	<1	<1	<1
Tert-butyl benzene	µg/L	<1	<1	<1	<1
1,2,4-trimethyl benzene	µg/L	<1	<1	<1	<1
1,3-dichlorobenzene	µg/L	<1	<1	<1	<1
Sec-butyl benzene	µg/L	<1	<1	<1	<1
1,4-dichlorobenzene	µg/L	<1	<1	<1	<1
4-isopropyl toluene	µg/L	<1	<1	<1	<1
1,2-dichlorobenzene	µg/L	<1	<1	<1	<1
n-butyl benzene	µg/L	<1	<1	<1	<1
1,2-dibromo-3-chloropropane	µg/L	<1	<1	<1	<1
1,2,4-trichlorobenzene	µg/L	<1	<1	<1	<1
Hexachlorobutadiene	µg/L	<1	<1	<1	<1
1,2,3-trichlorobenzene	µg/L	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	119	120	122	120
Surrogate Toluene-d8	%	99	100	99	100
Surrogate 4-Bromofluorobenzene	%	96	95	95	94

vTRH(C6-C10)/BTEXN in Water						
Our Reference		353486-1	353486-2	353486-3	353486-4	353486-6
Your Reference	UNITS	BH103	BH105	BH107	BD1/20240607	TS-070624
Date Sampled		07/06/2024	07/06/2024	07/06/2024	07/06/2024	07/06/2024
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	11/06/2024	11/06/2024	11/06/2024	11/06/2024	11/06/2024
Date analysed	-	12/06/2024	12/06/2024	12/06/2024	12/06/2024	12/06/2024
TRH C_6 - C_9	µg/L	<10	<10	<10	<10	[NA]
TRH C_6 - C_{10}	µg/L	<10	<10	<10	<10	[NA]
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10	<10	[NA]
Benzene	µg/L	<1	<1	<1	<1	94%
Toluene	µg/L	<1	<1	<1	<1	98%
Ethylbenzene	µg/L	<1	<1	<1	<1	100%
m+p-xylene	µg/L	<2	<2	<2	<2	100%
o-xylene	µg/L	<1	<1	<1	<1	101%
Naphthalene	µg/L	<1	<1	<1	<1	[NA]
Surrogate Dibromofluoromethane	%	119	120	122	120	114
Surrogate Toluene-d8	%	99	100	99	98	100
Surrogate 4-Bromofluorobenzene	%	96	95	95	95	98

vTRH(C6-C10)/BTEXN in Water		
Our Reference		353486-7
Your Reference	UNITS	TB-070624
Date Sampled		07/06/2024
Type of sample		Water
Date extracted	-	11/06/2024
Date analysed	-	12/06/2024
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	%	111
Surrogate Toluene-d8	%	99
Surrogate 4-Bromofluorobenzene	%	95

svTRH (C10-C40) in Water					
Our Reference		353486-1	353486-2	353486-3	353486-4
Your Reference	UNITS	BH103	BH105	BH107	BD1/20240607
Date Sampled		07/06/2024	07/06/2024	07/06/2024	07/06/2024
Type of sample		Water	Water	Water	Water
Date extracted	-	12/06/2024	12/06/2024	12/06/2024	12/06/2024
Date analysed	-	12/06/2024	12/06/2024	12/06/2024	12/06/2024
TRH C_{10} - C_{14}	µg/L	<50	<50	65	<50
TRH C_{15} - C_{28}	µg/L	<100	110	140	<100
TRH C_{29} - C_{36}	µg/L	<100	<100	<100	<100
Total +ve TRH (C10-C36)	µg/L	<50	110	210	<50
TRH >C_{10} - C_{16}	µg/L	<50	<50	130	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50	130	<50
TRH >C_{16} - C_{34}	µg/L	<100	110	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	µg/L	<50	110	130	<50
Surrogate o-Terphenyl	%	92	82	97	101

PAHs in Water					
Our Reference		353486-1	353486-2	353486-3	353486-4
Your Reference	UNITS	BH103	BH105	BH107	BD1/20240607
Date Sampled		07/06/2024	07/06/2024	07/06/2024	07/06/2024
Type of sample		Water	Water	Water	Water
Date extracted	-	12/06/2024	12/06/2024	12/06/2024	12/06/2024
Date analysed	-	12/06/2024	12/06/2024	12/06/2024	13/06/2024
Naphthalene	µg/L	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	µg/L	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	<0.1	<0.1	<0.1	<0.1
Fluorene	µg/L	<0.1	<0.1	<0.1	<0.1
Phenanthrene	µg/L	<0.1	<0.1	<0.1	<0.1
Anthracene	µg/L	<0.1	<0.1	<0.1	<0.1
Fluoranthene	µg/L	<0.1	<0.1	<0.1	<0.1
Pyrene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	µg/L	<0.1	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d14	%	90	99	93	105

Organochlorine Pesticides in Water				
Our Reference		353486-1	353486-2	353486-3
Your Reference	UNITS	BH103	BH105	BH107
Date Sampled		07/06/2024	07/06/2024	07/06/2024
Type of sample		Water	Water	Water
Date extracted	-	12/06/2024	12/06/2024	12/06/2024
Date analysed	-	12/06/2024	12/06/2024	12/06/2024
alpha-BHC	µg/L	<0.2	<0.2	<0.2
HCB	µg/L	<0.2	<0.2	<0.2
beta-BHC	µg/L	<0.2	<0.2	<0.2
gamma-BHC	µg/L	<0.2	<0.2	<0.2
Heptachlor	µg/L	<0.2	<0.2	<0.2
delta-BHC	µg/L	<0.2	<0.2	<0.2
Aldrin	µg/L	<0.2	<0.2	<0.2
Heptachlor Epoxide	µg/L	<0.2	<0.2	<0.2
gamma-Chlordane	µg/L	<0.2	<0.2	<0.2
alpha-Chlordane	µg/L	<0.2	<0.2	<0.2
Endosulfan I	µg/L	<0.2	<0.2	<0.2
pp-DDE	µg/L	<0.2	<0.2	<0.2
Dieldrin	µg/L	<0.2	<0.2	<0.2
Endrin	µg/L	<0.2	<0.2	<0.2
Endosulfan II	µg/L	<0.2	<0.2	<0.2
pp-DDD	µg/L	<0.2	<0.2	<0.2
Endrin Aldehyde	µg/L	<0.2	<0.2	<0.2
pp-DDT	µg/L	<0.2	<0.2	<0.2
Endosulfan Sulphate	µg/L	<0.2	<0.2	<0.2
Methoxychlor	µg/L	<0.2	<0.2	<0.2
Mirex	ug/L	<0.2	<0.2	<0.2
Surrogate 4-Chloro-3-NBTF	%	76	81	77

OP Pesticides in Water				
Our Reference		353486-1	353486-2	353486-3
Your Reference	UNITS	BH103	BH105	BH107
Date Sampled		07/06/2024	07/06/2024	07/06/2024
Type of sample		Water	Water	Water
Date extracted	-	12/06/2024	12/06/2024	12/06/2024
Date analysed	-	12/06/2024	12/06/2024	12/06/2024
Dichlorvos	µg/L	<0.2	<0.2	<0.2
Mevinphos	µg/L	<0.2	<0.2	<0.2
Phorate	µg/L	<0.2	<0.2	<0.2
Dimethoate	µg/L	<0.2	<0.2	<0.2
Diazinon	µg/L	<0.2	<0.2	<0.2
Disulfoton	µg/L	<0.2	<0.2	<0.2
Chlorpyriphos-methyl	µg/L	<0.2	<0.2	<0.2
Parathion-Methyl	µg/L	<0.2	<0.2	<0.2
Ronnel	µg/L	<0.2	<0.2	<0.2
Fenitrothion	µg/L	<0.2	<0.2	<0.2
Malathion	µg/L	<0.2	<0.2	<0.2
Chlorpyriphos	µg/L	<0.2	<0.2	<0.2
Fenthion	µg/L	<0.2	<0.2	<0.2
Parathion	µg/L	<0.2	<0.2	<0.2
Bromophos ethyl	µg/L	<0.2	<0.2	<0.2
Methidathion	µg/L	<0.2	<0.2	<0.2
Fenamiphos	µg/L	<0.2	<0.2	<0.2
Ethion	µg/L	<0.2	<0.2	<0.2
Phosalone	µg/L	<0.2	<0.2	<0.2
Azinphos-methyl (Guthion)	µg/L	<0.2	<0.2	<0.2
Coumaphos	µg/L	<0.2	<0.2	<0.2
Surrogate 4-Chloro-3-NBTF	%	76	81	77

PCBs in Water				
Our Reference		353486-1	353486-2	353486-3
Your Reference	UNITS	BH103	BH105	BH107
Date Sampled		07/06/2024	07/06/2024	07/06/2024
Type of sample		Water	Water	Water
Date extracted	-	12/06/2024	12/06/2024	12/06/2024
Date analysed	-	12/06/2024	12/06/2024	12/06/2024
Aroclor 1016	µg/L	<2	<2	<2
Aroclor 1221	µg/L	<2	<2	<2
Aroclor 1232	µg/L	<2	<2	<2
Aroclor 1242	µg/L	<2	<2	<2
Aroclor 1248	µg/L	<2	<2	<2
Aroclor 1254	µg/L	<2	<2	<2
Aroclor 1260	µg/L	<2	<2	<2
Surrogate 2-Fluorobiphenyl	%	75	81	76

Total Phenolics in Water				
Our Reference		353486-1	353486-2	353486-3
Your Reference	UNITS	BH103	BH105	BH107
Date Sampled		07/06/2024	07/06/2024	07/06/2024
Type of sample		Water	Water	Water
Date extracted	-	13/06/2024	13/06/2024	13/06/2024
Date analysed	-	13/06/2024	13/06/2024	13/06/2024
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05

HM in water - dissolved						
Our Reference		353486-1	353486-2	353486-3	353486-4	353486-5
Your Reference	UNITS	BH103	BH105	BH107	BD1/20240607	RINS1/20240607
Date Sampled		07/06/2024	07/06/2024	07/06/2024	07/06/2024	07/06/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	12/06/2024	12/06/2024	12/06/2024	12/06/2024	12/06/2024
Date analysed	-	12/06/2024	12/06/2024	12/06/2024	12/06/2024	12/06/2024
Arsenic-Dissolved	µg/L	<1	1	1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Copper-Dissolved	µg/L	4	2	<1	3	<1
Lead-Dissolved	µg/L	<1	1	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	4	2	10	4	<1
Zinc-Dissolved	µg/L	50	58	34	44	<1

PFAS in Waters Short				
Our Reference	UNITS	353486-1	353486-2	353486-3
Your Reference		BH103	BH105	BH107
Date Sampled		07/06/2024	07/06/2024	07/06/2024
Type of sample		Water	Water	Water
Date prepared	-	11/06/2024	11/06/2024	11/06/2024
Date analysed	-	11/06/2024	11/06/2024	11/06/2024
Perfluorohexanesulfonic acid - PFHxS	µg/L	<0.01	<0.01	<0.01
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	<0.01	<0.01
Perfluorooctanoic acid PFOA	µg/L	<0.01	<0.01	<0.01
6:2 FTS	µg/L	<0.01	0.01	<0.01
8:2 FTS	µg/L	<0.02	<0.02	<0.02
Surrogate $^{13}C_8$ *PFOS*	%	98	99	101
Surrogate $^{13}C_2$ *PFOA*	%	101	105	106
Extracted ISTD $^{18}O_2$ *PFHxS*	%	110	106	102
Extracted ISTD $^{13}C_4$ *PFOS*	%	104	105	102
Extracted ISTD $^{13}C_4$ *PFOA*	%	116	124	113
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	139	177	163
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	120	156	153
Total Positive PFHxS & PFOS	µg/L	0.01	<0.01	<0.01
Total Positive PFOA & PFOS	µg/L	0.01	<0.01	<0.01
Total Positive PFAS	µg/L	0.01	0.01	<0.01

Method ID	Methodology Summary
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
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-021/022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD and/or GC-MS/GC-MSMS. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
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.

Method ID	Methodology Summary
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLPs/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.4 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER.

QUALITY CONTROL: VOCs in water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date Extracted	-			11/06/2024	2	11/06/2024	12/06/2024		11/06/2024	[NT]
Date Analysed	-			12/06/2024	2	12/06/2024	13/06/2024		12/06/2024	[NT]
Dichlorodifluoromethane	µg/L	10	Org-023	<10	2	<10	<10	0	[NT]	[NT]
Chloromethane	µg/L	10	Org-023	<10	2	<10	<10	0	[NT]	[NT]
Vinyl Chloride	µg/L	10	Org-023	<10	2	<10	<10	0	[NT]	[NT]
Bromomethane	µg/L	10	Org-023	<10	2	<10	<10	0	[NT]	[NT]
Chloroethane	µg/L	10	Org-023	<10	2	<10	<10	0	[NT]	[NT]
Trichlorofluoromethane	µg/L	10	Org-023	<10	2	<10	<10	0	[NT]	[NT]
1,1-Dichloroethene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Trans-1,2-dichloroethene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,1-dichloroethane	µg/L	1	Org-023	<1	2	<1	<1	0	101	[NT]
Cis-1,2-dichloroethene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Bromochloromethane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Chloroform	µg/L	1	Org-023	<1	2	5	5	0	102	[NT]
2,2-dichloropropane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,2-dichloroethane	µg/L	1	Org-023	<1	2	<1	<1	0	99	[NT]
1,1,1-trichloroethane	µg/L	1	Org-023	<1	2	<1	<1	0	102	[NT]
1,1-dichloropropene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Cyclohexane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Carbon tetrachloride	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Benzene	µg/L	1	Org-023	<1	2	<1	<1	0	102	[NT]
Dibromomethane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,2-dichloropropane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Trichloroethene	µg/L	1	Org-023	<1	2	<1	<1	0	115	[NT]
Bromodichloromethane	µg/L	1	Org-023	<1	2	<1	<1	0	101	[NT]
trans-1,3-dichloropropene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
cis-1,3-dichloropropene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,1,2-trichloroethane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Toluene	µg/L	1	Org-023	<1	2	<1	<1	0	99	[NT]
1,3-dichloropropane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Dibromochloromethane	µg/L	1	Org-023	<1	2	<1	<1	0	107	[NT]
1,2-dibromoethane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Tetrachloroethene	µg/L	1	Org-023	<1	2	<1	<1	0	100	[NT]
1,1,1,2-tetrachloroethane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Chlorobenzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	2	<1	<1	0	98	[NT]
Bromoform	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
m+p-xylene	µg/L	2	Org-023	<2	2	<2	<2	0	99	[NT]
Styrene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,1,2,2-tetrachloroethane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]

QUALITY CONTROL: VOCs in water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
o-xylene	µg/L	1	Org-023	<1	2	<1	<1	0	100	[NT]
1,2,3-trichloropropane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Isopropylbenzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Bromobenzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
n-propyl benzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
2-chlorotoluene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
4-chlorotoluene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,3,5-trimethyl benzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Tert-butyl benzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,2,4-trimethyl benzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,3-dichlorobenzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Sec-butyl benzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,4-dichlorobenzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
4-isopropyl toluene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,2-dichlorobenzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
n-butyl benzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,2-dibromo-3-chloropropane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,2,4-trichlorobenzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Hexachlorobutadiene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,2,3-trichlorobenzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	113	2	120	113	6	110	[NT]
Surrogate Toluene-d8	%		Org-023	98	2	100	99	1	100	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	96	2	95	97	2	101	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date extracted	-			11/06/2024	2	11/06/2024	12/06/2024		11/06/2024	[NT]
Date analysed	-			12/06/2024	2	12/06/2024	13/06/2024		12/06/2024	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	2	<10	<10	0	99	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	2	<10	<10	0	99	[NT]
Benzene	µg/L	1	Org-023	<1	2	<1	<1	0	102	[NT]
Toluene	µg/L	1	Org-023	<1	2	<1	<1	0	99	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	2	<1	<1	0	98	[NT]
m+p-xylene	µg/L	2	Org-023	<2	2	<2	<2	0	99	[NT]
o-xylene	µg/L	1	Org-023	<1	2	<1	<1	0	100	[NT]
Naphthalene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	113	2	120	113	6	110	[NT]
Surrogate Toluene-d8	%		Org-023	98	2	100	99	1	100	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	96	2	95	97	2	101	[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	-			12/06/2024	1	12/06/2024	12/06/2024		12/06/2024	[NT]
Date analysed	-			12/06/2024	1	12/06/2024	12/06/2024		12/06/2024	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	1	<50	<50	0	113	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	1	<100	<100	0	109	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	1	<100	<100	0	100	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	1	<50	<50	0	113	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	1	<100	<100	0	109	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	1	<100	<100	0	100	[NT]
Surrogate o-Terphenyl	%		Org-020	117	1	92	89	3	85	[NT]

QUALITY CONTROL: PAHs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	353486-2
Date extracted	-			12/06/2024	1	12/06/2024	12/06/2024		12/06/2024	12/06/2024
Date analysed	-			12/06/2024	1	12/06/2024	12/06/2024		12/06/2024	12/06/2024
Naphthalene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	90	93
Acenaphthylene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	87	90
Fluorene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	88	91
Phenanthrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	94	95
Anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	94	99
Pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	93	101
Benzo(a)anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	75	76
Benzo(b,j+k)fluoranthene	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	68	75
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	90	1	90	98	9	92	96

QUALITY CONTROL: Organochlorine Pesticides in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	353486-2
Date extracted	-			12/06/2024	1	12/06/2024	12/06/2024		12/06/2024	12/06/2024
Date analysed	-			12/06/2024	1	12/06/2024	12/06/2024		12/06/2024	12/06/2024
alpha-BHC	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	90	93
HCB	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
beta-BHC	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	78	89
gamma-BHC	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Heptachlor	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	99	109
delta-BHC	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Aldrin	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	96	106
Heptachlor Epoxide	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	118	127
gamma-Chlordane	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
alpha-Chlordane	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Endosulfan I	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
pp-DDE	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	104	113
Dieldrin	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	99	105
Endrin	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	100	136
Endosulfan II	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
pp-DDD	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	93	110
Endrin Aldehyde	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
pp-DDT	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Endosulfan Sulphate	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	87	110
Methoxychlor	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Mirex	ug/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	76	1	76	80	5	82	87

QUALITY CONTROL: OP Pesticides in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	353486-2
Date extracted	-			12/06/2024	1	12/06/2024	12/06/2024		12/06/2024	12/06/2024
Date analysed	-			12/06/2024	1	12/06/2024	12/06/2024		12/06/2024	12/06/2024
Dichlorvos	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	79	87
Mevinphos	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Phorate	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Dimethoate	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Diazinon	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Disulfoton	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Chlorpyriphos-methyl	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Parathion-Methyl	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Ronnel	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	88	98
Fenitrothion	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	90	118
Malathion	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	99	111
Chlorpyriphos	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	89	94
Fenthion	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Parathion	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	80	95
Bromophos ethyl	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Methidathion	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Fenamiphos	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Ethion	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	87	109
Phosalone	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Azinphos-methyl (Guthion)	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Coumaphos	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	76	1	76	80	5	82	87

QUALITY CONTROL: PCBs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	353486-2
Date extracted	-			12/06/2024	1	12/06/2024	12/06/2024		12/06/2024	12/06/2024
Date analysed	-			12/06/2024	1	12/06/2024	12/06/2024		12/06/2024	12/06/2024
Aroclor 1016	µg/L	2	Org-021/022/025	<2	1	<2	<2	0	[NT]	[NT]
Aroclor 1221	µg/L	2	Org-021/022/025	<2	1	<2	<2	0	[NT]	[NT]
Aroclor 1232	µg/L	2	Org-021/022/025	<2	1	<2	<2	0	[NT]	[NT]
Aroclor 1242	µg/L	2	Org-021/022/025	<2	1	<2	<2	0	[NT]	[NT]
Aroclor 1248	µg/L	2	Org-021/022/025	<2	1	<2	<2	0	[NT]	[NT]
Aroclor 1254	µg/L	2	Org-021/022/025	<2	1	<2	<2	0	108	120
Aroclor 1260	µg/L	2	Org-021/022/025	<2	1	<2	<2	0	[NT]	[NT]
Surrogate 2-Fluorobiphenyl	%		Org-021/022/025	76	1	75	80	6	80	85

QUALITY CONTROL: Total Phenolics in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	353486-1
Date extracted	-			13/06/2024	[NT]	[NT]	[NT]	[NT]	13/06/2024	13/06/2024
Date analysed	-			13/06/2024	[NT]	[NT]	[NT]	[NT]	13/06/2024	13/06/2024
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	[NT]	[NT]	[NT]	[NT]	99	91

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date prepared	-			12/06/2024	[NT]	[NT]	[NT]	[NT]	12/06/2024	[NT]
Date analysed	-			12/06/2024	[NT]	[NT]	[NT]	[NT]	12/06/2024	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	90	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	[NT]	[NT]	[NT]	[NT]	86	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	84	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	90	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	91	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	[NT]	[NT]	[NT]	[NT]	107	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	92	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	87	[NT]

QUALITY CONTROL: PFAS in Waters Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date prepared	-			11/06/2024	[NT]	[NT]	[NT]	[NT]	11/06/2024	[NT]
Date analysed	-			11/06/2024	[NT]	[NT]	[NT]	[NT]	11/06/2024	[NT]
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	103	[NT]
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	101	[NT]
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	105	[NT]
6:2 FTS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	100	[NT]
8:2 FTS	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	99	[NT]
Surrogate $^{13}C_8$ *PFOS*	%		Org-029	101	[NT]	[NT]	[NT]	[NT]	100	[NT]
Surrogate $^{13}C_2$ *PFOA*	%		Org-029	95	[NT]	[NT]	[NT]	[NT]	98	[NT]
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	102	[NT]	[NT]	[NT]	[NT]	100	[NT]
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	97	[NT]	[NT]	[NT]	[NT]	99	[NT]
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	113	[NT]	[NT]	[NT]	[NT]	108	[NT]
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-029	115	[NT]	[NT]	[NT]	[NT]	118	[NT]
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	116	[NT]	[NT]	[NT]	[NT]	120	[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.

CHAIN OF CUSTODY DESPATCH SHEET

Douglas PARTNERS

Project No: 224583.02	**Suburb:** Five Dock		**To:** Envirolab Services
Project Manager: Kurt Plambeck	**Order Number:**	**Sampler:** PJ	12 Ashley St, Chatswood 2067 NSW
Email: kurt.plamback@douglaspartners.com.au; patrick.johansson@douglaspartners.com.au			**Attn:** Aileen Hie
Turnaround time: ☑ Standard ☐ 72 hour ☐ 48 hour ☐ 24 hour ☐ Same day			Lab phone Lab email
Prior Storage: ☐ Fridge ☐ Freezer ☑ Esky ☐ Shelf	**Do samples contain 'potential' HBM?** ☐ No ☐ Yes (If YES, handle, transport, store in accordance with FPM HAZID)		

Lab ID	Sample ID: Location / Other ID	Depth From	Depth To	Date Sampled	Sample Type: S - soil W - water M - Material	Container Type: G - glass P - plastic	Analytes: Combo 8	Combo 3	PFAS (short suite)	HM8	VOC	BTEX						Notes/ Preservation/ Additional Requirements
1	BH103			7/06/24	w	G/P	x		x		x							
2	BH105			7/06/24	w	G/P	x		x		x							
3	BH107			7/06/24	w	G/P	x		x		x							
4	BD1/20240607			7/06/24	w	G/P		x										
5	RINS1/20240607			7/06/24	w	G/P				x	x							
6	TS-070624			7/06/24	w	G						x						
7	TB-070624			7/06/24	w	G						x						

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

Job No: 353486
Date Received: 7/5/24
Time Received: 1605
Received By: JN
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Metals to analyse: 8ha
Number of samples in container:
Transported to laboratory by: PJ
Send results to: Douglas Partners Pty Ltd
Address: 96 Hermitage Rd, West Ryde 2114 NSW
Phone: (02) 9809 0666
Relinquished by: PJ
Date: 7/06/2024
Signed: PJ

LAB RECEIPT
Lab Ref. No: 353486
Received by: ELS SYD
Date & Time: 7/6/24, 1605
Signed: JN