Groundwater Impact Assessment

Uniting War Memorial Hospital Waverley (Uniting Waverley)

Birrell Street, Bronte Road, Church Street and Carrington Road, Waverley NSW

Prepared for The Uniting Church in Australia Property Trust (NSW) for Uniting (NSW.ACT)

Project 204088.03
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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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Groundwater Impact Assessment
Uniting War Memorial Hospital Waverley (Uniting Waverley)
Birrell Street, Bronte Road, Church Street and Carrington Road, Waverley NSW

1. Introduction

This groundwater impact assessment report has been prepared by Douglas Partners (Douglas) for the Waverley Uniting War Memorial Hospital development (Uniting Waverley) which is bounded by Birrell Street, Bronte Road, Church Street and Carrington Road, Waverley NSW ('the site'). The assessment was commissioned on behalf of The Uniting Church in Australia Property Trust (NSW) for Uniting (NSW.ACT).

The aim of this assessment is to assess the potential impacts of the proposed development on groundwater, together with monitoring and mitigation measures that should be adopted during construction to manage groundwater.

It is understood that the proposed development comprises a Residential Aged Care Facility (RACF), Independent Living Units (ILUs), Community and Ancillary Land Uses at the Uniting War Memorial Hospital Site. The proposed development is for the purposes of Seniors Housing which seeks to create a unique and special place that supports older people and the wider community. It will offer contemporary housing, aged care and health and wellness services within a welcoming urban oasis that promotes social connection, communal spaces and landscaped areas within the site. The site is shown on Drawing 1, Appendix A.

This assessment is based on the results of a geotechnical investigation undertaken at this site in July and August 2023, with groundwater monitoring undertaken in July and August 2023 and November 2024 (Douglas, 2024). An overview of the results of the investigations is presented in this report.

Groundwater levels across the site have been measured at a reduced level (RL) of around 84 to 92 m AHD during the current investigation. Dewatering to up to about 78 m AHD will be required for the construction of the proposed basements.

This report is required to accompany the environmental impact statement (EIS) for the State Significant Development (SSD-61389706) application to the relevant authorities for the proposed development. It was prepared in response to the requirements contained within the Planning Secretary's Environmental Assessment Requirements (SEARs) dated 18 August 2023. Specifically, this report has been prepared to respond to the SEARs requirements issued below.

Table 1: SEARs addressed in this report

SEARs item	Issue and assessment requirements	Documentation	Report section
13. Ground and Water Conditions	13.2 Provide a Surface and Groundwater Impact Assessment that assesses potential impacts on:	Surface and Groundwater Impact Assessment	-
	• surface water resources (quality and quantity) including related infrastructure, hydrology, dependent ecosystems, drainage lines, downstream assets and watercourses; and		Section 3
	• groundwater resources in accordance with the Groundwater Guidelines.		Sections 3 to 8

This groundwater impact assessment has been prepared with reference to the following policy and guidelines:

- NSW DPE. (2021). *Minimum requirements for building site groundwater investigations and reporting*;
- NSW DPE. (2022). *Guidelines for groundwater documentation for SSD / SSI projects*; and
- NSW Government. (2012). Aquifer Interference Policy.

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

2. Site description

The site is situated within the Eastern Suburbs of Sydney. The site occupies over 3.4 hectares of land, bound by Bronte Road, Birrell Street, Church Street and Carrington Road (refer to Figure 1). The site slopes significantly from east to west, with approximately 15 m difference in elevation between the highest point along the eastern boundary and the lowest point along the western boundary. The campus contains many significant historical elements which are subject to local heritage classification under the Waverley City Council LEP.

The subject area investigated for the purposes of this report occupies 2.2 hectares of land and can be seen highlighted in Figure 1. The area highlighted slopes significantly from east to west, with approximately 13 m difference in elevation between the highest point along the eastern boundary and the lowest point along the western boundary.

Figure 1: Aerial image of the site (blue boundary) with subject area highlighted (red boundary).

3. Published data

3.1 Geology

Reference to the NSW Seamless Geology map indicates that the bedrock underlying the site comprises Hawkesbury Sandstone which typically comprises horizontally bedded and vertically jointed, massive and cross-bedded, medium to coarse grained quartz sandstone with occasional shale or siltstone interbeds.

An extract of the geology map is shown in Figure 2 below.

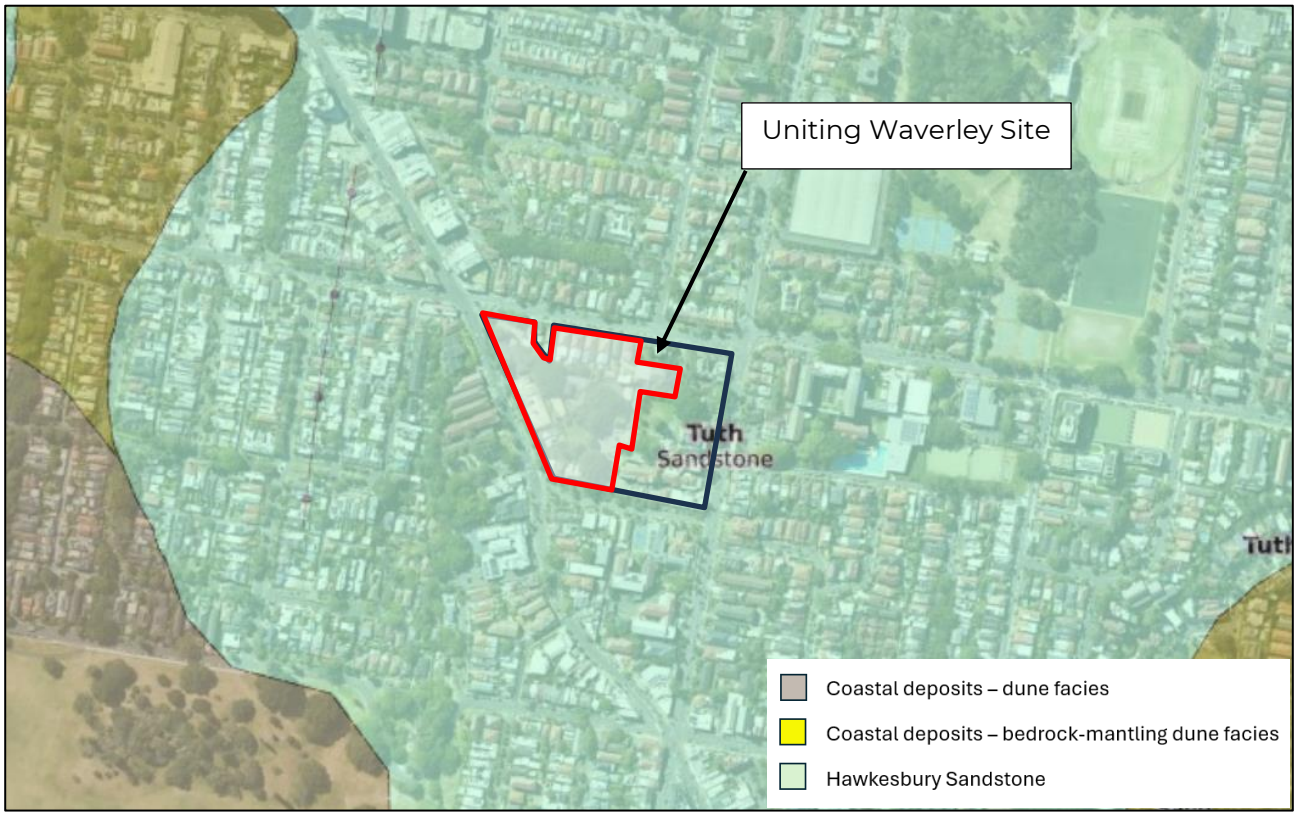


Figure 2: Extract of NSW seamless geology map with subject area outlined in red.

Previous investigations on and around the site confirm the presence of relatively shallow Hawkesbury Sandstone beneath the site.

3.2 Soil landscape

Reference to the Sydney 1 : 100 000 Soils Landscape Sheet, indicates that the site is underlain by Newport Soils (shallow, well sorted siliceous sands - Aeolian). Newport Soils are reported to have a very high soil erosion hazard.

3.3 Third party bores

There are eight registered groundwater monitoring bores within 500 m of the site. None of these monitoring bores have recorded standing groundwater levels; however, a recreational use bore approximately 580 m northeast of the site has a recorded standing water level at 21.6 m depth. Given its distance from the site and its screens being deeper than the proposed basement, the recorded groundwater level may not be representative of groundwater conditions at the Uniting Waverley site. An aerial image showing the location of the registered groundwater bores is shown in Figure 3.

Figure 3: Aerial image of registered groundwater bores, subject area in red)

3.4 Groundwater dependent ecosystems

A review of the Bureau of Meteorology Groundwater Dependant Ecosystems Atlas indicates that there is no aquatic, subterranean or terrestrial GDEs within 1 km of the site.

3.5 Acid sulfate soils

Published Acid Sulfate Soils (ASS) mapping (NSW Department of Environment and Climate Change based on published 1 : 25 000 Acid Sulfate Soil Risk Mapping, 1994-1998) indicates the site is in an area of no known occurrence of ASS.

3.6 Salinity

Dryland salinity risk and hazard mapping was undertaken in 2000 by the former NSW Government Departments of Land and Water Conservation to show the broad distribution of areas considered as having a high salinity risk or hazard. The site is not located within a zone mapped as having a salinity potential.

3.7 Riparian lands

Reference to the NSW Riparian Lands and Watercourses Map indicates that there are no riparian lands or watercourses within a 1 km radius of the site.

4. Investigation results

4.1 Geotechnical investigation

Nine boreholes (BH1 to BH9) were drilled to depths of approximately of 8 m to 20 m between 24 July and 9 August 2023. Details of the subsurface conditions encountered are provided in the geotechnical investigation report (Douglas, 2024). The locations of the boreholes are shown in Drawing 1 (Appendix A).

A summary of the interpreted geotechnical model is provided in Table 2.

Table 2: Summary of geotechnical model

Geotechnical unit	Description	Detailed description
Unit 1	Fill	Fill comprising silty sand and gravelly sands
Unit 2	Aeolian sand	Medium dense to very dense aeolian sand
Unit 3	Class V / IV	Sandstone bedrock of very low to low strength
Unit 4	Class III / II	Sandstone bedrock of medium strength or stronger

Note: Rock Class in accordance with Bertuzzi & Pells (2002) Application of Classification to a General Rock Profile

Free groundwater was only observed during auguring in borehole BH4 at 0.4 m depth. The use of water for rotary / washbore drilling and rock coring precluded any further observation of groundwater.

4.2 Groundwater levels

Four groundwater wells were installed within the site: BH1, BH3, BH6 and BH8 (Drawing 1, Appendix A). A summary of the well installation details is shown in Table 3.

Table 3: Summary of well installation details

Borehole	Surface Level (mAHD)	Screen Depth (m)	Screened Material
BH1	86.3	4.5 – 9.1	Sandstone
BH3	85.8	4.5 – 9.0	Sandstone
BH6	94.2	3.5 – 12.1	Sandstone
BH8	91.6	4.8 – 11.7	Sandstone

A summary of the manual water level readings recorded in the four monitoring wells are shown in Table 4.

Table 4: Summary of manual water level readings

Borehole	Measured Depth to Groundwater (m) [Groundwater Level (mAHD)]			
	09/08/2023	11/08/2023	17/08/2023	19/11/2024
BH1	5.34[1] [80.96]	-	3.67[1] [82.63]	2.00 [84.30]
BH3	-	4.00[1] [81.80]	2.20 [83.60]	2.30 [83.50]
BH6	2.90[1] [91.30]	-	2.53 [91.67]	2.35 [91.85]
BH8	2.14 [89.46]	2.08 [89.52]	2.04 [89.56]	1.93 [89.67]

Note: 1 - Groundwater levels appear to have not stabilised following rising head testing

Downhole data-loggers were installed in the monitoring wells after the initial reading to allow long-term monitoring between August 2023 and October 2024 and were re-installed in December 2024 until January 2025. A summary of the logger data is provided in Table 5. The hydrographs are attached in Appendix D.

Groundwater levels have generally been observed between 84 and 92 m AHD within the rock. Groundwater levels were generally stable and responded to climatic variations following significant rainfall events.

Spikes in response to rainfall were observed in BH6 until December 2023. From 2024, these spikes were no longer recorded and only attenuated responses to climatic variations were observed. The cause of these early groundwater level spikes that subsequently ceased is unknown.

Table 5: Summary of groundwater monitoring results (logger data)

Borehole (Well)	Screened lithology	Datalogger Installation Date	Groundwater Level During Monitoring Period (m AHD)		
			Minimum	Maximum	Average
BH1	Sandstone	09/08/2023	83.8 (07/12/2023)	84.7 (13/05/2024)	84.2
BH3	Sandstone	11/08/2023	83.5 (27/10/2023)	84.2 (21/01/2025)	83.8
BH6	Sandstone	04/08/2023	91.4 (27/10/2023)	94.3 (16/08/2023)	91.6
BH8	Sandstone	04/08/2023	89.2 (07/12/2023)	90.3 (07/06/2024)	89.6

4.3 Hydraulic conductivity testing

Rising head tests were carried out in boreholes BH1, BH3, BH6 and BH8 between 4 August 2023 and 11 August 2023 to estimate the hydraulic conductivity of the sandstone.

The rising head testing involved the removal of groundwater from the monitoring well, then measurement of the groundwater recharge (i.e., increase / return of water in the well) at regular time intervals. The results of the tests were analysed using Horslev's solution (1951) for slug testing interpretation and are summarised in Table 6, with the detailed reports provided in Appendix E.

Table 6: Summary of hydraulic conductivity

Borehole	Screen Depth (m)	Screen Material	Hydraulic Conductivity k (m/s)
BH1	4.5 – 9.1	Sandstone	2.2×10^{-9}
BH3	4.5 – 9.0	Sandstone	4.3×10^{-9}
BH6	3.5 – 12.1	Sandstone	2.2×10^{-8}
BH8	4.8 – 11.7	Sandstone	4.9×10^{-8}
Mean			**2.0×10^{-8}**

4.4 Groundwater quality

Groundwater quality testing was initially undertaken in the monitoring wells following their installation in August 2023. The wells were sampled again in December 2024.

The stabilised groundwater field parameters were recorded within the temporary observation wells prior to sampling. The field parameters are summarised below:

- The dissolved oxygen levels indicated generally anoxic conditions;
- The pH was slightly acidic;
- The electrical conductivity values are typical of fresh water as would be expected of Hawkesbury Sandstone;
- Redox potential (Eh) indicates slightly oxidising conditions; and
- No light non-aqueous phase liquid (LNAPL) was observed whilst sampling or detected using the interface probe.

A summary of the groundwater quality analytical results compared to relevant guidelines are presented in Appendix F.

All results for polycyclic aromatic hydrocarbons (PAH), phenol, organochlorine pesticides (OCP), organophosphorus pesticides (OPP) and polychlorinated biphenyls (PCB) were below the practical quantitative limit (PQL) and site assessment criteria (SAC) (noting that the PQL for a number of OCP and OPP are higher than the SAC). All concentrations of total recoverable hydrocarbon (TRH), benzene, toluene, ethylbenzene and xylenes (BTEX) and volatile organic compounds (VOC) were below the SAC.

Most analytical results for metals were below the SAC with the exception of the following:

- Chromium at 5 µg/L (August 2023) and 6 µg/L (December 2024) in BH3 which exceeded the ANZG 95% level of protection (LOP) for fresh water of 1 µg/L;
- Copper in all samples (ranging from 2 to 6 µg/L) in August 2023, and in BH3 and BH6 (at 2 µg/L) in December 2024 which exceeded the 95% LOP for fresh water of 1.4 µg/L;
- Nickel 31 µg/L (August 2023) and 16 µg/L (December 2024) in BH3 which exceeded the 95% LOP for fresh water of 11 µg/L; and
- Zinc in all samples (ranging from 22 to 55 µg/L) which exceeded the 95 % LOP for fresh water of 8 µg/L.

Based on our experience in the area, the concentrations of these metals in groundwater are considered likely to be attributed to the background concentrations that would be associated with the mineralogy of the sandstone and possibly other urban influences.

5. Conceptual hydrogeological model

The site subsurface profile comprised sandy fill and Aeolian soils (sand) underlain by Hawkesbury Sandstone bedrock.

The depth to groundwater was recorded in the four monitoring wells installed within the site. Water levels measured in the monitoring wells typically ranged between about 1.6 to 2.5 m depth. This indicates groundwater is within bedrock, along defects where secondary permeability has been enhanced (e.g., in fractures and cracks). Groundwater appears to flow west, following the topography of the site.

The soil profile was observed to be dry / moist during the groundwater investigation and monitoring period; however, some ephemeral perched water may be present at the soil / bedrock interface following rainfall events (or other anthropogenic recharge).

It should be noted that groundwater levels fluctuate with climatic variations and other factors (e.g., adjacent basements). Therefore, the water levels will temporarily rise during periods of heavy or prolonged rainfall and fall during dry periods.

It is expected that water inputs to the ground profile beneath the site include:

- Rainfall infiltration on the site and surrounds, including water flowing downslope laterally through the natural soils and bedrock from areas of higher topography; and
- Possible anthropogenic recharge from seepage from nearby leaking water mains and / or stormwater pipes, garden irrigation etc.

Water outputs or losses from the ground beneath the site include:

- Evapotranspiration from the vegetation across the surface; and
- Nearby dewatering projects or drained basements, if applicable.

6. Proposed development

It is understood that the proposed development comprises a Residential Aged Care Facility (RACF), Independent Living Units (ILUs), Community and Ancillary Land Uses at the Uniting War Memorial Hospital Site.

The proposal involves the construction and operation of Seniors Housing at the Uniting War Memorial Hospital Site (Uniting Waverley), comprising:

- Earthworks involving cut and fill;
- Tree removal;
- Demolition of existing structures on the northern and western portion of the Subject Site;
- Demolition of Cadi Cottage;
- Adaptive Reuse of 3 heritage buildings (Ellerslie, Banksia and Wych Hazel, and Church St Cottages);
- Augmentation of existing services and infrastructure such as water, power, and sewer;
- Construction of basement car parking comprising 478 car parking spaces;
- Construction of a 6-storey Residential Aged Care Facility (RACF), including:
  - 105 beds;
  - Consulting rooms and staff administration areas;
  - Ancillary land uses including a salon, cafe, chapel; and
  - Community facilities including a seniors' gym.
- Construction of 4-7-storey Independent Living Unit (ILU) buildings , including:
  - 231 units (including Affordable Rental Housing units);
- Construction of proposed driveway on Bronte Road and secondary driveways on Birrell St; and
- Provision of associated landscaping.

It is understood that the proposed development will include two drained basements with multiple basement levels. These basements are:

- A connected two-level basement carparking under proposed buildings A, B, C and D (Basement A, Figure 4). Lowest finished floor levels (FFL) of Basement A are as follows:
  - RL 79 m AHD under Building D, B+C (western portion);
  - RL 82 m AHD under Building A (eastern portion); and
- A one to two-level basement carparking under proposed buildings E, F and G (Basement B, Figure 4). The lowest finished floor level of Basement B is approximately RL 86 m AHD.

Basement A will be constructed first. Construction of Basement B will commence approximately two years later. Basement A and Basement B will eventually be connected.

An excerpt showing the basement outline is shown in Figure 4.

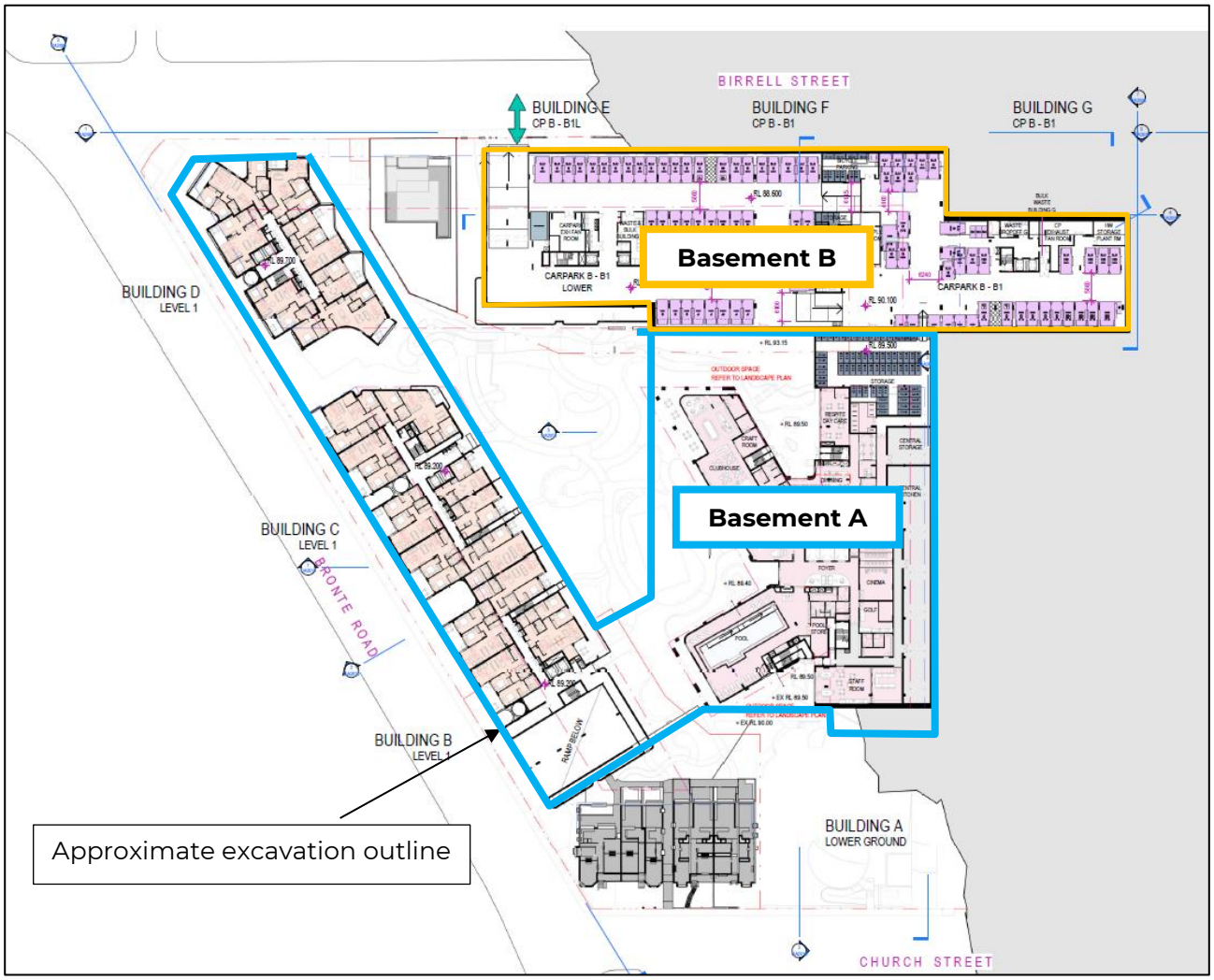


Figure 4: Excerpt of architectural drawings showing basement outline

It is also understood that the basement will feature a stepped profile, as shown in Figure 5. Based on the architectural drawings provided, it is anticipated that excavation of up to 13 m will be required in some areas of the site. Part of the basement excavation is therefore expected to intercept the water table and dewatering will be required.

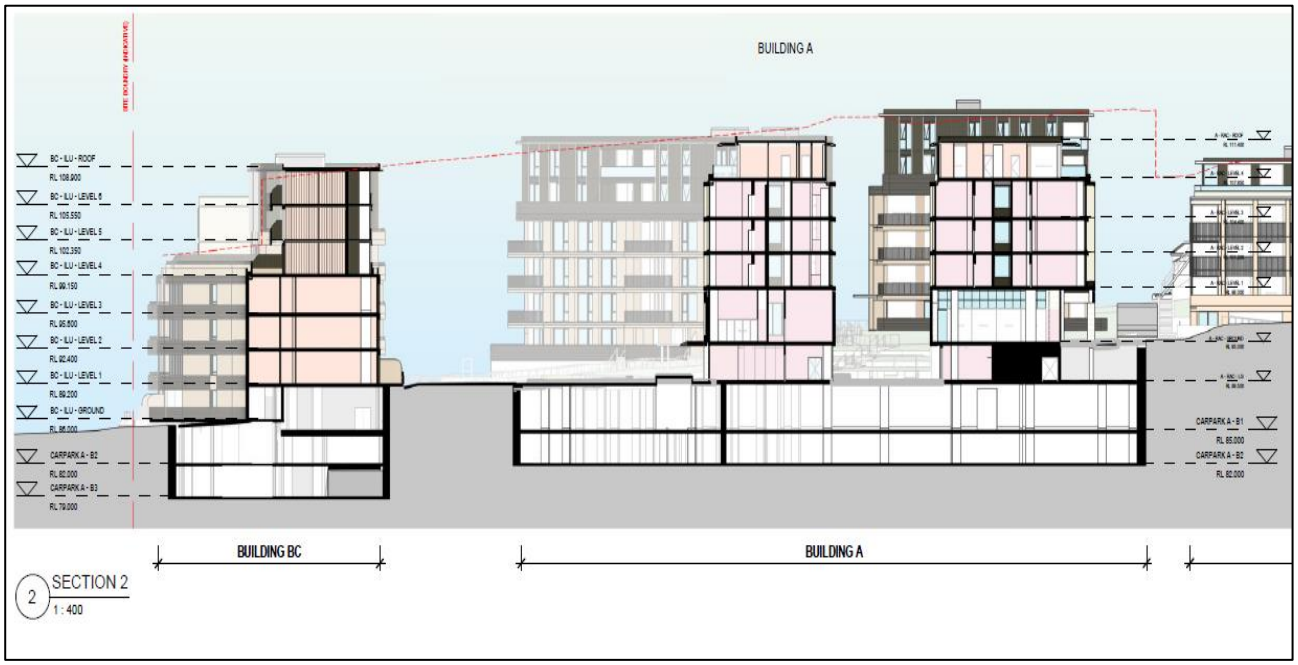


Figure 5: Excerpt of architectural drawings showing stepped basement profile

7. Groundwater inflow assessment

7.1 Numerical modelling methodology

Groundwater modelling was undertaken to assess the potential inflow rates into the proposed basement and the long-term drawdown (or cone of depression), and to indicate the volume of dewatering which is likely to be required during construction and in the long term.

Groundwater model simulations were conducted using the MODFLOW software engines (McDonald & Harbaugh, 1988). MODFLOW is a three-dimensional (3D) numerical groundwater modelling tool and is accepted as an industry-standard code for groundwater flow and contaminant transport. The model was developed using the pre-processor or 3D visualisation technology graphical interface program Visual MODFLOW (VMOD) Flex V10.0 by Waterloo Hydrogeologic. The model was based on site-specific data where possible, as well as estimates of unknown parameters based on experience in similar environments, values from literature (Fetter, 2001) and data matching.

7.1.1 Numerical model geometry and initial boundary conditions

The model extent was defined as the edge of the local catchment in which the overall site is located (Figure 6).

The following boundary conditions were assigned to the model:

- Drain boundary conditions were assigned to represent the drainage lines within the catchment area defined as the model extent; and

- A recharge boundary condition was assigned to the top of Layer 1 to represent rainfall infiltration. As the site and its surrounds are dominated by residential areas, rainfall recharge to the groundwater table is expected to be about 5% of total rainfall. This value was then adjusted as part of the model calibration (Section 7.2).

Recharge could also possibly be occurring from anthropogenic sources, such as seepage from leaking water mains. Loss of water from the aquifer may be occurring due to extraction activities from nearby properties, together with natural discharge into water bodies. Water loss from the aquifer to the atmosphere through evapotranspiration (e.g., from vegetation at the surface, above the aquifer) is considered and combined with the effective recharge value adopted.

The model extent and boundary conditions are shown in Figure 6.

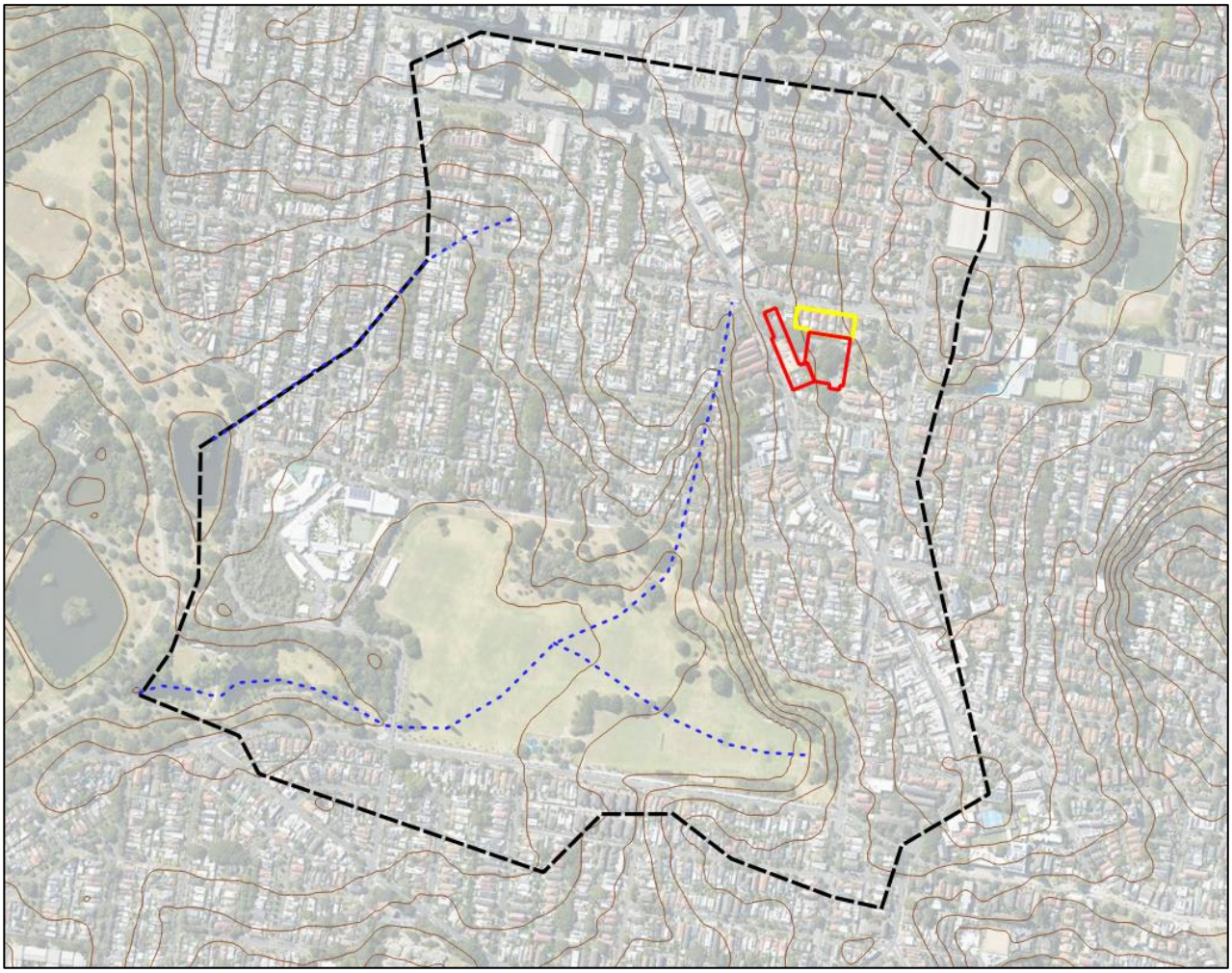


Figure 6: Model extent (black), drain boundary conditions (blue), Basement A (red), Basement B (yellow) and 5 m topography contours (brown)

7.1.2 Model layers

For the purpose of the numerical model and consistency with the geotechnical investigation, only the sandstone unit was modelled, subdivided into four layers to represent vertical flow. Aquifer parameters required for the model included horizontal (k_h) and vertical (k_v) hydraulic conductivity, as well as specific yield and specific storage. The hydraulic conductivity of the sandstone was conservatively assumed to be the maximum value estimated as part of the hydraulic conductivity testing (i.e., 5 x 10^{-8} m/s, Section 4.3). The selected aquifer parameters are presented in Table 7.

The calculated values from the in-situ hydraulic conductivity testing (Section 4.3) were used to define the layers' properties. The modelling was carried out by adopting the maximum value estimated as part of the hydraulic conductivity testing (Section 4.3). The vertical hydraulic conductivity was assumed to be 30% of the horizontal hydraulic conductivity. Other parameters were selected based on ranges of values documented in the available literature for similar lithologies (e.g., Fetter 1994 and Hoek & Bray 1981) and previous experience with similar materials.

Table 7: Model layer summary (base case)

Model Layer	Base of Layer (m AHD)	Number of sub-layers	Aquifer type	Sy	Ss (m^{-1})	k_h (m/s)	k_h/k_v
Sandstone	-20	4	Unconfined / confined	0.05	1 x 10^{-5}	5 x 10^{-8}	0.3

Notes: Sy: Specific yield Ss: Specific storage
k_h: Horizontal hydraulic conductivity k_v: Vertical hydraulic conductivity

7.1.1 Basement dewatering – Drain cells

The MODFLOW 'drain package' can be used to simulate water loss from the groundwater system, which occurs due to dewatering operations. Drain cells, set with a sufficiently high conductance (2,500 m^2/day), simulated the dewatering during construction of the basement.

The drain cells were assigned to 0.8 m below the basement finished floor levels (FFL). The eastern portion of Basement A is proposed with an FFL of approximately RL 82.0 m and a surface area of 5,200 m^2, and the western portion with an FFL of approximately RL 79.0 m and a surface area of 3,730 m^2. The lowest FFL of Basement B is RL 85.6 m. Elevations of the modelled drain cells are provided in Table 8.

Dewatering and construction of Basement A will start first, followed by Basement B two years (730 days) later as shown in Table 8. Construction dewatering would be undertaken over 48 months.

Table 8: Modelled drain cells for basement

Portion	Drain elevation (m AHD)	Starts at
Basement A	81.2 (eastern portion) 78.2 (western portion)	t = 0 day
Basement B	84.8	t = 730 days

A cross-section of the model layers and set-up is provided in Figure 7.

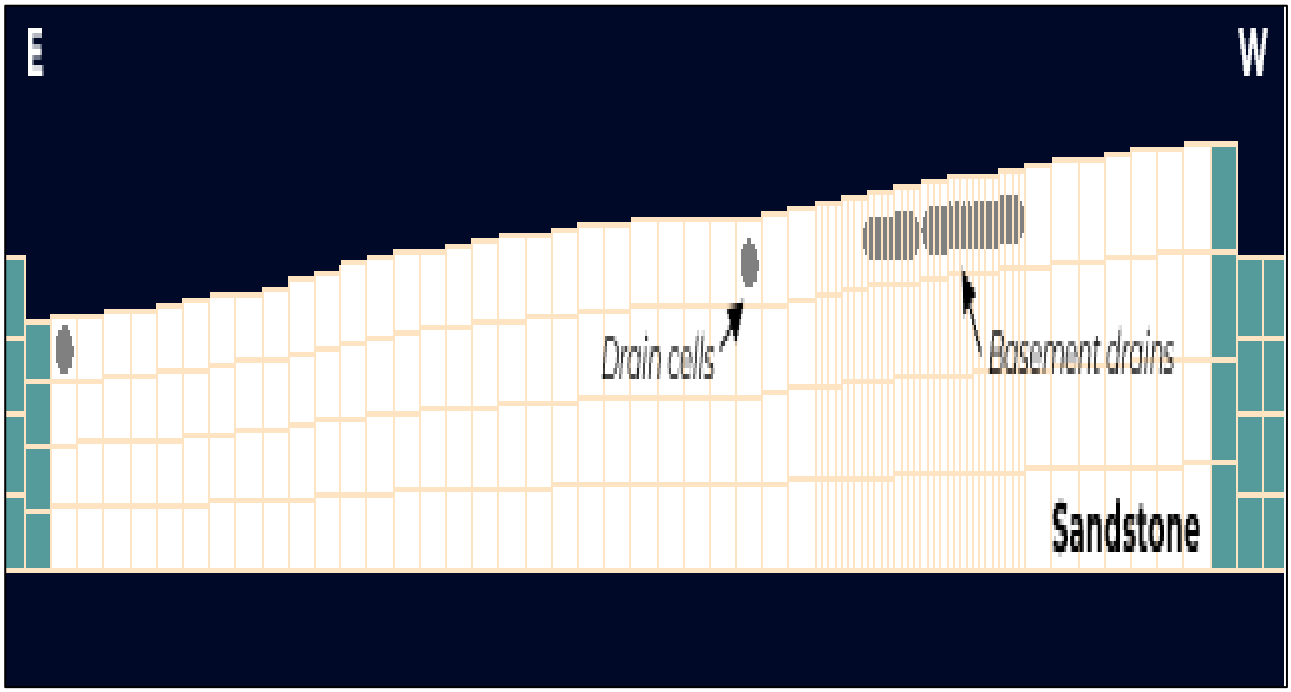


Figure 7: Model set-up

7.2 Model calibration – Initial Heads

The initial model (i.e. pre-development) was calibrated by adjusting rainfall recharge and watercourse drain elevations to match the observed groundwater levels at the site, with the groundwater level (or potentiometric head) averaging 84 to 92 m AHD within the site (Section 4.2). The estimated rainfall infiltration obtained from calibration is about 3% of the average total annual rainfall for Sydney, close to the expected value (Section 7.1.1). Calibration confirmed that the hydraulic parameters chosen for the model appeared to be realistic.

The calibrated groundwater levels were applied to the model as the initial hydraulic heads. The calibrated initial (existing) groundwater contours are illustrated on Drawing 2, Appendix A.

The calibration results are shown on Figure 8.

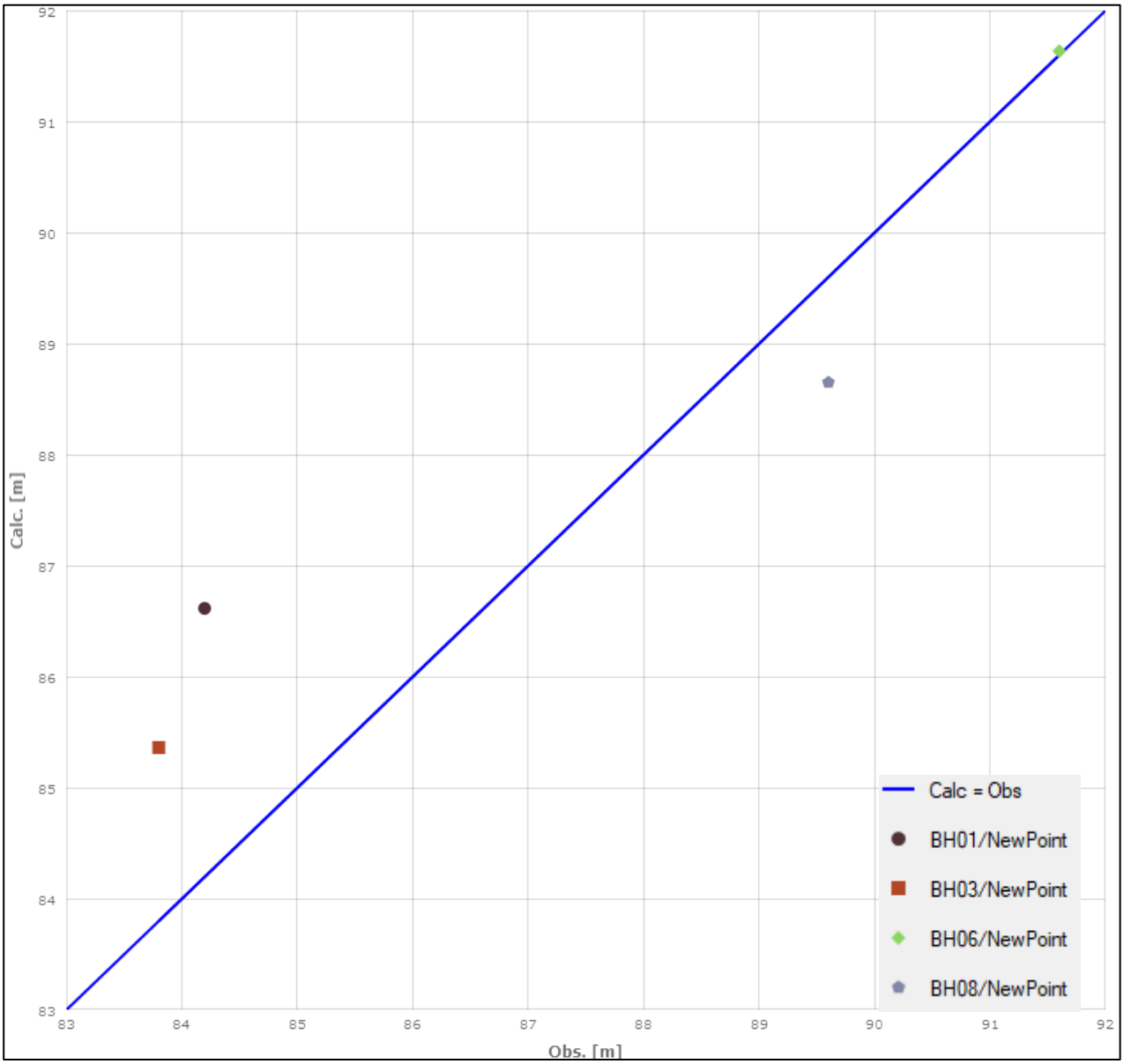


Figure 8: Calibration results

7.3 Sensitivity scenarios

Two sensitivity analyses were run to assess groundwater inflows under higher hydraulic conductivity and higher groundwater level conditions as follows:

- Sensitivity 1: The hydraulic conductivity of the sandstone was assumed to be the geometric mean of the values estimated as part of the hydraulic conductivity testing, i.e., 1 x 10^{-8} m/s (Section 4.3); and
- Sensitivity 2: The hydraulic conductivity of the sandstone was increased to 1 x 10^{-7} m/s, i.e. one order of magnitude higher than the geometric mean (Section 4.3); and
- Sensitivity 3: The water table is 1 m higher than under base case conditions.

7.4 Groundwater modelling results

7.4.1 Predicted groundwater inflow

Groundwater inflow into the 'drain cells' representing the excavation dewatering system, was evaluated throughout the model simulations using the 'zone budget' module of VMOD. The 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 so that the basement excavation can remain dry during construction.

Simulated results for the base case and sensitivity scenarios are presented in Table 9 and Table 10

Table 10, respectively. During the early stages of construction, inflow rates will be higher and will then gradually decrease as the groundwater storage in the aquifer in and around the excavation decreases, and the cone of depression in the potentiometric surface expands out from the basement.

For the inflow analysis, it was assumed that construction would take a total of 48 months (4 years). Basement A would be constructed during the first half of the construction period (first and second years) and Basement B during the second half (third and fourth years).

During the first two years of construction, only Basement A will be dewatered. Under baseline conditions, predicted cumulative inflows for Basement A over the first and second years respectively are 7.0 and 4.0 ML/year. Basement B dewatering will then start in the third year. Cumulative inflows for Basement A and Basement B over the third and fourth years of construction are predicted to be 4.1 and 3.5 ML/year. The cumulative inflow is predicted to reduce to 2 ML/year in the long term (post construction).

In the sensitivity cases, cumulative groundwater inflows are predicted as follows:

- Sensitivity 1: 3 ML during the first year of construction, reducing to 1 ML/year in the long term if the hydraulic conductivity of the sandstone is equal to the geometric mean of measured values;
- Sensitivity 2: 11 ML during the first year of construction, reducing to 5 ML/year in the long term if the hydraulic conductivity of the sandstone is one order of magnitude higher than the geometric mean of measured values. This is considered to be very conservative based on the testing results; and
- Sensitivity 3: 8 ML during the first year of construction, reducing to below 3 ML/year in the long term if the groundwater table is higher than expected.

Table 9: Base case - Simulated groundwater inflow rates with time

Year	Elapsed Time (days)	Dewatering Inflow Rate		
		Volume (m^3 / day)	Inflow rate (L / min)	Cumulative Inflow (ML)
1 (Basement A only)	1	102	76	7.0 (Cumulative during first year)
	2	84	58	
	5	70	49	

Year	Elapsed Time (days)	Dewatering Inflow Rate		
		Volume (m^3 / day)	Inflow rate (L / min)	Cumulative Inflow (ML)
	11	55	39	
	22	42	29	
	45	31	21	
	91	23	16	
	182	17	12	
	365	14	9	
2 (Basement A only)	730	11	8	4.0
3 (Basements A + B)	1095	11	8	4.1
4 (Basements A + B)	1460	10	6	3.5
Long term				
> 5 (Basements A + B)	Post-construction	m^3 / day	L / min	ML / year
		6	4	2.3

Table 10: Sensitivity cases - Simulated groundwater inflow

Stage	Year	Predicted cumulative dewatering inflow (ML / year)		
		Sensitivity 1 $k = 1 \times 10^{-8}$ m/s	Sensitivity 2 $k = 1 \times 10^{-7}$ m/s	Sensitivity 3 GWL + 1m
During construction	1 (Basement A only)	2.9	11.0	7.6
	2 (Basement A only)	1.6	6.8	4.3
	3 (Basements A + B)	1.9	7.1	4.7
	4 (Basements A + B)	1.4	6.3	3.9
Long term (post construction)		0.6	4.6	2.5

Notes: k: hydraulic conductivity
GWL: groundwater level

It should be noted that these volumes are 'estimates' of the average inflows. It is possible that localised zones of higher permeability be present within the site, through which the rate of inflow could be higher, and considering the subsurface heterogeneity and fractured aquifer system, a safety margin for application in the field should be considered. Accordingly, it is recommended that a 'factor of safety' of at least 2 be applied to these values for design purposes and that inflow rates be monitored during excavation and construction.

It should be noted that the simulated dewatering rates and drawdown are dependent on the dewatering scheme adopted for the site. If the depth of basement level and dewatering systems were to change then the currently predicted dewatering rates may change, in which case further modelling would be required.

Dewatering rates may exceed 3 ML during the first year of construction. A water access licence (WAL) of sufficient entitlement will be required to license the predicted water take.

7.4.2 Predicted groundwater drawdown and settlement

The drawdown contours are produced by subtracting the predicted water levels from the initial calibrated groundwater levels. The long term predicted drawdown is illustrated in Drawing 3, Appendix A (under base case conditions).

The model results indicate that the 2 m drawdown contour may extend to 90 m from the edge of the basement, as shown on the drawdown contours in Drawing 3 (Appendix A).

Any predicted drawdown will occur within the sandstone; settlement impacts are therefore unlikely.

8. Impact assessment

8.1 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 basement dewatering on site is expected to occur in the Hawkesbury Sandstone of relatively low hydraulic conductivity where low yields are expected. Under the AIP's definitions, the sandstone aquifer beneath the site is considered a "less productive groundwater source".

It is expected that the measured water levels within the rock on the site are probably associated with seepage flowing through bedding planes, fractures and joints in the rock. Once the groundwater level stabilises following initial excavation, these seepage flows are likely to be relatively minor during periods of dry weather and may increase slightly following periods of wet weather.

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 groundwater sources:

- Less than or equal to 10% cumulative variation in water table 40 m from any high priority groundwater dependant ecosystem, 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 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.

8.2 Risk assessment

An assessment of the potential effects of dewatering on neighbouring properties and groundwater receptors has been summarised in Table 11.

Table 11: Assessment of potential effects of dewatering

Item	Comment
Impacts on potential GDEs	There are no GDEs within 1 km of the site. Drawdown impacts on GDEs are therefore unlikely.
Water supply losses by neighbouring groundwater users	Several water bores are located within 500 m of the site, with the closest bores approximately 130 m (from centre of excavation) southeast of the site. Drawdown is predicted to be less than 1 m at this distance from the site. Hence, impacts at nearby water bores are predicted to be less than 2 m which complies with the AIP minimal impact considerations.
Potential subsidence of neighbouring structures	Groundwater drawdown is predicted to be within bedrock. Therefore, risk of subsidence on surrounding properties due to lowering of the water table is unlikely.
Mounding of water upgradient of structure	No mounding is predicted (drained basement).

Hence, the excavation is not expected to impact any GDEs or groundwater supply works with reference to the AIP minimal impact considerations

9. Proposed mitigation measures

9.1 Monitoring program

A groundwater monitoring program is proposed to be implemented during and after construction. The monitoring program will include groundwater level and water quality monitoring in the monitoring wells and sump(s) collecting inflows into the basement.

The objectives of the monitoring are to assess in a timely manner:

- Changes in groundwater levels that exceed the AIP minimal impact considerations;
- The presence and spreading of seepages of contaminated water;
- Groundwater inflows exceeding those estimated as part of this assessment; and
- The effectiveness of the dewatering system.

Groundwater inflow monitoring will ensure the dewatering volumes remain within predictions and WAL entitlement. Should dewatering rates be significantly higher than expected, construction will be halted, and grouting will be conducted to reduce inflows unless approval for a higher flow can be obtained.

Water quality testing of the water contained in the sump(s) will be undertaken to ensure its suitability for disposal. Should exceedances of the selected disposal criteria be found, treatment will be required prior to disposal.

9.2 Dewatering management plan

A Dewatering Management Plan (DMP) outlining the monitoring requirements of groundwater levels and acceptance criteria thresholds for groundwater disposal off site, together with a contingency plan, will be required for construction dewatering. A DMP should be prepared following the approval of the project by regulatory authorities and prior to the issue of a Construction Certificate. A DMP has been prepared separately by Douglas (ref: report 204088.03.R.004).

10. Conclusion

The geotechnical investigation identified that the site is underlain by sandy fill and Aeolian soils (sand) over Hawkesbury Sandstone. The sandstone has low hydraulic conductivity and hosts confined aquifers along defects (i.e. areas of enhanced secondary permeability). Groundwater levels within the site have been observed between about 1.6 to 2.5 m depth.

The basements are proposed to be drained. Based on the provided architectural drawings, excavations of up to 13 m are expected, hence the water table will be intersected during excavation. Two basements are proposed for the development: Basement A under buildings A, B, C and D, and Basement B under buildings E, F and G. Basement A will be constructed first, and Basement B will start two years later. The two basements will eventually be connected.

Under baseline conditions, groundwater modelling predicts that the total groundwater inflow during the first year of construction could be up to 7 ML/year, and then progressively reduce to 2 ML/year in the long term (post construction). Results of the sensitivity analyses suggest inflows could range between 3 and 11 ML/year during the first year of construction, and between 1 and 5 ML/year in the long term.

The modelling suggests that dewatering inflows would be relatively low and manageable with sumps and pumps. A drained basement is therefore considered technically feasible from a geotechnical point of view.

The project is not expected to impact any GDEs or groundwater supply works with reference to the AIP minimal impact considerations.

Groundwater quality testing undertaken as part of the detailed site investigation showed some metal concentrations exceeded the selected assessment criteria but noted these are considered to be consistent with expected ambient conditions. Treatment may therefore be required prior to disposal.

Based on the modelling results, inflows may be more than 3 ML/year. The proposed excavation is therefore likely to require a Water Access Licence from WaterNSW to cover the predicted water take. In conjunction with this, a groundwater management plan has been developed to outline the dewatering procedures, monitoring requirements and mitigation measures for the project (Douglas, 2025).

It should be noted that modelling predictions are estimates based on the information available. Actual groundwater inflows and drawdown may vary from those calculated.

11. References

Marinelli F, Niccoli W.L. (2000), Simple Analytical Equations for Estimating Ground Water Inflow to a Mine Pit, GROUND WATER, March-April 2000, pp311-314.

NSW Department of Primary Industries - Office of Water (2012), NSW Aquifer Interference Policy.

Douglas. (2024), Report on Geotechnical Investigation – Uniting War Memorial Hospital Waverley. Reference 204088.00.R.002.Rev2, dated 4 December 2024).

Douglas. (2025), Groundwater management plan, Uniting War Memorial Hospital Waverley. Reference 204088.03.R.004.Rev0. Dated 24 January 2025.

12. Limitations

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project bounded by Birrell Street, Bronte Road, Church Street and Carrington Road, Waverley NSW in accordance with the contract and permission to proceed received from Don Wang on behalf of Uniting War Memorial Hospital Waverley (Uniting Waverley). The work was carried out under the existing contract between Uniting Waverley and Douglas. This report is provided for the exclusive use of Uniting Waverley 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.

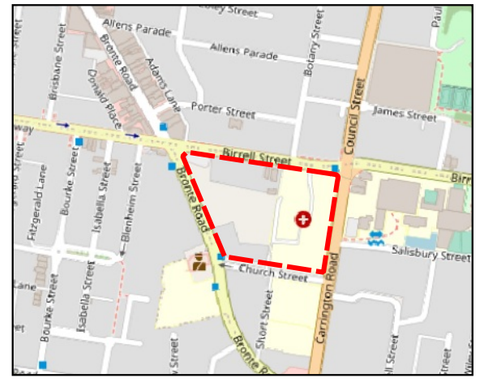
The assessment of atypical safety hazards arising from this advice is restricted to the (geotechnical / environmental / groundwater) components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, 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

Drawings



Locality Plan

LEGEND

- Borehole Location
- Approximate Proposed Building Footprint
- Approximate Proposed Building Footprint
- Approximate Proposed Building Footprint
- Approximate Proposed Building G Footprint
- Approximate Site Boundary
- Geotechnical Cross Section

NOTE:
1: Basemap from Metromap (Dated 26.07.2023)
2: Proposed Ground Level and Basement 01-02 Outlines from Architectus, Project No. 170454.00, Drawing Nos. DA1100, 1099 & 1098, Issue C (Dated 07.08.2023)

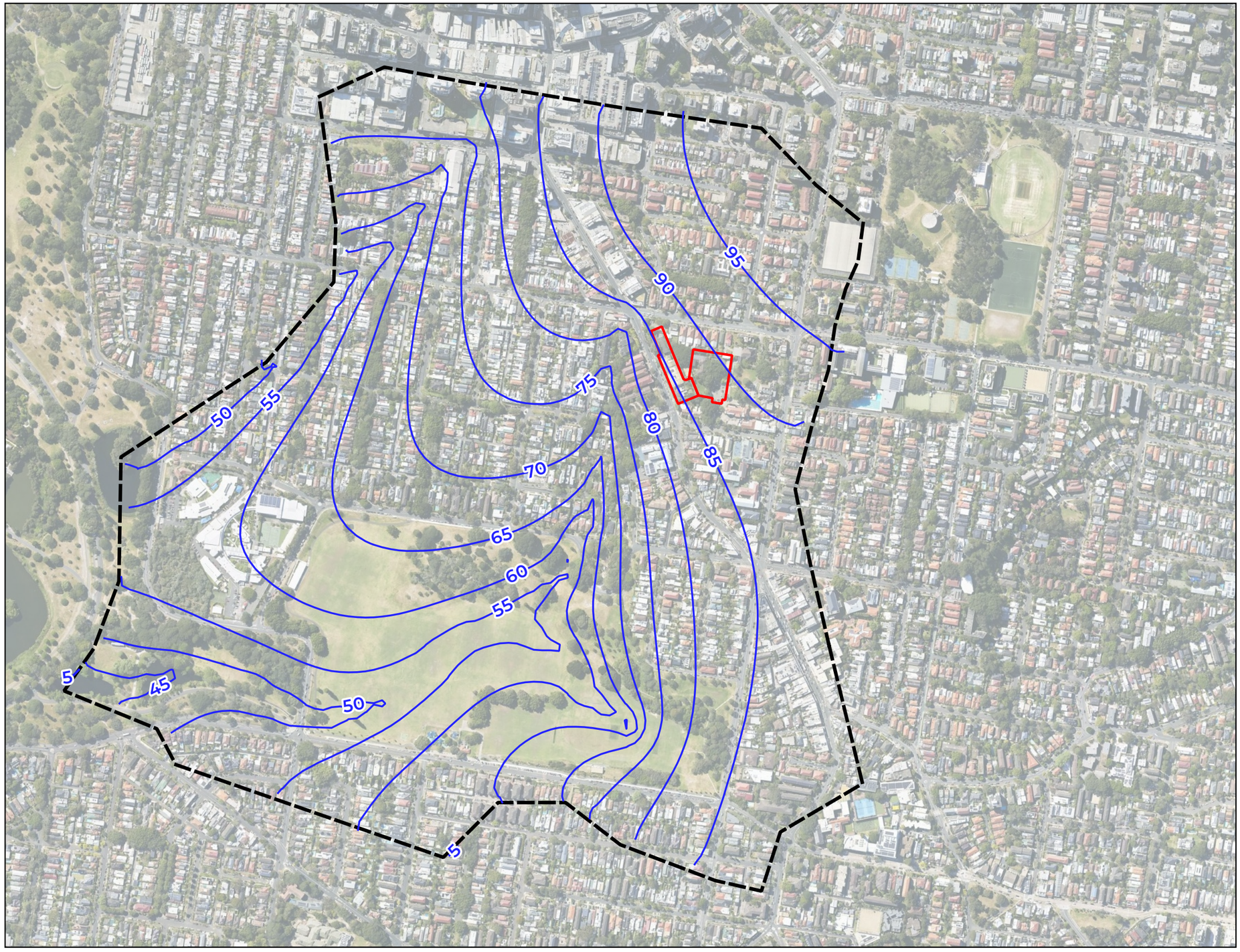
0 10 20 30 40 50 60 70 80 90 100 m

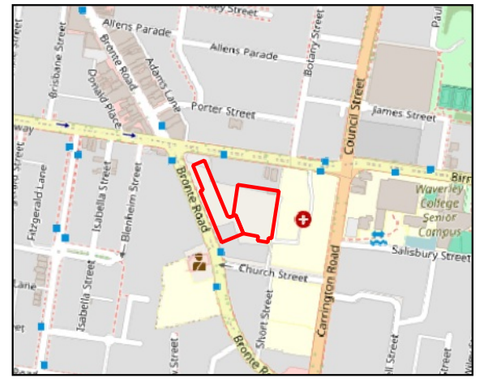
1:1000 @ A3

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: The Uniting Church in Australia Property Trust (NSW) for Uniting NSW.ACT		TITLE: **Test Location Plan**
OFFICE: Sydney	DRAWN BY: MN	**Proposed Redevelopment**
SCALE: 1:1000 @ A3	DATE: 07.09.2023	**Uniting Waverley, Birrell Street, Bronte Road and Church Street**

PROJECT No: 204088.00
DRAWING No: 1
REVISION: 0





Locality Plan

LEGEND

- Calibrated contours
- Model extent
- Basement outline

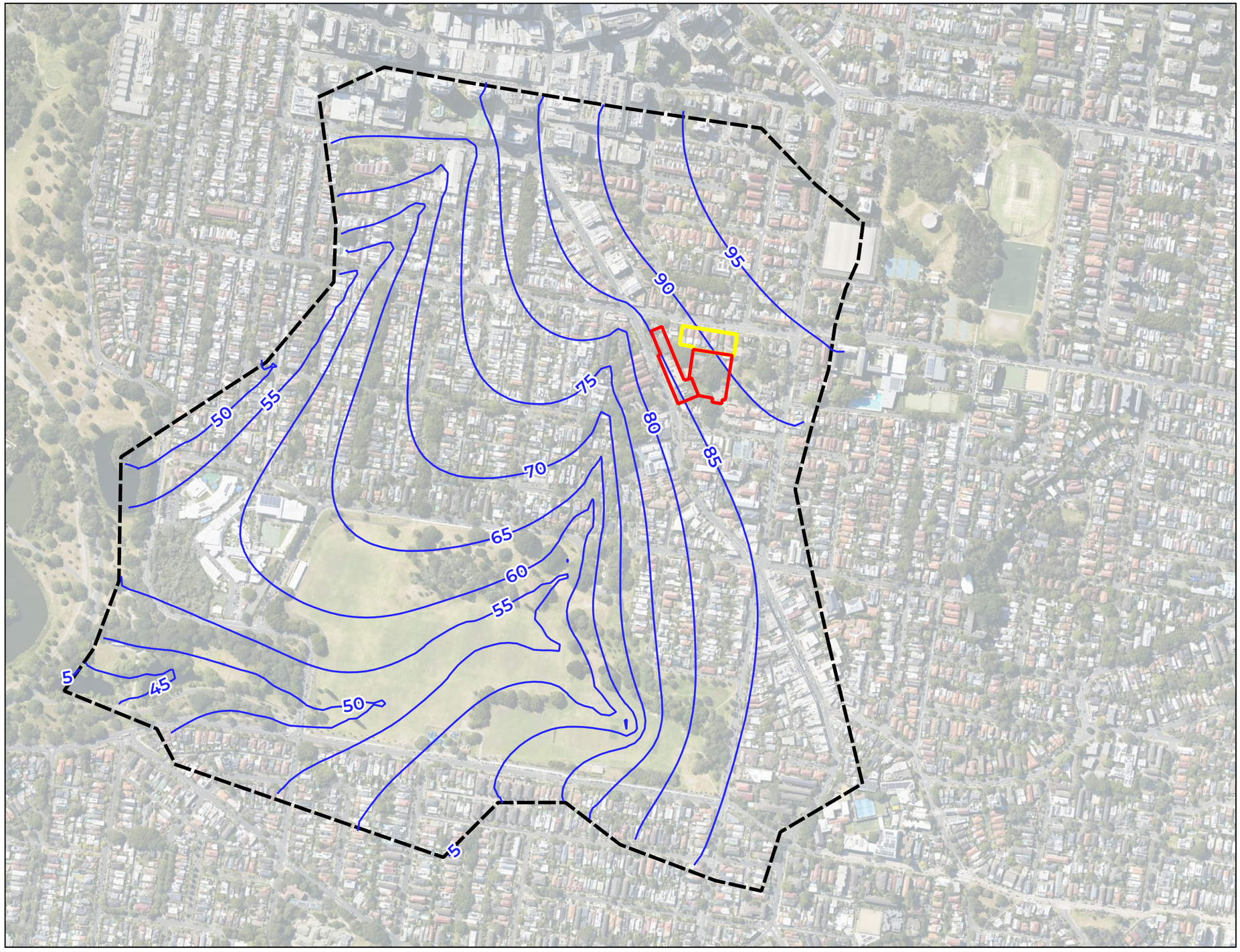
NOTE:
1: Basemap from Metromap (Dated 20.09.2024)
2: Proposed outlines from Architectus, Project No. 170454.00, Drawing Nos. DA1098, 1099,1100& 1101 Issue U (Dated 26.11.2024)

0 100 200 300 400 500 600 700 800 m

1:7200 @ A3

Douglas PARTNERS

CLIENT: The Uniting Church in Australia Property Trust (NSW) for Uniting NSW.ACT		TITLE: **Calibrated groundwater contours (pre-development)**	PROJECT No: 204088.03
OFFICE: Sydney	DRAWN BY: CC	**Proposed Redevelopment**	DRAWING No: 2
SCALE: 1:7200 @ A3	DATE: 22.01.2025	**Uniting Waverley, Birrell Street, Bronte Road and Church Street**	REVISION: 0



Locality Plan

LEGEND

- Calibrated contours
- Model extent
- Basement A
- Basement B

NOTE:
1: Basemap from Metromap (Dated 20.09.2024)
2: Proposed outlines from Architectus, Project No. 170454.00, Drawing Nos. DA1098, 1099,1100& 1101 Issue U (Dated 26.11.2024)

0 100 200 300 400 500 600 700 800 m

1:7200 @ A3

Douglas PARTNERS

CLIENT: The Uniting Church in Australia Property Trust (NSW) for Uniting NSW.ACT		TITLE: **Calibrated groundwater contours (pre-development)**	PROJECT No: 204088.03
OFFICE: Sydney	DRAWN BY: CC	**Proposed Redevelopment**	DRAWING No: 2
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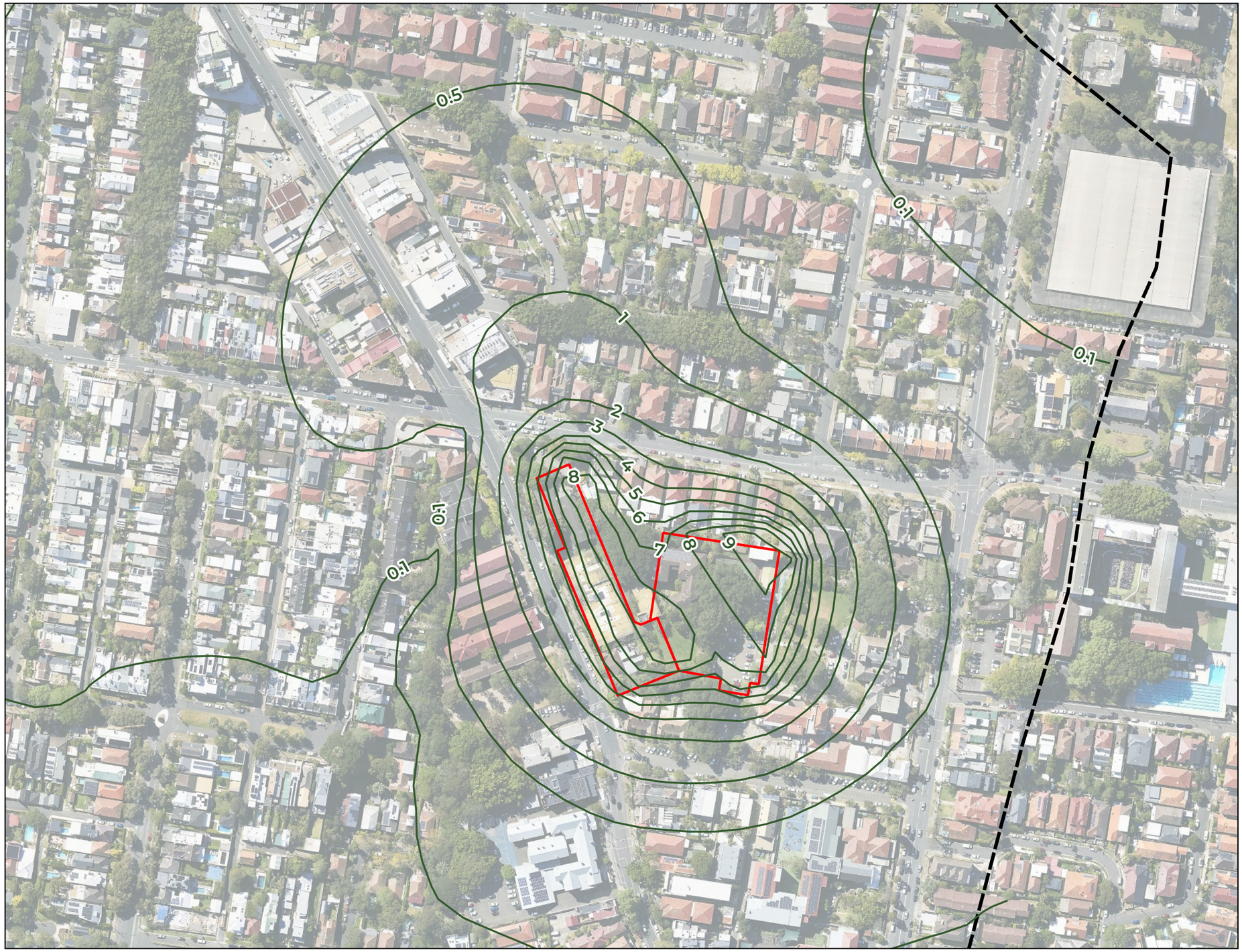
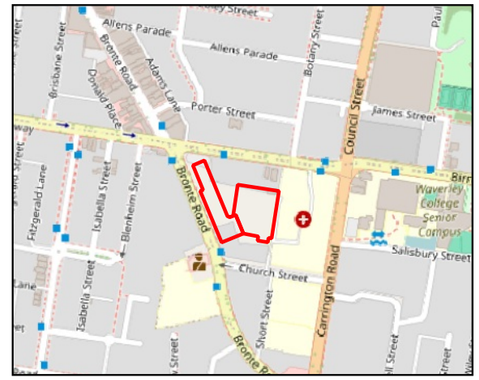




Locality Plan

LEGEND

- Drawdown (m)
- Model extent
- Basement outline

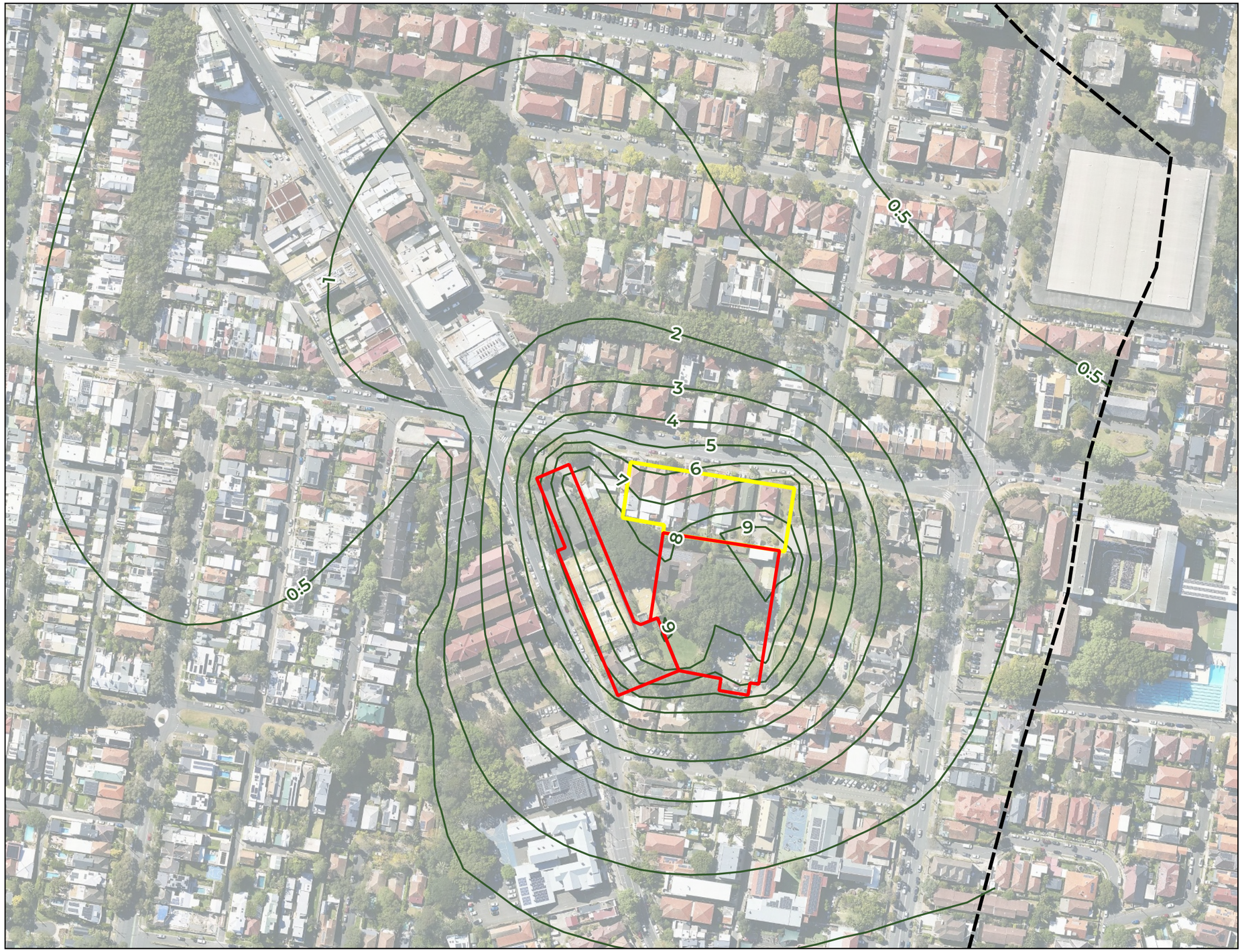
NOTE:
1: Basemap from Metromap (Dated 20.09.2024)
2: Proposed outlines from Architectus, Project No. 170454.00, Drawing Nos. DA1098, 1099,1100& 1101 Issue U (Dated 26.11.2024)

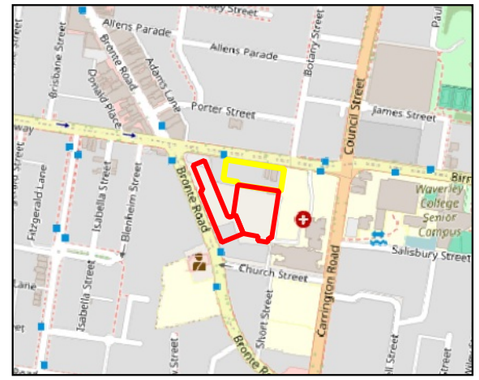
0 40 80 120 160 200 240 280 320 m

1:2411 @ A3

Douglas PARTNERS

CLIENT: The Uniting Church in Australia Property Trust (NSW) for Uniting NSW.ACT		TITLE: **Predicted drawdown (base case)**	PROJECT No: 204088.03
OFFICE: Sydney	DRAWN BY: CC	**Proposed Redevelopment**	DRAWING No: 3
SCALE: 1:2411 @ A3	DATE: 22.01.2025	**Uniting Waverley, Birrell Street, Bronte Road and Church Street**	REVISION: 0





Locality Plan

LEGEND

- Drawdown (m)
- Model extent
- Basement A
- Basement B

NOTE:
1: Basemap from Metromap (Dated 20.09.2024)
2: Proposed outlines from Architectus, Project No. 170454.00, Drawing Nos. DA1098, 1099,1100& 1101 Issue U (Dated 26.11.2024)

0 40 80 120 160 200 240 280 320 m

1:2411 @ A3

Douglas PARTNERS

CLIENT: The Uniting Church in Australia Property Trust (NSW) for Uniting NSW.ACT		TITLE: **Predicted drawdown (base case)**	PROJECT No: 204088.03
OFFICE: Sydney	DRAWN BY: CC	**Proposed Redevelopment**	DRAWING No: 3
SCALE: 1:2411 @ A3	DATE: 11.02.2025	**Uniting Waverley, Birrell Street, Bronte Road and Church Street**	REVISION: 1

Appendix B

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 C

Notes defining classification methods and descriptive terms

Borehole Logs

Sampling Methods

Douglas Partners

Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are generally based on Australian Standard AS1726:2017, Geotechnical Site Investigations. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	19 - 63
Medium gravel	6.7 - 19
Fine gravel	2.36 – 6.7
Coarse sand	0.6 - 2.36
Medium sand	0.21 - 0.6
Fine sand	0.075 - 0.21

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

The proportions of secondary constituents of soils are described as follows:

In fine grained soils (>35% fines)

Term	Proportion of sand or gravel	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	>30%	Sandy Clay
With	15 – 30%	Clay with sand
Trace	0 - 15%	Clay with trace sand

In coarse grained soils (>65% coarse)
- with clays or silts

Term	Proportion of fines	Example
And	Specify	Sand (70%) and Clay (30%)
Adjective	>12%	Clayey Sand
With	5 - 12%	Sand with clay
Trace	0 - 5%	Sand with trace clay

In coarse grained soils (>65% coarse)
- with coarser fraction

Term	Proportion of coarser fraction	Example
And	Specify	Sand (60%) and Gravel (40%)
Adjective	>30%	Gravelly Sand
With	15 - 30%	Sand with gravel
Trace	0 - 15%	Sand with trace gravel

The presence of cobbles and boulders shall be specifically noted by beginning the description with ‘Mix of Soil and Cobbles/Boulders’ with the word order indicating the dominant first and the proportion of cobbles and boulders described together.

Soil Descriptions

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	VS	<12
Soft	S	12 - 25
Firm	F	25 - 50
Stiff	St	50 - 100
Very stiff	VSt	100 - 200
Hard	H	>200
Friable	Fr	-

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	Density Index (%)
Very loose	VL	<15
Loose	L	15-35
Medium dense	MD	35-65
Dense	D	65-85
Very dense	VD	>85

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Extremely weathered material – formed from in-situ weathering of geological formations. Has soil strength but retains the structure or fabric of the parent rock;
- Alluvial soil – deposited by streams and rivers;
- Estuarine soil – deposited in coastal estuaries;
- Marine soil – deposited in a marine environment;
- Lacustrine soil – deposited in freshwater lakes;
- Aeolian soil – carried and deposited by wind;
- Colluvial soil – soil and rock debris transported down slopes by gravity;
- Topsoil – mantle of surface soil, often with high levels of organic material.
- Fill – any material which has been moved by man.

Moisture Condition – Coarse Grained Soils

For coarse grained soils the moisture condition should be described by appearance and feel using the following terms:

- Dry (D) Non-cohesive and free-running.
- Moist (M) Soil feels cool, darkened in colour.
  Soil tends to stick together.
  Sand forms weak ball but breaks easily.
- Wet (W) Soil feels cool, darkened in colour.
  Soil tends to stick together, free water forms when handling.

Moisture Condition – Fine Grained Soils

For fine grained soils the assessment of moisture content is relative to their plastic limit or liquid limit, as follows:

- ‘Moist, dry of plastic limit’ or ‘w <PL’ (i.e. hard and friable or powdery).
- ‘Moist, near plastic limit’ or ‘w ≈ PL (i.e. soil can be moulded at moisture content approximately equal to the plastic limit).
- ‘Moist, wet of plastic limit’ or ‘w >PL’ (i.e. soils usually weakened and free water forms on the hands when handling).
- ‘Wet’ or ‘w ≈LL’ (i.e. near the liquid limit).
- ‘Wet’ or ‘w >LL’ (i.e. wet of the liquid limit).

Rock Strength

Rock strength is defined by the Unconfined Compressive Strength and it refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects.

The Point Load Strength Index $Is_{(50)}$ is commonly used to provide an estimate of the rock strength and site specific correlations should be developed to allow UCS values to be determined. The point load strength test procedure is described by Australian Standard AS4133.4.1-2007. The terms used to describe rock strength are as follows:

Strength Term	Abbreviation	Unconfined Compressive Strength MPa	Point Load Index * $Is_{(50)}$ MPa
Very low	VL	0.6 - 2	0.03 - 0.1
Low	L	2 - 6	0.1 - 0.3
Medium	M	6 - 20	0.3 - 1.0
High	H	20 - 60	1 - 3
Very high	VH	60 - 200	3 - 10
Extremely high	EH	>200	>10

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$. It should be noted that the UCS to $Is_{(50)}$ ratio varies significantly for different rock types and specific ratios should be determined for each site.

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Residual Soil	RS	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.
Extremely weathered	XW	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible
Highly weathered	HW	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Moderately weathered	MW	The whole of the rock material is discoloured , usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable, but shows little or no change of strength from fresh rock.
Slightly weathered	SW	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
Fresh	FR	No signs of decomposition or staining.
Note: If HW and MW cannot be differentiated use DW (see below)		
Distinctly weathered	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching or may be decreased due to deposition of weathered products in pores.

Rock Descriptions

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with occasional fragments
Fractured	Core lengths of 30-100 mm with occasional shorter and longer sections
Slightly Fractured	Core lengths of 300 mm or longer with occasional sections of 100-300 mm
Unbroken	Core contains very few fractures

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq \text{100 mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or stronger. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Symbols & Abbreviations

Douglas Partners

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

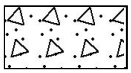
Symbols & Abbreviations

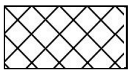
Graphic Symbols for Soil and Rock

General

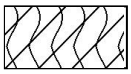

Asphalt

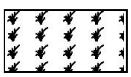

Road base

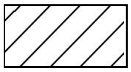

Concrete

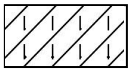

Filling

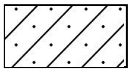
Soils


Topsoil

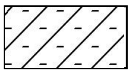

Peat

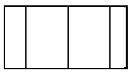

Clay

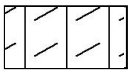

Silty clay

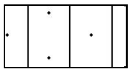

Sandy clay

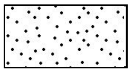

Gravelly clay

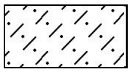

Shaly clay

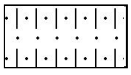

Silt


Clayey silt


Sandy silt

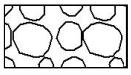

Sand

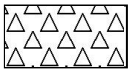

Clayey sand


Silty sand


Gravel

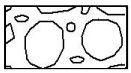

Sandy gravel


Cobbles, boulders

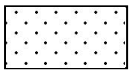

Talus

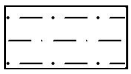
Sedimentary Rocks

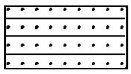

Boulder conglomerate

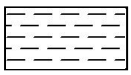

Conglomerate


Conglomeratic sandstone

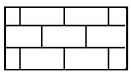

Sandstone


Siltstone

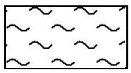

Laminite

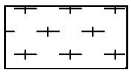

Mudstone, claystone, shale

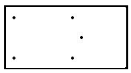

Coal


Limestone

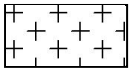
Metamorphic Rocks

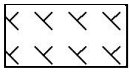

Slate, phyllite, schist

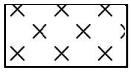

Gneiss

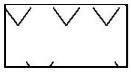

Quartzite

Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

BOREHOLE LOG

CLIENT: Uniting Church
PROJECT: Proposed Redevelopment
LOCATION: Uniting Waverley, Birrell St, Bronte Rd and Church St

SURFACE LEVEL: 86.3 AHD
EASTING: 338341
NORTHING: 6247953
DIP/AZIMUTH: 90°/--

BORE No: BH1
PROJECT No: 204088.00
DATE: 25 - 26/7/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
			EW HW MW SW FS FR		Ex Low / Very Low / Low / Medium / High / Very High / Ex High		0.01 / 0.05 / 0.10 / 0.50 / 1.00	B - Bedding J - Joint S - Shear F - Fault				
86	0.42	FILL/ Gravelly SAND: fine to medium, grey to dark grey, fine to medium angular igneous gravel, moist							A			
									A			
		SANDSTONE: medium to coarse grained, pale grey and orange staining, medium strength, slightly weathered, unbroken, Hawkesbury Sandstone							C	100	100	PL(A) = 0.6
85	1	Below 1.3m: high strength										
	2							>>				PL(A) = 1.1
84									C	100	99	
	3											PL(A) = 1.8
83												
	4							3.77m: B10°, pl, ro, fe stn 3.82m: B15°, pl, ro, cly + cbs vn				PL(A) = 1.2
82	4.12	SANDSTONE: medium to coarse, grey, high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone										
	5											PL(A) = 1.2
81									C	100	100	
	6	Below 5.9m: medium to high strength						>>				PL(A) = 1
80												
	7											PL(A) = 1.2
79												
	8							7.86m: B0-5°, pl, ro, cbs vn 7.95m: Ds 10mm				PL(A) = 0.5
78									C	100	100	
	9							8.74m: B0°, pl, ro, cbs vn				PL(A) = 0.5
77	9.35	Bore discontinued at 9.35m Target depth reached										PL(A) = 0.9

RIG: Bobcat **DRILLER:** SS **LOGGED:** TM/ECB **CASING:** HW to 0.42m

TYPE OF BORING: Solid flight auger (TC-bit) to 0.42m, NMLC-Coring to 9.35m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Groundwater well installed to 9.1m (screen 9.1-5.0m; blank 5.0-0.1m; gravel 9.1-4.5m; bentonite 4.5-2.7m; backfill to GL; gatic at surface).

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BORE: BH1 PROJECT: 204088.00 JULY 2023

0.42m – 5.00m

BORE: BH1 PROJECT: 204088.00 JULY 2023

5.00m – 9.35m

BOREHOLE LOG

CLIENT: Uniting Church
PROJECT: Proposed Redevelopment
LOCATION: Uniting Waverley, Birrell St, Bronte Rd and Church St

SURFACE LEVEL: 86.3 AHD
EASTING: 338341
NORTHING: 6247953
DIP/AZIMUTH: 90°/--

BORE No: BH1
PROJECT No: 204088.00
DATE: 25 - 26/7/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
86	0.0	FILL/ Gravelly SAND: fine to medium, grey to dark grey, fine to medium angular igneous gravel, moist		A	0.0				Gatic cover
					0.1				
				A	0.3				
	0.42				0.4				
		SANDSTONE: medium to coarse grained, pale grey and orange staining, medium strength, slightly weathered, unbroken, Hawkesbury Sandstone			0.42				
	1			C	0.96		PL(A) = 0.6		1
85		Below 1.3m: high strength			1.3				Backfill 0.0-2.7m
	2				1.96		PL(A) = 1.1		2 Blank pipe 0.1-5.0m
84				C					
	3				2.96		PL(A) = 1.8		3
83									Bentonite 2.7-4.5m
	4				3.96		PL(A) = 1.2		4
	4.12				4.14				
82		SANDSTONE: medium to coarse, grey, high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone							
	5				4.96		PL(A) = 1.2		5
81				C					
	6	Below 5.9m: medium to high strength			5.96		PL(A) = 1		6
80									Gravel 4.5-9.1m
	7				6.96		PL(A) = 1.2		7 Machine slotted PVC screen 5.0-9.1m
79					7.18				
	8				7.96		PL(A) = 0.5		8
78				C					
	9				8.96		PL(A) = 0.5		9 End cap
77	9.35				9.31		PL(A) = 0.9		
		Bore discontinued at 9.35m Target depth reached			9.35				

RIG: Bobcat **DRILLER:** SS **LOGGED:** TM/ECB **CASING:** HW to 0.42m

TYPE OF BORING: Solid flight auger (TC-bit) to 0.42m, NMLC-Coring to 9.35m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Groundwater well installed to 9.1m (screen 9.1-5.0m; blank 5.0-0.1m; gravel 9.1-4.5m; bentonite 4.5-2.7m; backfill to GL; gatic at surface).

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Uniting Church
PROJECT: Proposed Redevelopment
LOCATION: Uniting Waverley, Birrell St, Bronte Rd and Church St

SURFACE LEVEL: 85.9 AHD
EASTING: 338353
NORTHING: 6247909
DIP/AZIMUTH: 90°/--

BORE No: BH2
PROJECT No: 204088.00
DATE: 26 - 27/7/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
85	0.05	PAVERS: 50mm thick							E			
	0.1	FILL/BEDDING SAND: 50mm thick										
	0.21	FILL/CONCRETE: igneous aggregate, 110mm thick										
	1	FILL/Silty Gravelly SAND: medium to coarse, dark brown, fine to coarse sub-angular igenous and sandstone gravel, moist, apparently dense										
	1.3	FILL/SAND: fine to coarse, pale brown, trace organic material, wet										
84	1.7	SANDSTONE: medium to coarse grained, pale grey and orange staining, medium strength, slightly weathered, unbroken, Hawkesbury Sandstone						1.72m: B30°, pl, ro, fe stn				PL(A) = 0.7
	2											
	2.52							2.42m: CORE LOSS: 100mm	C	96	99	
83	3											PL(A) = 0.6
								3.75m: B10°, pl, ro, fe stn				PL(A) = 1.1
82	4											
	4.0	SANDSTONE: medium to coarse grained, pale grey, medium to high strength, fresh, with carbonaceous laminations, slightly fractured to unbroken, Hawkesbury Sandstone										PL(A) = 0.9
81	5								C	100	100	
								5.67m: B0-5°, un, ro, cbs vn				PL(A) = 1.4
80	6											
								6.6m: B0-5°, un, ro, cbs vn				PL(A) = 1
79	7											
								7.35m: B10°, pl, ro, cly ctg 2mm	C	100	100	
78	8							7.59m: B5°, pl, ro, cly ctg 5mm				PL(A) = 1
	8.22	Bore discontinued at 8.22m Target depth reached										
77	9											
76												

RIG: Bobcat **DRILLER:** SS **LOGGED:** ECB **CASING:** HW to 0.4m

TYPE OF BORING: Hand Tools to 0.1, Concrete core with 100mm diatube to 0.21, Hand tools to 0.3, NMLC-Coring to 8.22m

WATER OBSERVATIONS: Unable to detect free groundwater whilst augering due to use of water with diatube

REMARKS: Location coordinates are in MGA94 Zone 56. Unable to collect fill samples due to incorrect level of inferred rock and use of NMLC-Coring to retrieve samples.

SAMPLING & IN SITU TESTING LEGEND

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

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BORE: BH2 PROJECT: 204088.00 JULY 2023

1.70m – 6.00m

BORE: BH2 PROJECT: 204088.00 JULY 2023

6.00m – 8.22m

BOREHOLE LOG

CLIENT: Uniting Church
PROJECT: Proposed Redevelopment
LOCATION: Uniting Waverley, Birrell St, Bronte Rd and Church St

SURFACE LEVEL: 85.8 AHD
EASTING: 338375
NORTHING: 6247839
DIP/AZIMUTH: 90°/--

BORE No: BH3
PROJECT No: 204088.00
DATE: 7/8/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
85	0.65	FILL/Silty SAND: fine to coarse, brown then pale brown, trace rootlets, gravel and glass, moist							A/E A A/E			
	0.8	SAND SP: fine to medium, yellow-brown, moist, aeolian										
1	1.1	SAND SP: medium to coarse, pale grey, yellow and orange, with sandstone gravel, moist, extremely weathered sandstone										PL(A) = 0.3
84	2	SANDSTONE: medium to coarse, pale grey and orange staining, very low then low strength, moderately weathered, slightly fractured, Hawkesbury Sandstone Below 1.66m: high strength, slightly weathered						1.57m: B0-5°, pl-un, ro, cly ctg 2mm and rootlets 1.63m: B25°, pl, ro, fe stn 1.83m: B25°, pl, ro, fe stn 2.38m: B0-10°, un, ro, cbs vn 2.49m: B0-5°, un, ro, fe stn 2.53m: B0-5°, un, ro, fe stn	C	100	96	PL(A) = 1.3
83	3											PL(A) = 1.5
	3.02	SANDSTONE: medium to coarse grained, pale grey, high strength, fresh, unbroken, Hawkesbury Sandstone							C	100	98	
82	4							>>				PL(A) = 2
81	5								C	100	100	PL(A) = 1.9
80	6							5.75m: B5°, pl, ro, cly vn				PL(A) = 1.3
79	7								C	100	100	PL(A) = 1.3
								>>				
78	8								C	100	100	PL(A) = 1.8
77	9											PL(A) = 1
	9.09	Bore discontinued at 9.09m Target depth reached										
76												

RIG: Proline **DRILLER:** Tightsite **LOGGED:** ECB **CASING:** HQ to 1.4m

TYPE OF BORING: Hand Auger to 0.8m, NMLC-Coring to 9.09m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Groundwater well installed to 9.0m (screen 9.0-5.0m; blank 5.0-0.1m; gravel 9.0-4.5m; bentonite 4.5-0.1; backfill to GL; gatic at surface)

SAMPLING & IN SITU TESTING LEGEND

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

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BORE: BH03 PROJECT: 204088.00 AUGUST 2023

1.34m – 6.00m

BORE: BH03 PROJECT: 204088.00 AUGUST 2023

6.00m – 09.09m

BOREHOLE LOG

CLIENT: Uniting Church
PROJECT: Proposed Redevelopment
LOCATION: Uniting Waverley, Birrell St, Bronte Rd and Church St

SURFACE LEVEL: 85.8 AHD
EASTING: 338375
NORTHING: 6247839
DIP/AZIMUTH: 90°/--

BORE No: BH3
PROJECT No: 204088.00
DATE: 7/8/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
85	0.65	FILL/Silty SAND: fine to coarse, brown then pale brown, trace rootlets, gravel and glass, moist		A/E	0.22				Gatic cover
				A	0.3				Backfill 0.0-0.4m
				A/E	0.32				
	0.8	SAND SP: fine to medium, yellow-brown, moist, aeolian			0.4				
	1				0.5				1
	1.1	SAND SP: medium to coarse, pale grey, yellow and orange, with sandstone gravel, moist, extremely weathered sandstone							
					1.34		PL(A) = 0.3		
84		SANDSTONE: medium to coarse, pale grey and orange staining, very low then low strength, moderately weathered, slightly fractured, Hawkesbury Sandstone		C	1.96		PL(A) = 1.3		
	2	Below 1.66m: high strength, slightly weathered							2 Blank pipe 0.1-5.0m
									Bentonite 0.4-4.5m
83					2.72				
	3				2.96		PL(A) = 1.5		3
	3.02	SANDSTONE: medium to coarse grained, pale grey, high strength, fresh, unbroken, Hawkesbury Sandstone		C					
82									
	4				3.96		PL(A) = 2		4
					4.32				
81				C					
	5				4.96		PL(A) = 1.9		5
80									
	6				5.89		PL(A) = 1.3		6
					5.93				
79				C					Gravel 4.5-9.0m
	7				6.95		PL(A) = 1.3		7 Machine slotted PVC screen 5.0-9.0m
78					7.48				
					7.5				
	8				7.95		PL(A) = 1.8		8
77				C					
	9				8.95		PL(A) = 1		9 End cap
	9.09	Bore discontinued at 9.09m Target depth reached			9.09				
76									

RIG: Proline **DRILLER:** Tightsite **LOGGED:** ECB **CASING:** HQ to 1.4m

TYPE OF BORING: Hand Auger to 0.8m, NMLC-Coring to 9.09m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Groundwater well installed to 9.0m (screen 9.0-5.0m; blank 5.0-0.1m; gravel 9.0-4.5m; bentonite 4.5-0.1; backfill to GL; gatic at surface)

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Uniting Church
PROJECT: Proposed Redevelopment
LOCATION: Uniting Waverley, Birrell St, Bronte Rd and Church St

SURFACE LEVEL: 90.9 AHD
EASTING: 338415
NORTHING: 6247943
DIP/AZIMUTH: 90°/--

BORE No: BH4
PROJECT No: 204088.00
DATE: 24/7/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
90.9	0.0	FILL/ Silty SAND: fine to medium, dark grey, trace rootlets, moist							A/E*			
90	0.4	SANDSTONE: medium to coarse grained, pale grey and orange staining, medium strength, slightly weathered and fresh, slightly fractured to unbroken, Hawkesbury Sandstone										PL(A) = 0.5
89	1								C	100	99	
	2							1.77m: B10°, pl, ro, cly vn 2.15m: B5°, pl, ro, cly 1mm 2.28m: B10°, pl, ro, cly vn				PL(A) = 0.4
88	3							2.39m: B10°, pl, ro, cly vn 3.11m: B0°, pl, ro, cly 1mm 3.38m: Ds 10mm				PL(A) = 0.8
87	3.8	SANDSTONE: medium to coarse, grey, medium strength, fresh, slightly fractured, Hawkesbury Sandstone							C	100	95	PL(A) = 0.8
	4							4.05m: Ds 30mm				
86	5											PL(A) = 1
	5.0	SANDSTONE: medium to coarse grained, pale grey and orange staining, high strength, slightly weathered, slightly fractured, Hawkesbury Sandstone						4.95m: Ds 5mm 4.98m: Ds 20mm 5.12m: CORE LOSS: 160mm				
	5.28							5.58m: B5°, un, ro, cln 5.87m: B0° (x2), pl, ro, fe stn				
85	6								C	90	90	PL(A) = 2
84	6.9	SANDSTONE: medium to coarse grained, pale grey, high strength, fresh, unbroken, Hawkesbury Sandstone										PL(A) = 1.2
	7											
83	8											PL(A) = 1.9
									C	100	100	
82	9											PL(A) = 1.8
81	10.0											PL(A) = 1.6

Bore discontinued at 10.0m

RIG: BobcatTarget depth reached **DRILLER:** SS **LOGGED:** TM **CASING:** HW to 0.5m

TYPE OF BORING: Hand Auger to 0.2m, Solid flight auger (TC-bit) to 0.4m, Washboring (water) to 0.7m, NMLC-Coring to 10.0m

WATER OBSERVATIONS: Water seepage observed at 0.4m, 0% drilling flush return below 5.3m

REMARKS: Location coordinates are in MGA94 Zone 56. *Blind duplicate BD1/20230724TM taken from 0 to 0.1m

SAMPLING & IN SITU TESTING LEGEND

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

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BORE: BH4 PROJECT: 204088.00 JULY 2023

0.50m – 5.00m

BORE: BH4 PROJECT: 204088.00 JULY 2023

5.00 – 10.00m

BOREHOLE LOG

CLIENT: Uniting Church
PROJECT: Proposed Redevelopment
LOCATION: Uniting Waverley, Birrell St, Bronte Rd and Church St

SURFACE LEVEL: 89.4 AHD
EASTING: 338418
NORTHING: 6247849
DIP/AZIMUTH: 90°/--

BORE No: BH5
PROJECT No: 204088.00
DATE: 28/7/2023
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
			EW HW MW SW FS FR		Ex Low Very Low Low Medium High Very High Ex High		0.01 0.05 0.10 0.50 1.00	B - Bedding J - Joint S - Shear F - Fault				
89		FILL/Silty SAND: fine to medium, dark grey, trace rootlets, moist							A/E			
									A/E			
	0.8	SANDSTONE: medium to coarse grained, pale grey and orange staining, low then medium strength, moderately then slightly weathered, slightly fractured to unbroken, Hawkesbury Sandstone										PL(A) = 0.2
88	1							1.26m: Ds 50mm				
								1.71m: B10°, pl, ro, fe stn				PL(A) = 0.7
87	2								C	100	98	
								2.68m: B0°, pl, ro, cly ctg 5mm				
	3							2.88m: B0°, pl, ro, fe stn				PL(A) = 1.5
	3.07	SANDSTONE: medium to coarse grained, pale grey, high strength, fresh, unbroken, Hawkesbury Sandstone										
86												PL(A) = 2
	4											
85								4.68m: B20°, pl, ro, cly ctg 5mm				PL(A) = 1.1
	5								C	100	100	
84												PL(A) = 1.3
	6											
83								6.58m: B0-5°, un, ro, cbs vn				PL(A) = 1.7
	7											
82												PL(A) = 1.8
	8								C	100	100	
81												PL(A) = 1.7
	9											
80								9.52m: B0°, pl, ro, cbs vn				

RIG: Bobcat **DRILLER:** SS **LOGGED:** ECB **CASING:** HW to 1.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.0m, NMLC-Coring to 11.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Uniting Church
PROJECT: Proposed Redevelopment
LOCATION: Uniting Waverley, Birrell St, Bronte Rd and Church St

SURFACE LEVEL: 89.4 AHD
EASTING: 338418
NORTHING: 6247849
DIP/AZIMUTH: 90°/--

BORE No: BH5
PROJECT No: 204088.00
DATE: 28/7/2023
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
79		SANDSTONE: medium to coarse grained, pale grey, high strength, fresh, unbroken, Hawkesbury Sandstone *(continued)*							C	100	100	PL(A) = 1.5
	11 11.0	Bore discontinued at 11.0m Target depth reached										PL(A) = 1.6
78	12											
77	13											
76	14											
75	15											
74	16											
73	17											
72	18											
71	19											
70												

RIG: Bobcat **DRILLER:** SS **LOGGED:** ECB **CASING:** HW to 1.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.0m, NMLC-Coring to 11.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

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BORE: BH5 PROJECT: 204088.00 JULY 2023

1.03m – 6.00m

BORE: BH5 PROJECT: 204088.00 JULY 2023

6.00m – 11.00m

BOREHOLE LOG

CLIENT: Uniting Church
PROJECT: Proposed Redevelopment
LOCATION: Uniting Waverley, Birrell St, Bronte Rd and Church St

SURFACE LEVEL: 94.2 AHD
EASTING: 338474
NORTHING: 6247916
DIP/AZIMUTH: 90°/--

BORE No: BH6
PROJECT No: 204088.00
DATE: 25/7/2023
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
94	0.0	FILL/ SAND: fine to medium, dark grey, with silt, trace rootlets, moist		A			
	0.6	SAND SP: fine to medium, yellow-brown, trace silt, moist, aoelian		A			
93	1.15	SANDSTONE: medium to coarse grained, pale grey, medium strength, fresh, fractured, Hawkesbury Sandstone		A S			6 refusal
			1.37m: B5°, pl, ro, cly vn	C	100	85	PL(A) = 0.4
			1.67m: Ds 70mm				PL(A) = 0.2
92	2.5	SANDSTONE: medium to coarse grained, pale grey with some orange and red staining, low to medium strength, moderately to slightly weathered, fractured, Hawkesbury Sandstone					
			2.78m: B5°, pl, ro, cly 1mm				PL(A) = 0.1
91			2.92m: B5°, pl, ro, cly 1mm				
			3.14m: B5°, pl, ro, cly 2mm, fe stn				
			3.18m: B5°, pl, ro, cly 2mm, fe stn				
			3.39m: Cs 10mm				
			3.63m: B5°, pl, ro, cly 1mm				
			3.78m: B5°, pl, ro, cly vn				
90	3.82	SANDSTONE: medium to coarse grained, pale grey, medium and high strength, fresh, unbroken, Hawkesbury Sandstone		C	100	75	PL(A) = 0.6
89							PL(A) = 0.9
88			5.83m: B5°, pl, ro, cln				PL(A) = 1.3
			6.84m: B5°, pl, ro, cly vn	C	100	99	PL(A) = 0.4
87			7.14m: B5°, pl, ro, cly 2mm				
			7.48m: B5°, pl, ro, cly 2mm				
86	7.6	SANDSTONE: medium to coarse grained, pale grey with some red and yellow, high strength, moderately weathered, unbroken, Hawkesbury Sandstone					PL(A) = 1.5
							PL(A) = 1.6
85	9.05	SANDSTONE: medium to coarse grained, pale grey, high strength, fresh, unbroken, Hawkesbury Sandstone		C	100	99	
			>>				PL(A) = 2.2

RIG: Bobcat **DRILLER:** SS **LOGGED:** TM **CASING:** HW to 1.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.0m, Washboring (water) to 1.32 NMLC-Coring to 12.1m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Groundwater well installed to 12.1m (screen 12.1-6.0m; blank 6.0-0.0m; gravel 12.1-3.5m; bentonite 3.5-3.0; backfill to GL; gatic at surface)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Uniting Church
PROJECT: Proposed Redevelopment
LOCATION: Uniting Waverley, Birrell St, Bronte Rd and Church St

SURFACE LEVEL: 94.2 AHD
EASTING: 338474
NORTHING: 6247916
DIP/AZIMUTH: 90°/--

BORE No: BH6
PROJECT No: 204088.00
DATE: 25/7/2023
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
84	11	SANDSTONE: medium to coarse grained, pale grey, high strength, fresh, unbroken, Hawkesbury Sandstone *(continued)*							C	100	99	PL(A) = 2.2
83	12								C	100	100	PL(A) = 1.5
82	12.1	Bore discontinued at 12.1m Target depth reached										
81	13											
80	14											
79	15											
78	16											
77	17											
76	18											
75	19											

RIG: Bobcat **DRILLER:** SS **LOGGED:** TM **CASING:** HW to 1.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.0m, Washboring (water) to 1.32 NMLC-Coring to 12.1m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Groundwater well installed to 12.1m (screen 12.1-6.0m; blank 6.0-0.0m; gravel 12.1-3.5m; bentonite 3.5-3.0; backfill to GL; gatic at surface)

SAMPLING & IN SITU TESTING LEGEND

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

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BORE: BH6 PROJECT: 204088.00 JULY 2023

1.32m – 5.00m

BORE: BH6 PROJECT: 204088.00 JULY 2023

5.00m – 10.00m

BORE: BH6 PROJECT: 204088.00 JULY 2023

10.00m – 12.10m

BOREHOLE LOG

CLIENT: Uniting Church
PROJECT: Proposed Redevelopment
LOCATION: Uniting Waverley, Birrell St, Bronte Rd and Church St

SURFACE LEVEL: 94.2 AHD
EASTING: 338474
NORTHING: 6247916
DIP/AZIMUTH: 90°/--

BORE No: BH6
PROJECT No: 204088.00
DATE: 25/7/2023
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
94	0.0	FILL/ SAND: fine to medium, dark grey, with silt, trace rootlets, moist		A	0.0				Gatic cover
					0.1				
				A	0.4				
	0.6	SAND SP: fine to medium, yellow-brown, trace silt, moist, aoelian			0.5				
					0.9				Blank pipe 0.1-6.8m
93	1			A	1.0		6		
	1.15	SANDSTONE: medium to coarse grained, pale grey, medium strength, fresh, fractured, Hawkesbury Sandstone		S	1.15		refusal		
					1.32				
					1.4		PL(A) = 0.4		Backfill 0.0-3.0m
92	2			C	1.9		PL(A) = 0.2		
					2.4				
	2.5	SANDSTONE: medium to coarse grained, pale grey with some orange and red staining, low to medium strength, moderately to slightly weathered, fractured, Hawkesbury Sandstone							
91	3				3.0		PL(A) = 0.1		Bentonite 3.0-3.5m
	3.82	SANDSTONE: medium to coarse grained, pale grey, medium and high strength, fresh, unbroken, Hawkesbury Sandstone		C	3.9		PL(A) = 0.6		
90	4								
					4.9		PL(A) = 0.9		
89	5								
					5.4				
					5.9		PL(A) = 1.3		
88	6								
87	7			C	6.9		PL(A) = 0.4		
	7.6	SANDSTONE: medium to coarse grained, pale grey with some red and yellow, high strength, moderately weathered, unbroken, Hawkesbury Sandstone							Gravel 3.5-12.1m
					7.9		PL(A) = 1.5		
86	8								
					8.4				
					8.9		PL(A) = 1.6		
85	9								Machine slotted PVC screen 6.0-12.1m
	9.05	SANDSTONE: medium to coarse grained, pale grey, high strength, fresh, unbroken, Hawkesbury Sandstone		C					
					9.9		PL(A) = 2.2		

RIG: Bobcat **DRILLER:** SS **LOGGED:** TM **CASING:** HW to 1.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.0m, Washboring (water) to 1.32 NMLC-Coring to 12.1m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Groundwater well installed to 12.1m (screen 12.1-6.0m; blank 6.0-0.0m; gravel 12.1-3.5m; bentonite 3.5-3.0; backfill to GL; gatic at surface)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Uniting Church
PROJECT: Proposed Redevelopment
LOCATION: Uniting Waverley, Birrell St, Bronte Rd and Church St

SURFACE LEVEL: 94.2 AHD
EASTING: 338474
NORTHING: 6247916
DIP/AZIMUTH: 90°/--

BORE No: BH6
PROJECT No: 204088.00
DATE: 25/7/2023
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
84		SANDSTONE: medium to coarse grained, pale grey, high strength, fresh, unbroken, Hawkesbury Sandstone *(continued)*		C	10.9		PL(A) = 2.2		
83	11			C	11.4				
					11.9		PL(A) = 1.5		
82	12								End cap
	12.1	Bore discontinued at 12.1m Target depth reached			12.1				
81	13								
80	14								
79	15								
78	16								
77	17								
76	18								
75	19								

RIG: Bobcat **DRILLER:** SS **LOGGED:** TM **CASING:** HW to 1.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.0m, Washboring (water) to 1.32 NMLC-Coring to 12.1m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Groundwater well installed to 12.1m (screen 12.1-6.0m; blank 6.0-0.0m; gravel 12.1-3.5m; bentonite 3.5-3.0; backfill to GL; gatic at surface)

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Uniting Church
PROJECT: Proposed Redevelopment
LOCATION: Uniting Waverley, Birrell St, Bronte Rd and Church St

SURFACE LEVEL: 92.2 AHD
EASTING: 338462
NORTHING: 6247879
DIP/AZIMUTH: 90°/--

BORE No: BH7
PROJECT No: 204088.00
DATE: 27 - 28/7/2023
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
			EW HW MW SW FS FR		Ex Low Very Low Low Medium High Very High Ex High		0.01 0.05 0.10 0.50 1.00	B - Bedding J - Joint S - Shear F - Fault				
92		FILL/Silty SAND: fine to medium, dark grey, trace rootlets, moist							A/E			
		Below 0.7m: wet										
91	1.0	SAND: medium to coarse, pale grey, trace organics, moist, residual							A/E S			3/50 refusal
	1.1	SANDSTONE: medium to coarse grained, pale grey with orange staining, medium strength, moderately weathered then slightly weathered, unbroken, Hawkesbury Sandstone						1.35m: CORE LOSS: 600mm				PL(A) = 0.1
90	1.95							2.12m: J80°, pl, ro, cln	C	74	95	PL(A) = 0.4
								2.35m: J60°, pl, ro, cln				
89	3.2	SANDSTONE: medium to coarse grained, pale grey, medium strength, fresh, unbroken, Hawkesbury Sandstone						2.92m: Ds 80mm				PL(A) = 0.5
								3.16m: B5°, pl, ro, fe stn				
88								4.24m: B10°, pl, ro, cly vn	C	100	98	PL(A) = 0.8
87		Below 4.8m: high strength						4.8m: B15°, pl, ro, cly vn 4.94m: B20°, pl, ro, cly vn 5.08m: B30°, pl, ro, cbs vn 5.34m: Ds 40mm				PL(A) = 1.1
86		Below 6.07m: slightly weathered						6.07m: B0°, pl, ro, fe stn				PL(A) = 1
								6.72m: B30°, pl, ro, cln				
85	7.05	SANDSTONE: medium to coarse grained, pale grey, high strength , fresh, slightly fractured to unbroken, Hawkesbury Sandstone							C	100	100	PL(A) = 1.9
84												PL(A) = 2
83								9.32m: B0-5°, un, ro, cbs and cly vn	C	100	100	PL(A) = 1.4

RIG: Bobcat **DRILLER:** SS **LOGGED:** ECB **CASING:** HW to 1.1m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.1m, NMLC-Coring to 20.39m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Uniting Church
PROJECT: Proposed Redevelopment
LOCATION: Uniting Waverley, Birrell St, Bronte Rd and Church St

SURFACE LEVEL: 92.2 AHD
EASTING: 338462
NORTHING: 6247879
DIP/AZIMUTH: 90°/--

BORE No: BH7
PROJECT No: 204088.00
DATE: 27 - 28/7/2023
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
82		SANDSTONE: medium to coarse grained, pale grey, high strength , fresh, slightly fractured to unbroken, Hawkesbury Sandstone *(continued)*										PL(A) = 1.5
81	11								C	100	100	PL(A) = 1.3
80	12							11.89m: B20-30°, un, ro, cbs vn				PL(A) = 1.2
79	13							12.7m: B10°, pl, ro, cly vn	C	100	100	PL(A) = 1.9
78	14							14.38m: B10°, pl, ro, cly ctg 5mm				PL(A) = 2.4
77	15							15.22m: B20°, pl, ro, cbs vn 15.41m: B5°, pl ,ro, cbs vn	C	100	100	PL(A) = 1.1
76	16											PL(A) = 1.2
75	17								C	100	100	PL(A) = 1
74	18							>>				PL(A) = 1.1
73	19								C	100	100	PL(A) = 1.5

RIG: Bobcat **DRILLER:** SS **LOGGED:** ECB **CASING:** HW to 1.1m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.1m, NMLC-Coring to 20.39m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
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BOREHOLE LOG

CLIENT: Uniting Church
PROJECT: Proposed Redevelopment
LOCATION: Uniting Waverley, Birrell St, Bronte Rd and Church St

SURFACE LEVEL: 92.2 AHD
EASTING: 338462
NORTHING: 6247879
DIP/AZIMUTH: 90°/--

BORE No: BH7
PROJECT No: 204088.00
DATE: 27 - 28/7/2023
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
72									C	100	100	PL(A) = 1.2
	20.39	Bore discontinued at 20.39m Target depth reached										
71	21											
70	22											
69	23											
68	24											
67	25											
66	26											
65	27											
64	28											
63	29											

RIG: Bobcat **DRILLER:** SS **LOGGED:** ECB **CASING:** HW to 1.1m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.1m, NMLC-Coring to 20.39m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

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BORE: BH7 PROJECT: 204088.00 JULY 2023

1.10m – 6.00m

BORE: BH7 PROJECT: 204088.00 JULY 2023

6.00m – 11.00m

BORE: BH7 PROJECT: 204088.00 JULY 2023

11.00m – 16.00m

BORE: BH7 PROJECT: 204088.00 JULY 2023

16.00m – 20.39m

BOREHOLE LOG

CLIENT: Uniting Church
PROJECT: Proposed Redevelopment
LOCATION: Uniting Waverley, Birrell St, Bronte Rd and Church St

SURFACE LEVEL: 91.6 AHD
EASTING: 338452
NORTHING: 6247822
DIP/AZIMUTH: 90°/--

BORE No: BH8
PROJECT No: 204088.00
DATE: 31/7/2023
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
91	0.05	FILL/Silty GRAVEL: roadbase							E			
		FILL/Silty SAND: fine to medium, dark brown, trace rootlets, glass and gravel, dry							E			
		Below 0.5m: moist										
	1 1.0	SANDSTONE: medium to coarse grained, pale grey and orange and red staining, high strength, slightly weathered, slightly fractured, indistinct cross bedding at 0-5°, Hawkesbury Sandstone							E S			18,3/30 refusal
90	2							1.8m: B0°, pl, ro, fe stn	C	100	96	PL(A) = 1.3 PL(A) = 1.2
89								2.26m: B15°, pl, ro,fe stn 2.31m: B15°, pl, ro, fe stn 2.46m: B15°, pl, ro, fe stn and cly vn 2.58m: B15°, pl, ro, fe stn 2.7m: B15°, pl, ro, fe stn				
88	3	Below 3.04m: pale grey and fresh										PL(A) = 1.3
87	4							4.07m: B10°, pl, ro, fe stn and cly vn 4.24m: Fg 20mm 4.54m: Ds 60mm	C	100	98	PL(A) = 1.3
86	5							5.28m: B20-40°, un, ro, cbs vn 5.31m: Ds 20m				PL(A) = 1.1
85	5.9 6	SANDSTONE: medium to coarse grained, pale grey and orange and red staining, medium strength, fresh, slightly fractured, indistinct cross bedding at 0-5°, Hawkesbury Sandstone										PL(A) = 0.5
84	7	Below 7.0m: high strength						6.75m: Ds 20mm	C	100	99	PL(A) = 0.7
83	8	Below 8.0m: unbroken						7.97m: B0°, pl, ro, cbs ctg 2mm 7.98m: B0°, pl, ro, cbs vn				PL(A) = 1.6
82	9								C	100	100	PL(A) = 1.7

RIG: Bobcat **DRILLER:** SS **LOGGED:** ECB **CASING:** HW to 1.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.0m, NMLC-Coring to 12.17m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Groundwater well installed to 11.7m (screen 11.7-5.7m; blank 5.7-0.0m; gravel 11.7-4.8m; bentonite 4.8-3.0m; backfill to GL; gatic at surface)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Uniting Church
PROJECT: Proposed Redevelopment
LOCATION: Uniting Waverley, Birrell St, Bronte Rd and Church St

SURFACE LEVEL: 91.6 AHD
EASTING: 338452
NORTHING: 6247822
DIP/AZIMUTH: 90°/--

BORE No: BH8
PROJECT No: 204088.00
DATE: 31/7/2023
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
81	11	SANDSTONE: medium to coarse grained, pale grey and orange and red staining, medium strength, fresh, slightly fractured, indistinct cross bedding at 0-5°, Hawkesbury Sandstone *(continued)*						>>	C	100	100	PL(A) = 1.8 PL(A) = 1.7
80	12								C	100	100	PL(A) = 1.4
	12.17	Bore discontinued at 12.17m Target depth reached										
79	13											
78	14											
77	15											
76	16											
75	17											
74	18											
73	19											
72												

RIG: Bobcat **DRILLER:** SS **LOGGED:** ECB **CASING:** HW to 1.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.0m, NMLC-Coring to 12.17m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Groundwater well installed to 11.7m (screen 11.7-5.7m; blank 5.7-0.0m; gravel 11.7-4.8m; bentonite 4.8-3.0m; backfill to GL; gatic at surface)

SAMPLING & IN SITU TESTING LEGEND

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

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BORE: BH8 PROJECT: 204088.00 JULY 2023

1.15m – 6.00m

BORE: BH8 PROJECT: 204088.00 JULY 2023

6.00m – 11.00m

BORE: BH8 PROJECT: 204088.00 JULY 2023

11.00m – 12.17m

BOREHOLE LOG

CLIENT: Uniting Church
PROJECT: Proposed Redevelopment
LOCATION: Uniting Waverley, Birrell St, Bronte Rd and Church St

SURFACE LEVEL: 91.6 AHD
EASTING: 338452
NORTHING: 6247822
DIP/AZIMUTH: 90°/--

BORE No: BH8
PROJECT No: 204088.00
DATE: 31/7/2023
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
91	0.05	FILL/Silty GRAVEL: roadbase		E	0.1				Gatic cover
		FILL/Silty SAND: fine to medium, dark brown, trace rootlets, glass and gravel, dry			0.2				
		Below 0.5m: moist		E	0.4				
					0.5				
					0.9				
1	1.0	SANDSTONE: medium to coarse grained, pale grey and orange and red staining, high strength, slightly weathered, slightly fractured, indistinct cross bedding at 0-5°, Hawkesbury Sandstone		E	1.0		18,3/30 refusal		1
				S	1.15		PL(A) = 1.3		
					1.18				
90					1.2				Backfill 0.0-3.0m
				C					Blank pipe 0-5.7m
2					1.96		PL(A) = 1.2		2
89					2.54				
3					2.96		PL(A) = 1.3		3
		Below 3.04m: pale grey and fresh							
88									
4				C	3.96		PL(A) = 1.3		Bentonite 3.0-4.8m 4
87									
5					4.96		PL(A) = 1.1		5
86					5.56				
6	5.9	SANDSTONE: medium to coarse grained, pale grey and orange and red staining, medium strength, fresh, slightly fractured, indistinct cross bedding at 0-5°, Hawkesbury Sandstone			6.0		PL(A) = 0.5		6
85									
7		Below 7.0m: high strength		C	6.92		PL(A) = 0.7		7
84									
8		Below 8.0m: unbroken			7.96		PL(A) = 1.6		8 Gravel 4.8-11.7m
83					8.56				Machine slotted PVC screen 5.7-11.7m
9					8.96		PL(A) = 1.7		9
82				C					

RIG: Bobcat **DRILLER:** SS **LOGGED:** ECB **CASING:** HW to 1.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.0m, NMLC-Coring to 12.17m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Groundwater well installed to 11.7m (screen 11.7-5.7m; blank 5.7-0.0m; gravel 11.7-4.8m; bentonite 4.8-3.0m; backfill to GL; gatic at surface)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Uniting Church
PROJECT: Proposed Redevelopment
LOCATION: Uniting Waverley, Birrell St, Bronte Rd and Church St

SURFACE LEVEL: 91.6 AHD
EASTING: 338452
NORTHING: 6247822
DIP/AZIMUTH: 90°/--

BORE No: BH8
PROJECT No: 204088.00
DATE: 31/7/2023
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
81	11	SANDSTONE: medium to coarse grained, pale grey and orange and red staining, medium strength, fresh, slightly fractured, indistinct cross bedding at 0-5°, Hawkesbury Sandstone *(continued)*		C	9.96		PL(A) = 1.8		11
					10.96		PL(A) = 1.7		
80				C	11.56				End cap
	12				11.96		PL(A) = 1.4		12
	12.17	Bore discontinued at 12.17m Target depth reached			12.17				
79	13								13
78	14								14
77	15								15
76	16								16
75	17								17
74	18								18
73	19								19
72									

RIG: Bobcat **DRILLER:** SS **LOGGED:** ECB **CASING:** HW to 1.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.0m, NMLC-Coring to 12.17m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Groundwater well installed to 11.7m (screen 11.7-5.7m; blank 5.7-0.0m; gravel 11.7-4.8m; bentonite 4.8-3.0m; backfill to GL; gatic at surface)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Uniting Church
PROJECT: Proposed Redevelopment
LOCATION: Uniting Waverley, Birrell St, Bronte Rd and Church St

SURFACE LEVEL: 96.6 AHD
EASTING: 338528
NORTHING: 6247898
DIP/AZIMUTH: 90°/--

BORE No: BH9
PROJECT No: 204088.00
DATE: 9/8/2023
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
96	0.6	FILL/Silty SAND: fine to medium, dark brown, grey and dark grey, with sub-rounded sandstone gravel, trace rootlets and roots, moist							A/E			
	1	SAND SP: fine to medium, yellow and yellow-brown, trace silt, moist, aoelian							A/E			
95	1.34	SANDSTONE: medium to coarse grained, pale grey and orange staining, very low and low strength, highly to moderately weathered, slightly fractured, Hawkesbury Sandstone										PL(A) = 0.3
	2							2.22m: B0°, pl, ro, fe stn 2.3m: Ds 70mm	C	100	73	PL(A) = 0.5
94								2.68m: Ds 130mm 2.86m: Ds 140mm				
	3							3.21m: Ds 40mm 3.49m: Ds 20mm				PL(A) = 0.1
93	3.73	SANDSTONE: medium to coarse grained, pale grey, high strength, fresh, slightly fractured to unbroken, Hakwebsury Sandstone						3.73m: B0°, pl, ro, cly ctg 5mm	C	100	96	PL(A) = 0.3
	4											PL(A) = 1.3
92												
	5							5.1m: B0°, pl, ro, cly ctg 2mm	C	100	96	PL(A) = 1.8
91												
	6							5.89m: B0°, pl, ro, cbs vn 5.95m: B0°, pl, ro, cly ctg 10mm				PL(A) = 1.5
	5.95	SANDSTONE: medium to coarse grained, pale grey and orange staining, high strength, slightly weathered, slightly fractured, Hawkesbury Sandstone							C	100	100	
90								6.7m: B20°, pl, ro, fe stn 6.82m: B15°, pl, ro, fe stn				PL(A) = 1.9
	7											PL(A) = 1.9
89		Below 7.69m: brown-grey						7.5m: B15°, pl, ro, fe stn 7.62m: B15°, pl, ro, fe stn 7.68m: B0-5°, un, ro, fe stn				
	8								C	100	100	PL(A) = 1.1
88												
	9											PL(A) = 1.7
	9.0	SANDSTONE: medium to coarse grained, pale grey, high strength, fresh, unbroken, Hawkesbury Sandstone						>>	C	100	100	
87												

RIG: Proline **DRILLER:** Tightsite **LOGGED:** ECB **CASING:** HQ to 1.3m

TYPE OF BORING: Hand Auger to 1.4m, NMLC-Coring to 11.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Uniting Church
PROJECT: Proposed Redevelopment
LOCATION: Uniting Waverley, Birrell St, Bronte Rd and Church St

SURFACE LEVEL: 96.6 AHD
EASTING: 338528
NORTHING: 6247898
DIP/AZIMUTH: 90°/--

BORE No: BH9
PROJECT No: 204088.00
DATE: 9/8/2023
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
86	11	SANDSTONE: medium to coarse grained, pale grey, high strength, fresh, unbroken, Hawkesbury Sandstone *(continued)*							C	100	100	PL(A) = 2.4
									C	100	100	
	11.0	Bore discontinued at 11.0m										PL(A) = 1.6
85	12											
84	13											
83	14											
82	15											
81	16											
80	17											
79	18											
78	19											
77												

RIG: Proline **DRILLER:** Tightsite **LOGGED:** ECB **CASING:** HQ to 1.3m

TYPE OF BORING: Hand Auger to 1.4m, NMLC-Coring to 11.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BORE: BH09 PROJECT: 204088.00 AUGUST 2023

1.34m – 6.00m

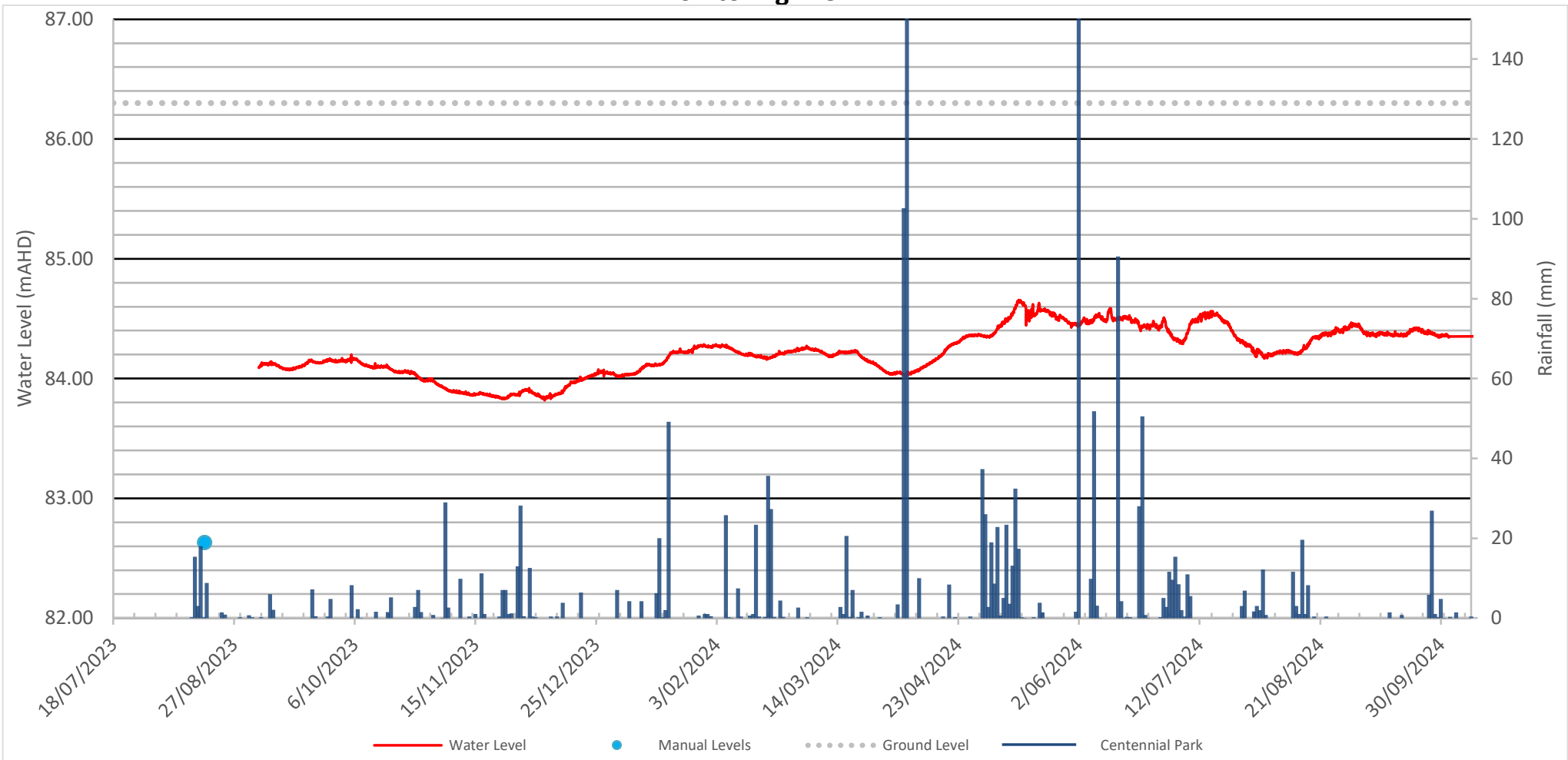
BORE: BH09 PROJECT: 204088.00 AUGUST 2023

6.00m – 11.00m

Appendix D

Hydrographs

Monitoring Well: BH1

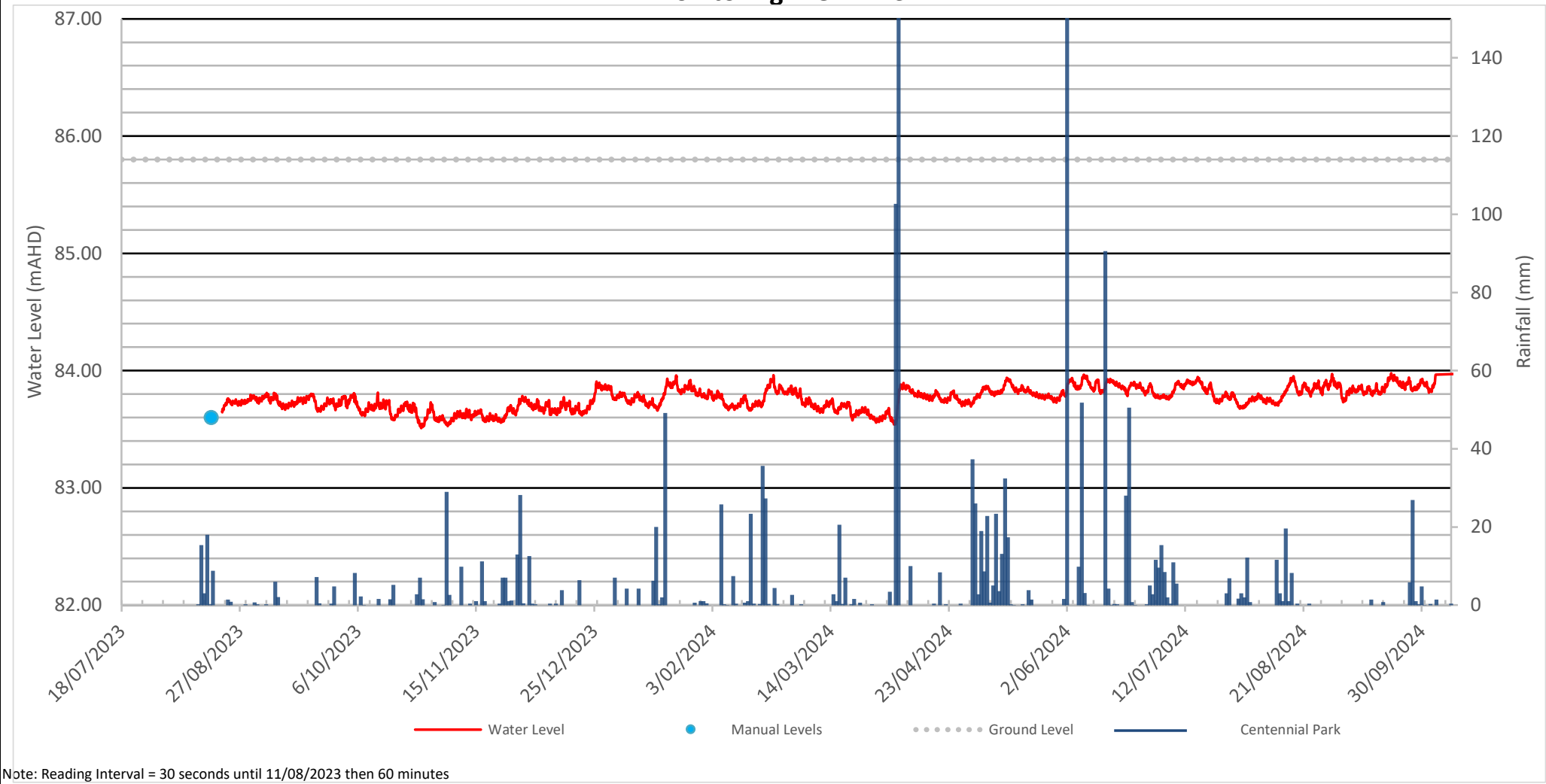


Note: Reading Interval = 30 seconds until 09/08/2023 then 60 minutes

Douglas PARTNERS

From	Drawn:
9/08/2023	LHS
To	**Date:**
2/10/2024	21/11/2024

Monitoring Well: BH3

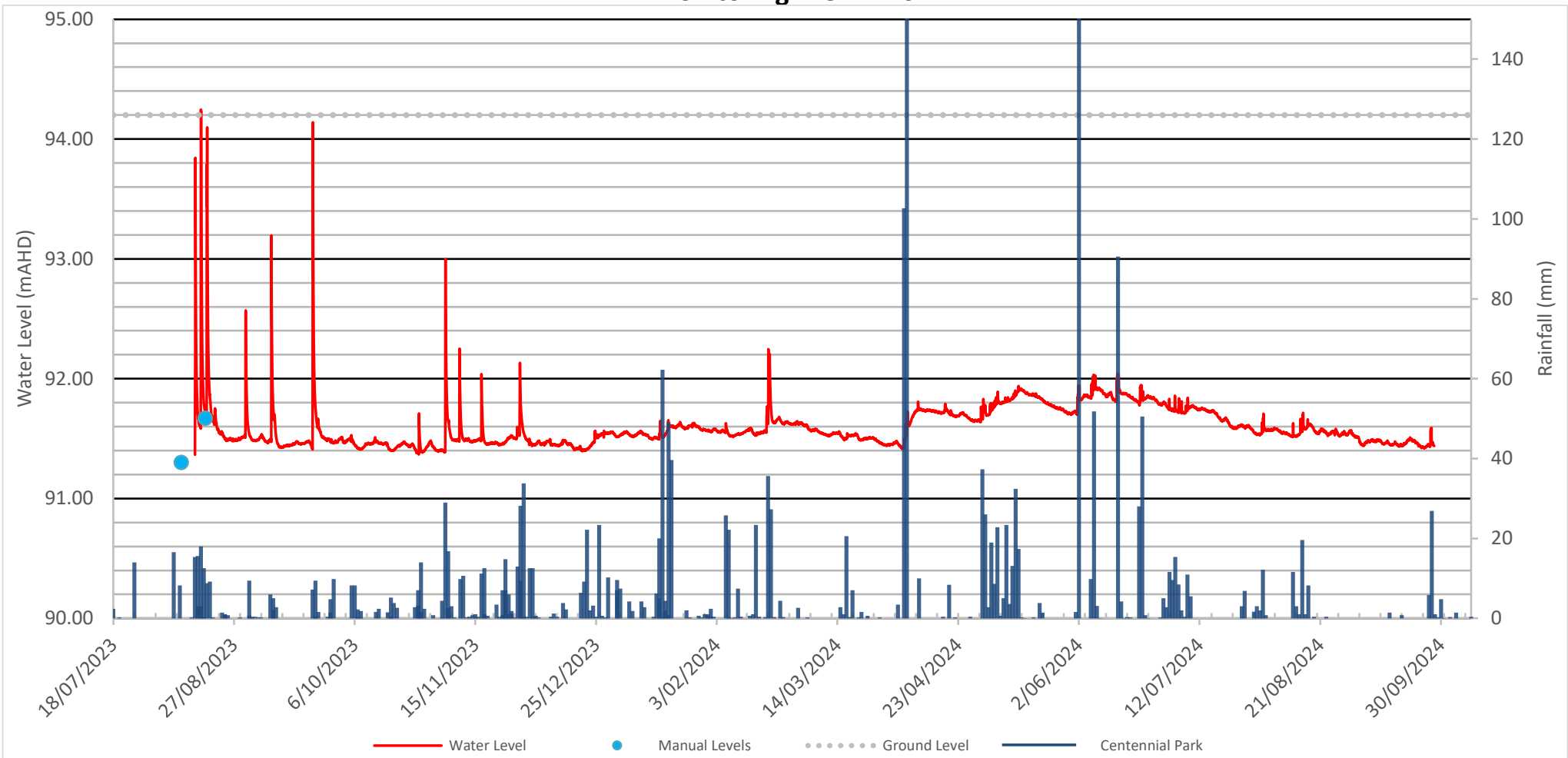


Note: Reading Interval = 30 seconds until 11/08/2023 then 60 minutes

Douglas PARTNERS

From	Drawn:
11/08/2023	LHS
To	**Date:**
4/10/2024	21/11/2024

Monitoring Well: BH6

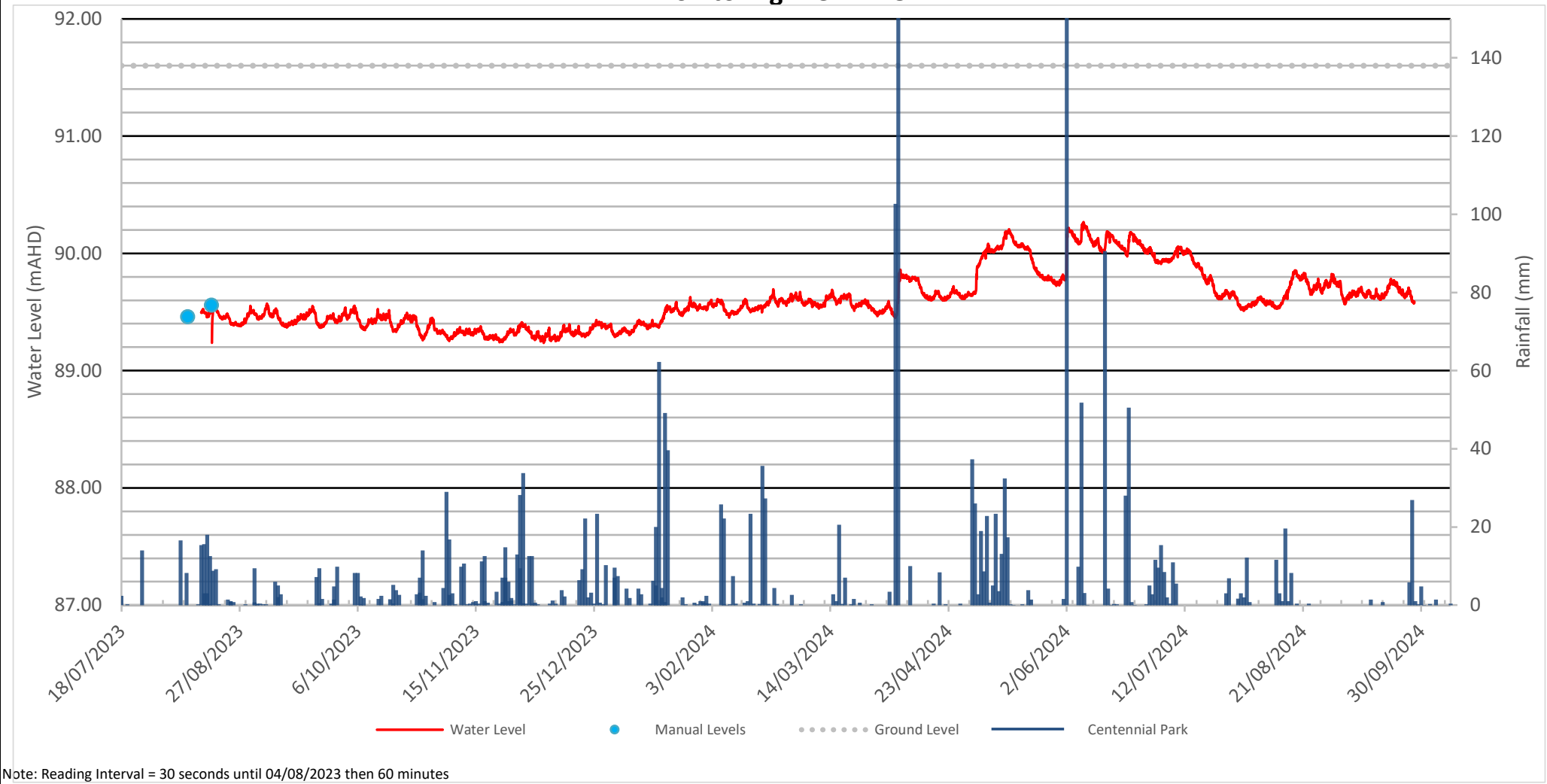


Note: Reading Interval = 30 seconds until 04/08/2023 then 60 minutes

Douglas PARTNERS

From	Drawn:
4/08/2023	LHS
To	**Date:**
27/09/2024	21/11/2024

Monitoring Well: BH8

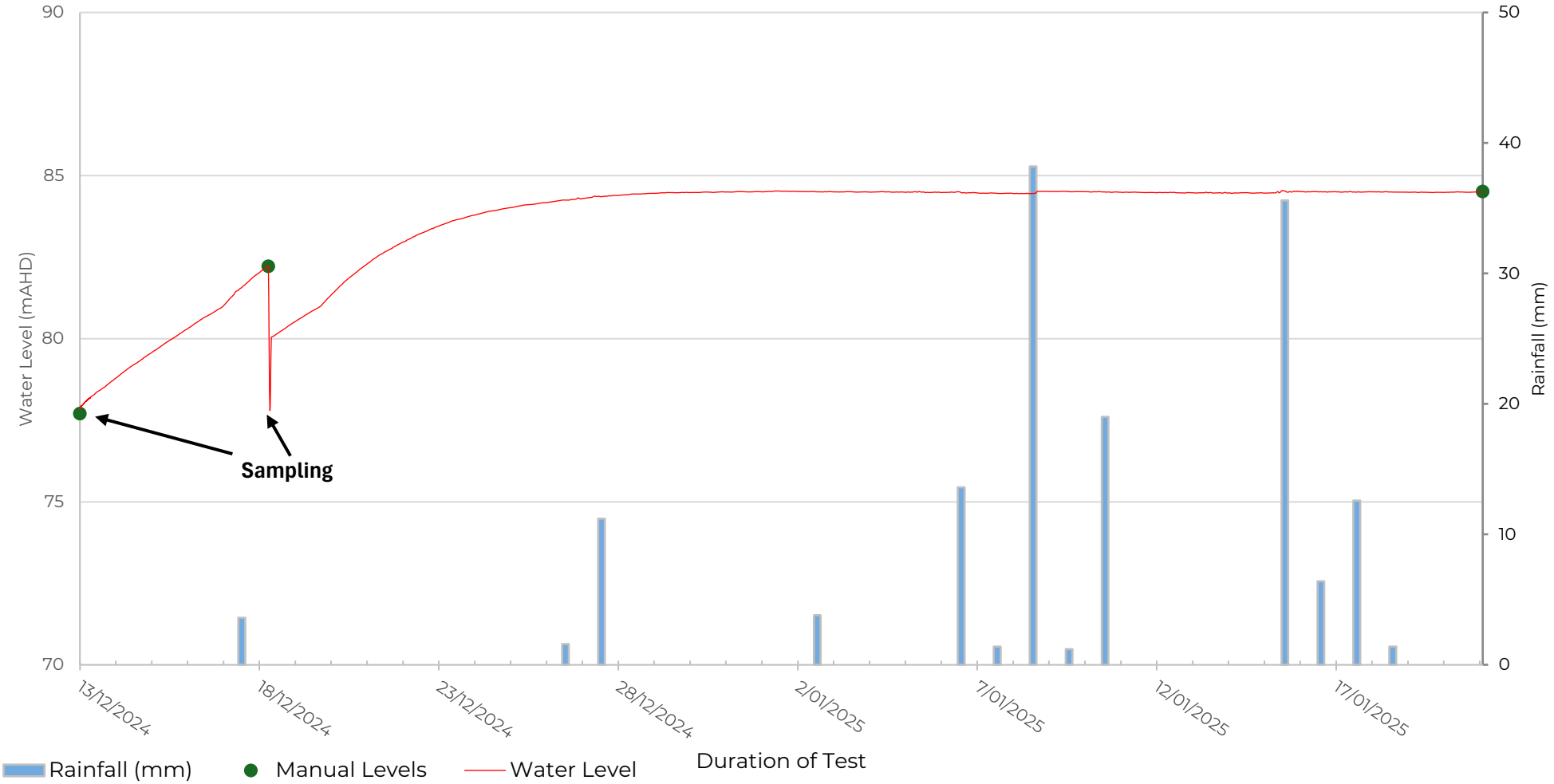


Note: Reading Interval = 30 seconds until 04/08/2023 then 60 minutes

Douglas PARTNERS

From	Drawn:
4/08/2023	LHS
To	**Date:**
27/09/2024	21/11/2024

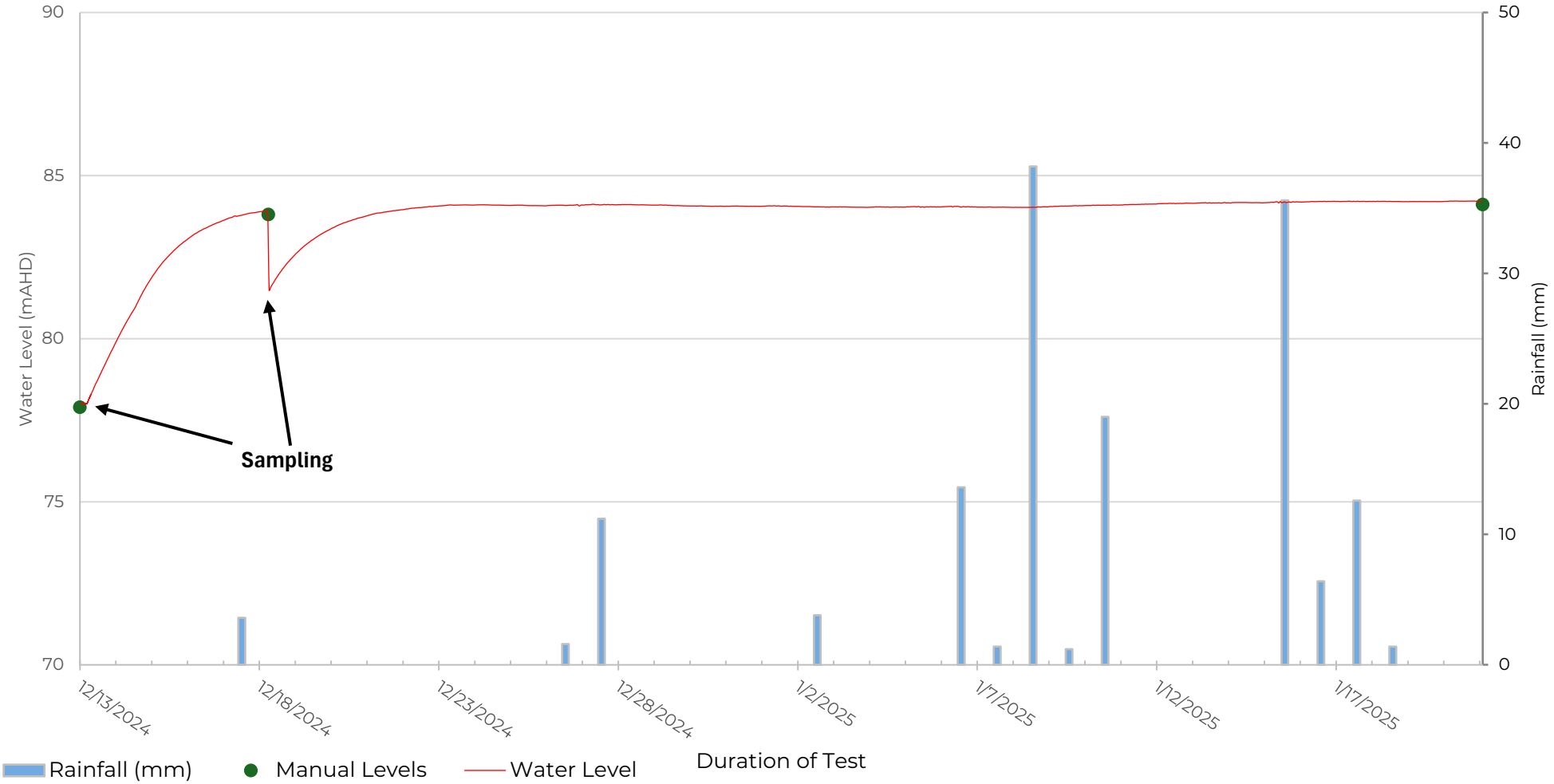
BH01 Groundwater Monitoring



Douglas PARTNERS | GROUNDED EXPERTISE

Borehole:	Borehole Depth: (mBGL)	From:	Drawn:
BH01	9	13/12/2024	ECB
Project:	**Surface RL: (mAHD)**	**To:**	**Checked:**
204088.03	86.3	21/01/2025	PH

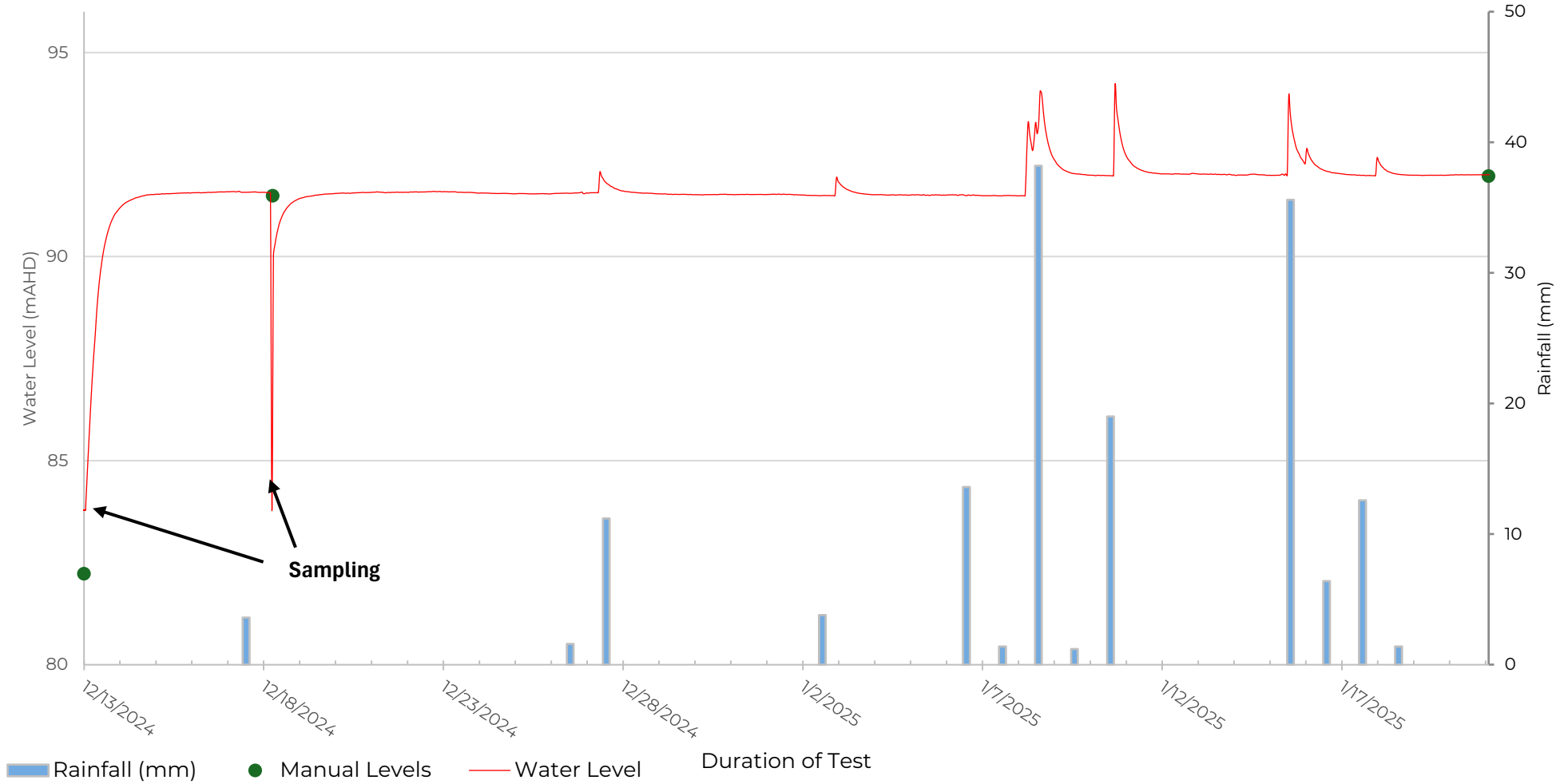
BH03 Groundwater Monitoring



Douglas PARTNERS | GROUNDED EXPERTISE

Borehole:	Borehole Depth: (mBGL)	From:	Drawn:
BH03	9	13/12/2024	ECB
Project:	**Surface RL: (mAHD)**	**To:**	**Checked:**
204088.03	85.8	21/01/2025	PH

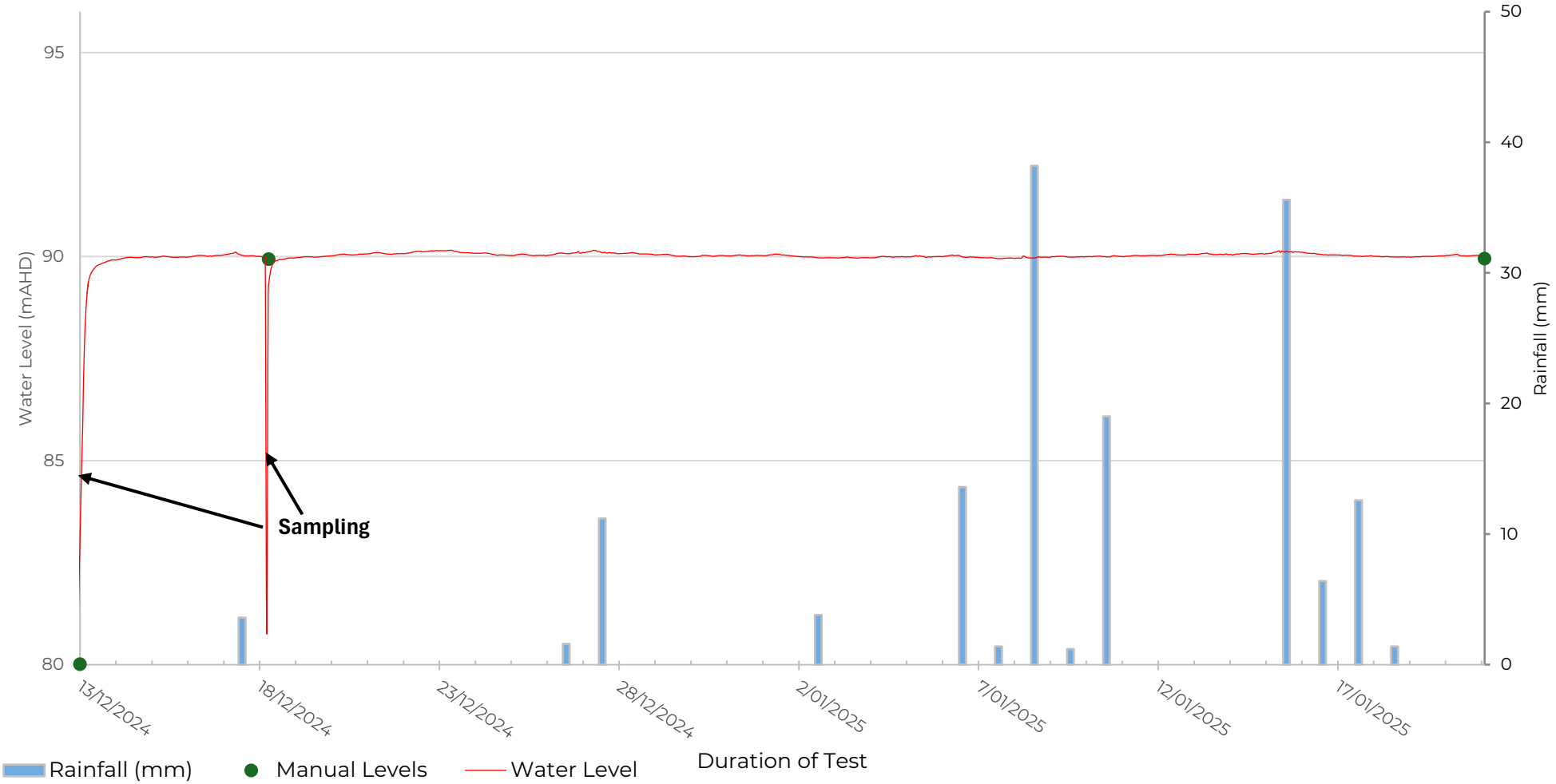
BH06 Groundwater Monitoring



Douglas PARTNERS | GROUNDED EXPERTISE

Borehole:	Borehole Depth: (mBGL)	From:	Drawn:
BH03	12.1	13/12/2024	ECB
Project:	**Surface RL: (mAHD)**	**To:**	**Checked:**
204088.03	94.2	21/01/2025	PH

BH08 Groundwater Monitoring



Douglas PARTNERS | GROUNDED EXPERTISE

Borehole:	Borehole Depth: (mBGL)	From:	Drawn:
BH08	12.1	13/12/2024	ECB
Project:	**Surface RL: (mAHD)**	**To:**	**Checked:**
204088.03	91.6	21/01/2025	PH

Appendix E

Hydraulic conductivity results

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

Permeability Testing - Rising Head Test Report

Client:	The Uniting Church in Australia Property Trust (NSW) for Uniting (NSW.ACT)	Project No:	204088.00
Project:	United War Memorial Hospital Redevelopment	Test date:	9-Aug-23
Location:	Birrell Street, Waverly	Tested by:	ECB

Test Location

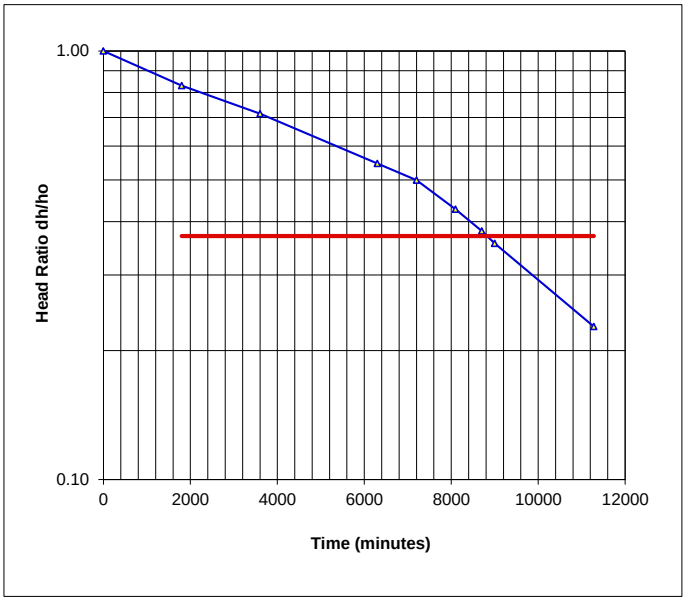
Description:	Standpipe in borehole	**Test No.**	BH1	
Material type:	Sandstone	Easting:	338341	m
		Northing	6247953	m
		Surface Level:	86.3	m AHD

Details of Well Installation

Effective diameter (2re)	96	mm	Depth to water before test	2.17	m
borehole diameter (2R)	96	mm	Depth to water at start of test	8.72	m
Effective Length of well screen (Le)	4.6	m	Depth of top of gravel pack	4.50	m
			Depth of base of gravel pack	9.10	m

Test Results

Time (min)	Depth (m)	Change in Head dH (m)	dH/Ho
0.00	8.72	6.55	1.000
1800	7.61	5.44	0.831
3600	6.85	4.68	0.715
6300	5.75	3.58	0.547
7200	5.44	3.27	0.499
8100	4.97	2.80	0.427
8700	4.66	2.49	0.380
9000	4.50	2.33	0.356
11280	3.66	1.49	0.227



To = 8800 mins
5E+05 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 = 2.2E-09** m/sec
= 1.9E-04 m/day

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

Permeability Testing - Rising Head Test Report

Client:	The Uniting Church in Australia Property Trust (NSW) for Uniting (NSW.ACT)	Project No:	204088.00
Project:	United War Memorial Hospital Redevelopment	Test date:	9-Aug-23
Location:	Birrell Street, Waverly	Tested by:	ECB

Test Location

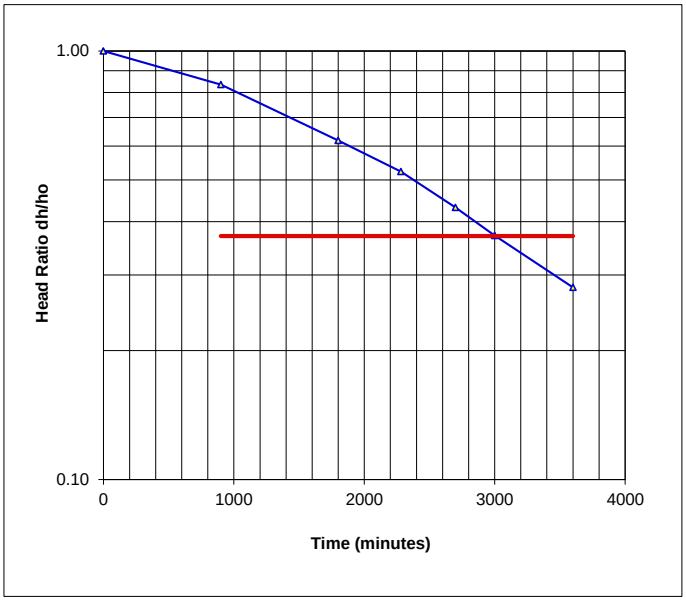
Description:	Standpipe in borehole	**Test No.**	BH3	
Material type:	Sandstone	Easting:	338375	m
		Northing	624839	m
		Surface Level:	85.8	m AHD

Details of Well Installation

Effective diameter (2re)	76	mm	Depth to water before test	2.05	m
borehole diameter (2R)	76	mm	Depth to water at start of test	7.82	m
Effective Length of well screen (Le)	4.5	m	Depth of top of gravel pack	4.50	m
			Depth of base of gravel pack	9.00	m

Test Results

Time (min)	Depth (m)	Change in Head dH (m)	dH/Ho
0	7.82	5.77	1.000
900	6.87	4.82	0.835
1800	5.62	3.57	0.619
2280	5.07	3.02	0.523
2700	4.54	2.49	0.432
3000	4.19	2.14	0.371
3600	3.67	1.62	0.281



To = 3000 mins
2E+05 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-09** m/sec
= 3.7E-04 m/day

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

Permeability Testing - Rising Head Test Report

Client:	The Uniting Church in Australia Property Trust (NSW) for Uniting (NSW.ACT)	Project No:	204088.00
Project:	United War Memorial Hospital Redevelopment	Test date:	4-Aug-23
Location:	Birrell Street, Waverly	Tested by:	ECB

Test Location

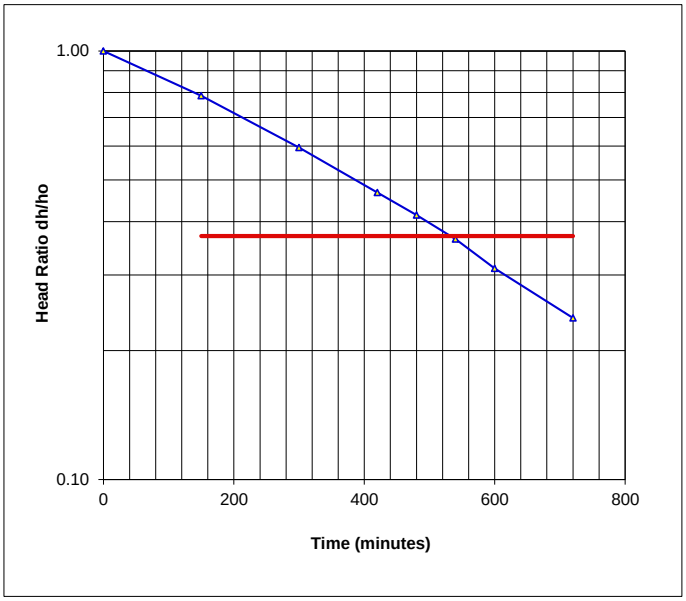
Description:	Standpipe in borehole	**Test No.**	BH6	
Material type:	Sandstone	Easting:	338474	m
		Northing	6247916	m
		Surface Level:	94.2	m AHD

Details of Well Installation

Effective diameter (2re)	96	mm	Depth to water before test	2.7	m
borehole diameter (2R)	96	mm	Depth to water at start of test	11.22	m
Effective Length of well screen (Le)	8.6	m	Depth of top of gravel pack	3.50	m
			Depth of base of gravel pack	12.10	m

Test Results

Time (min)	Depth (m)	Change in Head dH (m)	dH/Ho
0	11.22	8.52	1.000
150	9.40	6.70	0.786
300	7.77	5.07	0.595
420	6.68	3.98	0.467
480	6.23	3.53	0.414
540	5.80	3.10	0.364
600	5.35	2.65	0.311
720	4.73	2.03	0.238



To = 530 mins
31800 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 = 2.2E-08** m/sec
= 1.9E-03 m/day

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

Permeability Testing - Rising Head Test Report

Client:	The Uniting Church in Australia Property Trust (NSW) for Uniting (NSW.ACT)	Project No:	204088.00
Project:	United War Memorial Hospital Redevelopment	Test date:	4-Aug-23
Location:	Birrell Street, Waverly	Tested by:	ECB

Test Location

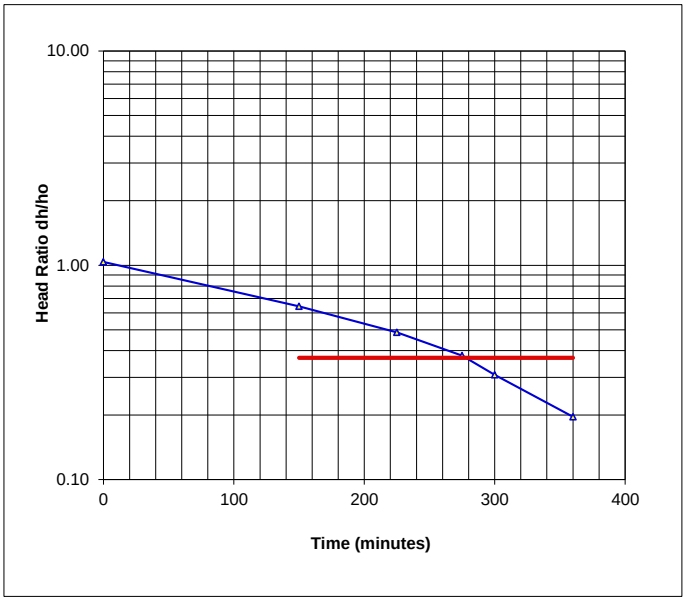
Description:	Standpipe in borehole	**Test No.**	BH8	
Material type:	Sandstone	Easting:	338452	m
		Northing	6247822	m
		Surface Level:	91.6	m AHD

Details of Well Installation

Effective diameter (2re)	96	mm	Depth to water before test	2.14	m
borehole diameter (2R)	96	mm	Depth to water at start of test	10.90	m
Effective Length of well screen (Le)	6.9	m	Depth of top of gravel pack	4.80	m
			Depth of base of gravel pack	11.70	m

Test Results

Time (min)	Depth (m)	Change in Head dH (m)	dH/Ho
0	11.22	9.08	1.037
150	7.77	5.63	0.643
225	6.40	4.26	0.486
275	5.46	3.32	0.379
300	4.84	2.70	0.308
360	3.86	1.72	0.196



To = 280 mins
16800 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-08** m/sec
= 4.3E-03 m/day

Appendix F

Groundwater quality summary tables

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 330913

Client Details

Client	Douglas Partners Pty Ltd
Attention	Paul Gorman
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**204088.01 Waverley**
Number of Samples	3 Water
Date samples received	18/08/2023
Date completed instructions received	18/08/2023

Analysis Details

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

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

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

Report Details

Date results requested by	25/08/2023
Date of Issue	24/08/2023

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

Results Approved By
Diego Bigolin, Inorganics Supervisor
Dragana Tomas, Senior Chemist
Loren Bardwell, Development Chemist
Steven Luong, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

VOCs in water				
Our Reference		330913-1	330913-2	330913-3
Your Reference	UNITS	BH1	BH3	BH8
Date Sampled		17/08/2023	17/08/2023	17/08/2023
Type of sample		Water	Water	Water
Date extracted	-	21/08/2023	21/08/2023	21/08/2023
Date analysed	-	22/08/2023	22/08/2023	22/08/2023
Dichlorodifluoromethane	µg/L	<10	<10	<10
Chloromethane	µg/L	<10	<10	<10
Vinyl Chloride	µg/L	<10	<10	<10
Bromomethane	µg/L	<10	<10	<10
Chloroethane	µg/L	<10	<10	<10
Trichlorofluoromethane	µg/L	<10	<10	<10
1,1-Dichloroethene	µg/L	<1	<1	<1
Trans-1,2-dichloroethene	µg/L	<1	<1	<1
1,1-dichloroethane	µg/L	<1	<1	<1
Cis-1,2-dichloroethene	µg/L	<1	<1	<1
Bromochloromethane	µg/L	<1	<1	<1
Chloroform	µg/L	1	<1	6
2,2-dichloropropane	µg/L	<1	<1	<1
1,2-dichloroethane	µg/L	<1	<1	<1
1,1,1-trichloroethane	µg/L	<1	<1	<1
1,1-dichloropropene	µg/L	<1	<1	<1
Cyclohexane	µg/L	<1	<1	<1
Carbon tetrachloride	µg/L	<1	<1	<1
Benzene	µg/L	<1	<1	<1
Dibromomethane	µg/L	<1	<1	<1
1,2-dichloropropane	µg/L	<1	<1	<1
Trichloroethene	µg/L	<1	<1	<1
Bromodichloromethane	µg/L	<1	<1	<1
trans-1,3-dichloropropene	µg/L	<1	<1	<1
cis-1,3-dichloropropene	µg/L	<1	<1	<1
1,1,2-trichloroethane	µg/L	<1	<1	<1
Toluene	µg/L	<1	2	<1
1,3-dichloropropane	µg/L	<1	<1	<1
Dibromochloromethane	µg/L	<1	<1	<1
1,2-dibromoethane	µg/L	<1	<1	<1
Tetrachloroethene	µg/L	<1	<1	<1
1,1,1,2-tetrachloroethane	µg/L	<1	<1	<1
Chlorobenzene	µg/L	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1

VOCs in water				
Our Reference		330913-1	330913-2	330913-3
Your Reference	UNITS	BH1	BH3	BH8
Date Sampled		17/08/2023	17/08/2023	17/08/2023
Type of sample		Water	Water	Water
Bromoform	µg/L	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2
Styrene	µg/L	<1	<1	<1
1,1,2,2-tetrachloroethane	µg/L	<1	<1	<1
o-xylene	µg/L	<1	<1	<1
1,2,3-trichloropropane	µg/L	<1	<1	<1
Isopropylbenzene	µg/L	<1	<1	<1
Bromobenzene	µg/L	<1	<1	<1
n-propyl benzene	µg/L	<1	<1	<1
2-chlorotoluene	µg/L	<1	<1	<1
4-chlorotoluene	µg/L	<1	<1	<1
1,3,5-trimethyl benzene	µg/L	<1	<1	<1
Tert-butyl benzene	µg/L	<1	<1	<1
1,2,4-trimethyl benzene	µg/L	<1	<1	<1
1,3-dichlorobenzene	µg/L	<1	<1	<1
Sec-butyl benzene	µg/L	<1	<1	<1
1,4-dichlorobenzene	µg/L	<1	<1	<1
4-isopropyl toluene	µg/L	<1	<1	<1
1,2-dichlorobenzene	µg/L	<1	<1	<1
n-butyl benzene	µg/L	<1	<1	<1
1,2-dibromo-3-chloropropane	µg/L	<1	<1	<1
1,2,4-trichlorobenzene	µg/L	<1	<1	<1
Hexachlorobutadiene	µg/L	<1	<1	<1
1,2,3-trichlorobenzene	µg/L	<1	<1	<1
Surrogate Dibromofluoromethane	%	100	101	98
Surrogate toluene-d8	%	94	95	94
Surrogate 4-BFB	%	103	104	103

vTRH(C6-C10)/BTEXN in Water				
Our Reference	UNITS	330913-1	330913-2	330913-3
Your Reference		BH1	BH3	BH8
Date Sampled		17/08/2023	17/08/2023	17/08/2023
Type of sample		Water	Water	Water
Date extracted	-	21/08/2023	21/08/2023	21/08/2023
Date analysed	-	22/08/2023	22/08/2023	22/08/2023
TRH C_6 - C_9	µg/L	<10	<10	<10
TRH C_6 - C_{10}	µg/L	<10	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10
Benzene	µg/L	<1	<1	<1
Toluene	µg/L	<1	2	<1
Ethylbenzene	µg/L	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2
o-xylene	µg/L	<1	<1	<1
Naphthalene	µg/L	<1	<1	<1
Surrogate Dibromofluoromethane	%	100	101	98
Surrogate toluene-d8	%	94	95	94
Surrogate 4-BFB	%	103	104	103

svTRH (C10-C40) in Water				
Our Reference		330913-1	330913-2	330913-3
Your Reference	UNITS	BH1	BH3	BH8
Date Sampled		17/08/2023	17/08/2023	17/08/2023
Type of sample		Water	Water	Water
Date extracted	-	22/08/2023	22/08/2023	22/08/2023
Date analysed	-	23/08/2023	23/08/2023	23/08/2023
TRH C_{10} - C_{14}	µg/L	<50	150	<50
TRH C_{15} - C_{28}	µg/L	<100	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100	<100
Total +ve TRH (C10-C36)	µg/L	<50	150	<50
TRH >C_{10} - C_{16}	µg/L	<50	160	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	160	<50
TRH >C_{16} - C_{34}	µg/L	<100	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100
Total +ve TRH (>C10-C40)	µg/L	<50	160	<50
Surrogate o-Terphenyl	%	81	75	80

PAHs in Water				
Our Reference		330913-1	330913-2	330913-3
Your Reference	UNITS	BH1	BH3	BH8
Date Sampled		17/08/2023	17/08/2023	17/08/2023
Type of sample		Water	Water	Water
Date extracted	-	22/08/2023	22/08/2023	22/08/2023
Date analysed	-	24/08/2023	24/08/2023	24/08/2023
Naphthalene	µg/L	<0.2	<0.2	<0.2
Acenaphthylene	µg/L	<0.1	<0.1	<0.1
Acenaphthene	µg/L	<0.1	<0.1	<0.1
Fluorene	µg/L	<0.1	<0.1	<0.1
Phenanthrene	µg/L	<0.1	<0.1	<0.1
Anthracene	µg/L	<0.1	<0.1	<0.1
Fluoranthene	µg/L	<0.1	<0.1	<0.1
Pyrene	µg/L	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5	<0.5
Total +ve PAH's	µg/L	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d14	%	99	93	106

Organochlorine Pesticides in Water				
Our Reference		330913-1	330913-2	330913-3
Your Reference	UNITS	BH1	BH3	BH8
Date Sampled		17/08/2023	17/08/2023	17/08/2023
Type of sample		Water	Water	Water
Date extracted	-	22/08/2023	22/08/2023	22/08/2023
Date analysed	-	24/08/2023	24/08/2023	24/08/2023
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 TCMX	%	112	101	114

OP Pesticides in Water				
Our Reference		330913-1	330913-2	330913-3
Your Reference	UNITS	BH1	BH3	BH8
Date Sampled		17/08/2023	17/08/2023	17/08/2023
Type of sample		Water	Water	Water
Date extracted	-	22/08/2023	22/08/2023	22/08/2023
Date analysed	-	24/08/2023	24/08/2023	24/08/2023
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 TCMX	%	112	101	114

PCBs in Water				
Our Reference		330913-1	330913-2	330913-3
Your Reference	UNITS	BH1	BH3	BH8
Date Sampled		17/08/2023	17/08/2023	17/08/2023
Type of sample		Water	Water	Water
Date extracted	-	22/08/2023	22/08/2023	22/08/2023
Date analysed	-	24/08/2023	24/08/2023	24/08/2023
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 TCMX	%	112	101	114

Total Phenolics in Water				
Our Reference		330913-1	330913-2	330913-3
Your Reference	UNITS	BH1	BH3	BH8
Date Sampled		17/08/2023	17/08/2023	17/08/2023
Type of sample		Water	Water	Water
Date extracted	-	21/08/2023	21/08/2023	21/08/2023
Date analysed	-	21/08/2023	21/08/2023	21/08/2023
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05

HM in water - dissolved				
Our Reference		330913-1	330913-2	330913-3
Your Reference	UNITS	BH1	BH3	BH8
Date Sampled		17/08/2023	17/08/2023	17/08/2023
Type of sample		Water	Water	Water
Date prepared	-	21/08/2023	21/08/2023	21/08/2023
Date analysed	-	21/08/2023	21/08/2023	21/08/2023
Arsenic-Dissolved	µg/L	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	0.1
Chromium-Dissolved	µg/L	<1	5	<1
Copper-Dissolved	µg/L	5	4	6
Lead-Dissolved	µg/L	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	11	31	8
Zinc-Dissolved	µg/L	29	55	27

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.
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	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
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.

QUALITY CONTROL: VOCs in water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			21/08/2023	1	21/08/2023	22/08/2023		21/08/2023	[NT]
Date analysed	-			22/08/2023	1	22/08/2023	23/08/2023		22/08/2023	[NT]
Dichlorodifluoromethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Chloromethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Vinyl Chloride	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Bromomethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Chloroethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Trichlorofluoromethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
1,1-Dichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Trans-1,2-dichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1-dichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	108	[NT]
Cis-1,2-dichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromochloromethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chloroform	µg/L	1	Org-023	<1	1	1	2	67	114	[NT]
2,2-dichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	106	[NT]
1,1,1-trichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	105	[NT]
1,1-dichloropropene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Cyclohexane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Carbon tetrachloride	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Dibromomethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Trichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	116	[NT]
Bromodichloromethane	µg/L	1	Org-023	<1	1	<1	<1	0	100	[NT]
trans-1,3-dichloropropene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
cis-1,3-dichloropropene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1,2-trichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,3-dichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Dibromochloromethane	µg/L	1	Org-023	<1	1	<1	<1	0	96	[NT]
1,2-dibromoethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Tetrachloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	109	[NT]
1,1,1,2-tetrachloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromoform	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	[NT]	[NT]
Styrene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1,2,2-tetrachloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]

QUALITY CONTROL: VOCs in water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,3-trichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Isopropylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
n-propyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
2-chlorotoluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
4-chlorotoluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,3,5-trimethyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Tert-butyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,4-trimethyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,3-dichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Sec-butyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,4-dichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
4-isopropyl toluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
n-butyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dibromo-3-chloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,4-trichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Hexachlorobutadiene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,3-trichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	99	1	100	100	0	93	[NT]
Surrogate toluene-d8	%		Org-023	95	1	94	96	2	97	[NT]
Surrogate 4-BFB	%		Org-023	103	1	103	103	0	99	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			21/08/2023	1	21/08/2023	22/08/2023		21/08/2023	[NT]
Date analysed	-			22/08/2023	1	22/08/2023	23/08/2023		22/08/2023	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	1	<10	<10	0	109	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	1	<10	<10	0	109	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	107	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	108	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	110	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	109	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	109	[NT]
Naphthalene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	99	1	100	100	0	93	[NT]
Surrogate toluene-d8	%		Org-023	95	1	94	96	2	97	[NT]
Surrogate 4-BFB	%		Org-023	103	1	103	103	0	99	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	[NT]
Date extracted	-			22/08/2023	[NT]	[NT]	[NT]	[NT]	22/08/2023	[NT]
Date analysed	-			23/08/2023	[NT]	[NT]	[NT]	[NT]	23/08/2023	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	98	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	99	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	114	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	98	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	99	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	114	[NT]
Surrogate o-Terphenyl	%		Org-020	70	[NT]	[NT]	[NT]	[NT]	82	[NT]

QUALITY CONTROL: PAHs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	[NT]
Date extracted	-			22/08/2023	[NT]	[NT]	[NT]	[NT]	22/08/2023	[NT]
Date analysed	-			24/08/2023	[NT]	[NT]	[NT]	[NT]	24/08/2023	[NT]
Naphthalene	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	70	[NT]
Acenaphthylene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	68	[NT]
Fluorene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	67	[NT]
Phenanthrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	67	[NT]
Anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	64	[NT]
Pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	70	[NT]
Benzo(a)anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	63	[NT]
Benzo(b,j+k)fluoranthene	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	68	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	89	[NT]	[NT]	[NT]	[NT]	81	[NT]

QUALITY CONTROL: Organochlorine Pesticides in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	[NT]
Date extracted	-			22/08/2023	[NT]	[NT]	[NT]	[NT]	22/08/2023	[NT]
Date analysed	-			24/08/2023	[NT]	[NT]	[NT]	[NT]	24/08/2023	[NT]
alpha-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	66	[NT]
HCB	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	63	[NT]
gamma-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Heptachlor	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	63	[NT]
delta-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	65	[NT]
Heptachlor Epoxide	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	62	[NT]
gamma-Chlordane	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-Chlordane	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	69	[NT]
Dieldrin	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	70	[NT]
Endrin	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	64	[NT]
Endosulfan II	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDD	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	68	[NT]
Endrin Aldehyde	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	71	[NT]
Methoxychlor	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Mirex	ug/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	92	[NT]	[NT]	[NT]	[NT]	86	[NT]

QUALITY CONTROL: OP Pesticides in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	[NT]
Date extracted	-			22/08/2023	[NT]	[NT]	[NT]	[NT]	22/08/2023	[NT]
Date analysed	-			24/08/2023	[NT]	[NT]	[NT]	[NT]	24/08/2023	[NT]
Dichlorvos	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	73	[NT]
Mevinphos	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Phorate	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dimethoate	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Diazinon	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Disulfoton	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chlorpyriphos-methyl	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Parathion-Methyl	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ronnel	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	64	[NT]
Fenitrothion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	67	[NT]
Malathion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	67	[NT]
Chlorpyriphos	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	65	[NT]
Fenthion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Parathion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	66	[NT]
Bromophos ethyl	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Methidathion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fenamiphos	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ethion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	61	[NT]
Phosalone	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Azinphos-methyl (Guthion)	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Coumaphos	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	92	[NT]	[NT]	[NT]	[NT]	86	[NT]

QUALITY CONTROL: PCBs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	[NT]
Date extracted	-			22/08/2023	[NT]	[NT]	[NT]	[NT]	22/08/2023	[NT]
Date analysed	-			24/08/2023	[NT]	[NT]	[NT]	[NT]	24/08/2023	[NT]
Aroclor 1016	µg/L	2	Org-021	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1221	µg/L	2	Org-021	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1232	µg/L	2	Org-021	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1242	µg/L	2	Org-021	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1248	µg/L	2	Org-021	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1254	µg/L	2	Org-021	<2	[NT]	[NT]	[NT]	[NT]	84	[NT]
Aroclor 1260	µg/L	2	Org-021	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-021	92	[NT]	[NT]	[NT]	[NT]	86	[NT]

QUALITY CONTROL: Total Phenolics in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	330913-2
Date extracted	-			21/08/2023	1	21/08/2023	21/08/2023		21/08/2023	21/08/2023
Date analysed	-			21/08/2023	1	21/08/2023	21/08/2023		21/08/2023	21/08/2023
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	1	<0.05	<0.05	0	104	95

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			21/08/2023	1	21/08/2023	21/08/2023		21/08/2023	[NT]
Date analysed	-			21/08/2023	1	21/08/2023	21/08/2023		21/08/2023	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	97	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	<0.1	<0.1	0	99	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	100	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	1	5	5	0	97	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	95	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0.05	0	104	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	11	11	0	98	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	29	24	19	101	[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.

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	204088.01	**Suburb:**	Waverley	**To:**	Envirolab Services
Project Manager:	Paul Gorman	**Order Number:**	-	**Sampler:**	JBC
					12 Ashley St, Chatswood NSW 2067
Email:	Paul.Gorman@douglaspartners.com.au			**Attn:**	Sample Receipt
Turnaround time:	☑ Standard ☐ 72 hour ☐ 48 hour ☐ 24 hour ☐ Same day				(02) 9910 6200 samplereceipt@envirolab.com.au
Prior Storage:	☑ Fridge ☐ Freezer ☐ Esky ☐ Shelf	**Do samples contain 'potential' HBM?**	☑ No ☐ Yes		(If YES, then handle, transport and 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: Heavy Metals (low level)	TRH / BTEX	PAH (low level)	OCP, OPP, PCB (standard level)	Phenol	VOC						Notes/ Preservation/ Additional Requirements
1	BH1			17/08/23	W	G/P	x	x	x	x	x	x						
2	BH3			17/08/23	W	G/P	x	x	x	x	x	x						
3	BH8			17/08/23	W	G/P	x	x	x	x	x	x						

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

Job No: 330913
Date Received: 18/8/23
Time Received: 1545
Received By: EW
Temp: Cool/Ambient
Cooling: Ice/Icepack 5°C.
Security: Intact/Broken/None

Metals to analyse:		**LAB RECEIPT**	
Number of samples in container:		**Transported to laboratory by:**	**Lab Ref. No:**
Send results to:	Douglas Partners Pty Ltd		**Received by:** EMILY (W)
Address:	96 Hermitage Road, West Ryde NSW 211	**Phone:** (02) 9809 0666	**Date & Time:** 18/8/23 1545.
Relinquished by:	JBC	**Date:** 18/08/2023 **Signed:** JBC	**Signed:** EW

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

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Pty Ltd
Attention	Paul Gorman

Sample Login Details

Your reference	204088.01 Waverley
Envirolab Reference	330913
Date Sample Received	18/08/2023
Date Instructions Received	18/08/2023
Date Results Expected to be Reported	25/08/2023

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	3 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	5
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

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

Analysis Underway, details on the following page:

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

Sample ID	VOCs in water	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHs in Water	Organochlorine Pesticides in Water	OP Pesticides in Water	PCBs in Water	Total Phenolics in Water	HM in water - dissolved
BH1	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH3	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH8	✓	✓	✓	✓	✓	✓	✓	✓	✓

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

Additional Info

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

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 369507

Client Details

Client	Douglas Partners Pty Ltd
Attention	Peter Hunt
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**204088.03 Birrell Street**
Number of Samples	5 Water
Date samples received	19/12/2024
Date completed instructions received	19/12/2024

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	03/01/2025
Date of Issue	03/01/2025

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Results Approved By
Liam Timmins, Organics Supervisor
Nick Sarlamis, Assistant Operation Manager
Tabitha Roberts, Senior Chemist
Timothy Toll, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

VOCs in water					
Our Reference		369507-1	369507-2	369507-3	369507-4
Your Reference	UNITS	BH1	BH3	BH6	BH8
Date Sampled		18/12/2024	18/12/2024	18/12/2024	18/12/2024
Type of sample		Water	Water	Water	Water
Date Extracted	-	21/12/2024	21/12/2024	21/12/2024	21/12/2024
Date Analysed	-	21/12/2024	21/12/2024	21/12/2024	21/12/2024
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	<1	<1	<1
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		369507-1	369507-2	369507-3	369507-4
Your Reference	UNITS	BH1	BH3	BH6	BH8
Date Sampled		18/12/2024	18/12/2024	18/12/2024	18/12/2024
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	%	102	99	103	103
Surrogate Toluene-d8	%	99	98	99	100
Surrogate 4-Bromofluorobenzene	%	96	88	95	94

vTRH(C6-C10)/BTEXN in Water					
Our Reference		369507-1	369507-2	369507-3	369507-4
Your Reference	UNITS	BH1	BH3	BH6	BH8
Date Sampled		18/12/2024	18/12/2024	18/12/2024	18/12/2024
Type of sample		Water	Water	Water	Water
Date extracted	-	21/12/2024	21/12/2024	21/12/2024	21/12/2024
Date analysed	-	21/12/2024	21/12/2024	21/12/2024	21/12/2024
TRH C_6 - C_9	µg/L	<10	<10	<10	<10
TRH C_6 - C_{10}	µg/L	<10	<10	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10	<10
Benzene	µg/L	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2
o-xylene	µg/L	<1	<1	<1	<1
Naphthalene	µg/L	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	102	99	103	103
Surrogate Toluene-d8	%	99	98	99	100
Surrogate 4-Bromofluorobenzene	%	96	88	95	94

svTRH (C10-C40) in Water					
Our Reference	UNITS	369507-1	369507-2	369507-3	369507-4
Your Reference		BH1	BH3	BH6	BH8
Date Sampled		18/12/2024	18/12/2024	18/12/2024	18/12/2024
Type of sample		Water	Water	Water	Water
Date extracted	-	20/12/2024	20/12/2024	20/12/2024	20/12/2024
Date analysed	-	20/12/2024	20/12/2024	20/12/2024	20/12/2024
TRH C_{10} - C_{14}	µg/L	<50	<50	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100	<100	<100
Total +ve TRH (C10-C36)	µg/L	<50	<50	<50	<50
TRH >C_{10} - C_{16}	µg/L	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50	<50	<50
TRH >C_{16} - C_{34}	µg/L	<100	120	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	µg/L	<50	120	<50	<50
Surrogate o-Terphenyl	%	71	86	76	94

PAHs in Water					
Our Reference		369507-1	369507-2	369507-3	369507-4
Your Reference	UNITS	BH1	BH3	BH6	BH8
Date Sampled		18/12/2024	18/12/2024	18/12/2024	18/12/2024
Type of sample		Water	Water	Water	Water
Date extracted	-	20/12/2024	20/12/2024	20/12/2024	20/12/2024
Date analysed	-	23/12/2024	23/12/2024	23/12/2024	23/12/2024
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	%	97	112	87	106

HM in water - dissolved					
Our Reference		369507-1	369507-2	369507-3	369507-4
Your Reference	UNITS	BH1	BH3	BH6	BH8
Date Sampled		18/12/2024	18/12/2024	18/12/2024	18/12/2024
Type of sample		Water	Water	Water	Water
Date prepared	-	20/12/2024	20/12/2024	20/12/2024	20/12/2024
Date analysed	-	20/12/2024	20/12/2024	20/12/2024	20/12/2024
Arsenic-Dissolved	µg/L	<1	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	0.1
Chromium-Dissolved	µg/L	<1	6	<1	<1
Copper-Dissolved	µg/L	1	2	2	1
Lead-Dissolved	µg/L	<1	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	6	16	5	5
Zinc-Dissolved	µg/L	22	44	44	39

HM in water - total					
Our Reference		369507-1	369507-2	369507-3	369507-4
Your Reference	UNITS	BH1	BH3	BH6	BH8
Date Sampled		18/12/2024	18/12/2024	18/12/2024	18/12/2024
Type of sample		Water	Water	Water	Water
Date prepared	-	23/12/2024	23/12/2024	23/12/2024	23/12/2024
Date analysed	-	23/12/2024	23/12/2024	23/12/2024	23/12/2024
Arsenic-Total	µg/L	<1	2	<1	<1
Cadmium-Total	µg/L	<0.1	<0.1	<0.1	0.2
Chromium-Total	µg/L	2	8	<1	1
Copper-Total	µg/L	2	3	2	2
Lead-Total	µg/L	<1	3	5	1
Mercury-Total	µg/L	<0.05	<0.05	<0.05	<0.05
Nickel-Total	µg/L	5	14	4	4
Zinc-Total	µg/L	17	37	37	35

Miscellaneous Inorganics					
Our Reference		369507-1	369507-2	369507-3	369507-4
Your Reference	UNITS	BH1	BH3	BH6	BH8
Date Sampled		18/12/2024	18/12/2024	18/12/2024	18/12/2024
Type of sample		Water	Water	Water	Water
Date prepared	-	02/01/2025	02/01/2025	02/01/2025	02/01/2025
Date analysed	-	02/01/2025	02/01/2025	02/01/2025	02/01/2025
Oil & Grease (LLE)	mg/L	9	13	<5	5

Method ID	Methodology Summary
Inorg-003	Oil & Grease - determine gravimetrically following extraction with Hexane, in accordance with APHA latest edition, 5520-B.
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-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.

QUALITY CONTROL: VOCs in water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date Extracted	-			21/12/2024	[NT]	[NT]	[NT]	[NT]	21/12/2024	[NT]
Date Analysed	-			21/12/2024	[NT]	[NT]	[NT]	[NT]	21/12/2024	[NT]
Dichlorodifluoromethane	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chloromethane	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Vinyl Chloride	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bromomethane	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chloroethane	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Trichlorofluoromethane	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,1-Dichloroethene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Trans-1,2-dichloroethene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,1-dichloroethane	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Cis-1,2-dichloroethene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bromochloromethane	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chloroform	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	107	[NT]
2,2-dichloropropane	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2-dichloroethane	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	109	[NT]
1,1,1-trichloroethane	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]
1,1-dichloropropene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Cyclohexane	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Carbon tetrachloride	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Dibromomethane	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2-dichloropropane	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Trichloroethene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	110	[NT]
Bromodichloromethane	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	109	[NT]
trans-1,3-dichloropropene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
cis-1,3-dichloropropene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,1,2-trichloroethane	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	103	[NT]
1,3-dichloropropane	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibromochloromethane	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	111	[NT]
1,2-dibromoethane	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Tetrachloroethene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
1,1,1,2-tetrachloroethane	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chlorobenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	92	[NT]
Bromoform	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	99	[NT]
Styrene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,1,2,2-tetrachloroethane	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]

QUALITY CONTROL: VOCs in water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]
1,2,3-trichloropropane	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Isopropylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bromobenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
n-propyl benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
2-chlorotoluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
4-chlorotoluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,3,5-trimethyl benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Tert-butyl benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2,4-trimethyl benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,3-dichlorobenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Sec-butyl benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,4-dichlorobenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
4-isopropyl toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2-dichlorobenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
n-butyl benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2-dibromo-3-chloropropane	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2,4-trichlorobenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Hexachlorobutadiene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2,3-trichlorobenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	102	[NT]	[NT]	[NT]	[NT]	99	[NT]
Surrogate Toluene-d8	%		Org-023	100	[NT]	[NT]	[NT]	[NT]	100	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	95	[NT]	[NT]	[NT]	[NT]	97	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			21/12/2024	[NT]	[NT]	[NT]	[NT]	21/12/2024	[NT]
Date analysed	-			21/12/2024	[NT]	[NT]	[NT]	[NT]	21/12/2024	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	98	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	98	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	103	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	92	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	99	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Naphthalene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	102	[NT]	[NT]	[NT]	[NT]	99	[NT]
Surrogate Toluene-d8	%		Org-023	100	[NT]	[NT]	[NT]	[NT]	100	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	95	[NT]	[NT]	[NT]	[NT]	97	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	369507-2
Date extracted	-			20/12/2024	1	20/12/2024	20/12/2024		20/12/2024	20/12/2024
Date analysed	-			20/12/2024	1	20/12/2024	20/12/2024		20/12/2024	20/12/2024
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	1	<50	<50	0	105	104
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	1	<100	<100	0	104	106
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	1	<100	<100	0	100	99
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	1	<50	<50	0	105	104
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	1	<100	<100	0	104	106
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	1	<100	<100	0	100	99
Surrogate o-Terphenyl	%		Org-020	74	1	71	63	12	84	106

QUALITY CONTROL: PAHs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	369507-2
Date extracted	-			20/12/2024	1	20/12/2024	20/12/2024		20/12/2024	20/12/2024
Date analysed	-			23/12/2024	1	23/12/2024	23/12/2024		23/12/2024	23/12/2024
Naphthalene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	93	106
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	84
Fluorene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	92	102
Phenanthrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	97	116
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	92	99
Pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	96	104
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	91	101
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	76	85
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	89	1	97	100	3	109	108

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	369507-2
Date prepared	-			20/12/2024	1	20/12/2024	20/12/2024		20/12/2024	20/12/2024
Date analysed	-			20/12/2024	1	20/12/2024	20/12/2024		20/12/2024	20/12/2024
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		98	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	<0.1	[NT]		97	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		107	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	1	1	[NT]		102	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		99	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0.05	0	117	109
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	6	[NT]		104	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	22	[NT]		105	[NT]

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	369507-2
Date prepared	-			23/12/2024	1	23/12/2024	23/12/2024		23/12/2024	23/12/2024
Date analysed	-			23/12/2024	1	23/12/2024	23/12/2024		23/12/2024	23/12/2024
Arsenic-Total	µg/L	1	Metals-022	<1	1	<1	<1	0	95	93
Cadmium-Total	µg/L	0.1	Metals-022	<0.1	1	<0.1	<0.1	0	91	94
Chromium-Total	µg/L	1	Metals-022	<1	1	2	2	0	86	89
Copper-Total	µg/L	1	Metals-022	<1	1	2	2	0	89	93
Lead-Total	µg/L	1	Metals-022	<1	1	<1	<1	0	83	86
Mercury-Total	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0.05	0	116	109
Nickel-Total	µg/L	1	Metals-022	<1	1	5	5	0	89	91
Zinc-Total	µg/L	1	Metals-022	<1	1	17	18	6	86	90

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			02/01/2025	[NT]	[NT]	[NT]	[NT]	02/01/2025	[NT]
Date analysed	-			02/01/2025	[NT]	[NT]	[NT]	[NT]	02/01/2025	[NT]
Oil & Grease (LLE)	mg/L	5	Inorg-003	<5	[NT]	[NT]	[NT]	[NT]	86	[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.

COC: 19/12/24 0948

Douglas PARTNERS | GROUNDED EXPERTISE

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	204088.03	**Suburb:**	Birrell Street	**To:**	Envirolab Services
Project Manager:	Peter Hunt	**Order Number:**		**Sampler:** JBC	12 Ashley St, Chatswood NSW 2067
Email:	Peter.Hunt@douglaspartners.com.au; paul.gorman@douglaspartners.com.au			**Attn:**	Sample Receipt
Turnaround time:	☑ Standard ☐ 72 hour ☐ 48 hour ☐ 24 hour ☐ Same day				(02) 9910 6200 samplereceipt@envirolab.cor
Prior Storage:	☑ Fridge ☐ Freezer ☐ Esky ☐ Shelf	**Do samples contain 'potential' HBM?**	☑ No ☐ Yes (YES, then handle, transport and 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: Metals (dissolved and total)	TRH	BTEX	PAH	VOC	Oil and grease	HOLD					Notes/ Preservation/ Additional Requirements
1	BH1			18/12/24	W	G/P	x	x	x	x	x	x						
2	BH3			18/12/24	W	G/P	x	x	x	x	x	x						
3	BH6			18/12/24	W	G/P	x	x	x	x	x	x						
4	BH8			18/12/24	W	G/P	x	x	x	x	x	x						
5	BD1/20241218			18/12/24	W	G/P							x					

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

Job No: 369507
Date Received: 19/12/24
Time Received: 1530
Received By: LC
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Metals to analyse: HM8 (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)

Number of samples in container:		**Transported to laboratory by:**	Courier
Send results to:	Douglas Partners Pty Ltd		
Address:	96 Hermitage Road, West Ryde NSW 211	**Phone:**	(02) 9809 0666
Relinquished by:		**Date:**	**Signed:**

LAB RECEIPT

Lab Ref. No:	369507
Received by:	LC
Date & Time	19/12/24 1530
Signed:	LC

Douglas PARTNERS

Table F2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, VOC (excluding BTEX)

		METALS - Dissolved								TRH				BTEX						PAH					Phenol			
		Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	F1 ((C6-C10)-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)	Benzene	Toluene	Ethylbenzene	o-Xylene	m+p-Xylene	Total Xylenes	Anthracene	Naphthalene	Benzo(a)pyrene (BaP)	Fluoranthene	Phenanthrene	Total Phenolics	Aldrin	DDE	DDT
	PQL	1	0.1	1	1	1	0.05	1	1	10	50	100	100	1	1	1	1	2	1	0.1	0.2	0.1	0.1	0.1	0.05	0.2	0.2	0.2
ANZG (2018) 95% LOP Fresh		24	0.2	1	1.4	3.4	0.06	11	8					950	180	80	350	275		0.01	16	0.1	1	0.6	320	0.001		0.006
NEPC (2013) HSL 2-4m										1000	1000			800	NL	NL			NL		NL							
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L
BH1	17/08/23	<1	<0.1	<1	5	<1	<0.05	11	29	<10	<50	<100	<100	<1	<1	<1	<1	<2	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.5	<0.2	<0.2	<0.2
BH3	17/08/23	<1	<0.1	5	4	<1	<0.05	31	55	<10	160	<100	<100	<1	2	<1	<1	<2	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.5	<0.2	<0.2	<0.2
BH8	17/08/23	<1	0.1	<1	6	<1	<0.05	8	27	<10	<50	<100	<100	<1	<1	<1	<1	<2	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.5	<0.2	<0.2	<0.2

Notes:

*	QA/QC replicate of sample listed directly below the primary sample
PQL	Practical quantitation limit
-	No criterion / not defined / not tested / not applicable
	Shaded cell is exceedance of guideline value
	Where one or more guideline value is exceeded, the cell is shaded to the colour of the highest guideline value exceeded
	NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013), health screening level Sand 2-4m
	ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 95% level of protection of species for Fresh aquatic ecosystems [NB: 99% level of protection adopted for bioaccumulative chemicals]
	ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 95% level of protection of species for Marine aquatic ecosystems [NB: 99% level of protection adopted for bioaccumulative chemicals]
	NHMRC (2008) Guidelines for Managing Risk in Recreational Water

Table F2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, VOC (excluding BTEX)

		OCP														OPP												
		delta-BHC	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan Sulphate	Endrin	Heptachlor	Hexachlorobenzene	Lindane	Methoxychlor	Mirex	DDD	Total OCP	Aldrin + Dieldrin (calculated)	Azinphos methyl (Guthion)	Bromophos-ethyl	Chlorpyriphos	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenitrothion	Fenthion	Malathion	Parathion	Parathion-methyl	Total OPP
	PQL	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
ANZG (2018) 95% LOP Fresh			0.01				0.01	0.01	0.1	0.2	0.005	0.04				0.02		0.00004	0.01		0.15		0.2		0.05	0.004		
NEPC (2013) HSL 2-4m																												
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH1	17/08/23	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BH3	17/08/23	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BH8	17/08/23	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Notes:

* QA/QC replicate of sample listed directly below the primary sample

PQL Practical quantitation limit

\- No criterion / not defined / not tested / not applicable

Shaded cell is exceedance of guideline value

Where one or more guideline value is exceeded, the cell is shaded to the colour of the highest guideline value exceeded

NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013), health screening level Sand 2-4m

ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 95% level of protection of species for Fresh aquatic ecosystems [NB: 99% level of protection adopted for bioaccumulative chemicals]

ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 95% level of protection of species for Marine aquatic ecosystems [NB: 99% level of protection adopted for bioaccumulative chemicals]

NHMRC (2008) Guidelines for Managing Risk in Recreational Water

Table F2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, VOC (excluding BTEX)

		PCB			VOC																								
		Arochlor 1242	Arochlor 1254	Total PCB	1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	Tetrachloroethene	1,1,2-Trichloroethane	1,1,2-Trichloroethylene	1,1-Dichloroethene	1,2,3-Trichlorobenzene	1,2,4-Trichlorobenzene	1,2-Dichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,3-Dichloropropane	1,4-Dichlorobenzene	Carbon Tetrachloride	Vinyl Chloride	Chloroform	Isopropylbenzene (cumene)	1,2-Dibromoethane	Hexachlorobutadiene	Bromomethane	Monochlorobenzene	Styrene (vinylbenzene)	Total VOC
	PQL	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	10	1	1	1	1	10	1	1	1
ANZG (2018) 95% LOP Fresh		0.3	0.01		270	400	70	6500	330	700	3	85	160	1900	900	260	1100	60	240	100	770	30					55		
NEPC (2013) HSL 2-4m																													
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH1	17/08/23	<2	<2	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	1	<1	<1	<1	<10	<1	<1	<1	1
BH3	17/08/23	<2	<2	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<1	<1	<1	<10	<1	<1	<1	<1
BH8	17/08/23	<2	<2	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	6	<1	<1	<1	<10	<1	<1	<1	6

Notes:

* QA/QC replicate of sample listed directly below the primary sample

PQL Practical quantitation limit

\- No criterion / not defined / not tested / not applicable

Shaded cell is exceedance of guideline value

Where one or more guideline value is exceeded, the cell is shaded to the colour of the highest guideline value exceeded

NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013), health screening level Sand 2-4m

ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 95% level of protection of species for Fresh aquatic ecosystems [NB: 99% level of protection adopted for bioaccumulative chemicals]

ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 95% level of protection of species for Marine aquatic ecosystems [NB: 99% level of protection adopted for bioaccumulative chemicals]

NHMRC (2008) Guidelines for Managing Risk in Recreational Water

Table F2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, VOC (excluding BTEX)

		Metals - Dissolved								TRH				BTEX						PAH										
		Total Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	F1 ((C6-C10)-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)	Benzene	Toluene	Ethylbenzene	o-Xylene	m+p-Xylene	Total Xylenes	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Naphthalene	Benzo(a)pyrene (BaP)	Benzo(b,j+k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene
	PQL	1	0.1	1	1	1	0.05	1	1	10	50	100	100	1	1	1	1	2	1	0.1	0.1	0.1	0.1	1	0.1	0.2	0.1	0.1	0.1	0.1
ANZG (2018) 95% LOP Fresh		13	0.2	1	1.4	3.4	**0.06**	11	8					950	180	80	350	75				**0.01**		16	**0.1**					**1**
NEPC (2013) HSL 2-4m										1000	1000			800	NL	NL			NL					NL						
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH1	18/12/24	<1	<0.1	<1	**1**	<1	<0.05	**6**	**22**	<10	<50	<100	<100	<1	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1
BH3	18/12/24	<1	<0.1	**6**	**2**	<1	<0.05	**16**	**44**	<10	<50	**120**	<100	<1	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1
BH6	18/12/24	<1	<0.1	<1	**2**	<1	<0.05	**5**	**44**	<10	<50	<100	<100	<1	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1
BH8	18/12/24	<1	**0.1**	<1	**1**	<1	<0.05	**5**	**39**	<10	<50	<100	<100	<1	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1

Notes:

- No criterion / not defined / not tested / not applicable

PQL Practical quantitation limit

NL Not limiting

Shaded cell is exceedance of guideline value

Where one or more guideline value is exceeded, the cell is shaded to the colour of the highest guideline value exceeded

ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 95% level of protection of species for Fresh aquatic ecosystems [NB: 99% level of protection adopted for bioaccumulative chemicals]

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ANZG (2018) Ammonia DGV is pH and temperature dependant. DGV for a pH of 8 provided in table.

Table F2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, VOC (excluding BTEX)

		Fluorene	Indeno[1,2,3-c,d]pyrene	Phenanthrene	Pyrene	Sum of detected PAH	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	tetrachloroethene	1,1,2-trichloroethane	1,1,2-trichloroethylene	1,1-dichloroethane	1,1-Dichloroethene	1,1-dichloropropene	1,2,3-trichlorobenzene	1,2,3-trichloropropane	1,2,4-trichlorobenzene	1,2,4-trimethyl benzene	1,2-dibromo-3-chloropropane	1,2-dichlorobenzene	1,2-dichloroethane	1,2-dichloropropane	1,3,5-trimethyl benzene	1,3-dichlorobenzene	1,3-dichloropropane	1,4-dichlorobenzene	2,2-dichloropropane	2-chlorotoluene	4-chlorotoluene
	PQL	0.1	0.1	0.1	0.1	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
ANZG (2018) 95% LOP Fresh				**0.6**				270	400	70	6,500	330		700		**3**		**85**			160	1,900	900		260	1,100	60			
NEPC (2013) HSL 2-4m																														
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH1	18/12/24	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH3	18/12/24	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH6	18/12/24	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH8	18/12/24	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Notes:

- No criterion / not defined / not tested / not applicable

Practical quantitation limit

NL Not limiting

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Table F2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, VOC (excluding BTEX)

		VOC (excluding BTEX)																												
		4-isopropyl toluene	Bromobenzene	Bromochloromethane	Bromodichloromethane	Bromoform	carbon tetrachloride	Chloroethane	Vinyl Chloride	Chloroform	Chloromethane	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Isopropylbenzene (cumene)	Cyclohexane	dibromochloromethane	Dibromomethane	Dichlorodifluoromethane	1,2-dibromoethane	hexachlorobutadiene	Bromomethane	Monochlorobenzene	n-butyl benzene	n-propyl benzene	sec-butyl benzene	Styrene (vinylbenzene)	Tert-butyl benzene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Trichlorofluoromethane
	PQL	1	1	1	1	1	1	10	10	1	10	1	1	1	1	1	1	10	1	1	10	1	1	1	1	1	1	1	1	10
ANZG (2018) 95% LOP Fresh							240		100	770				30								55								
NEPC (2013) HSL 2-4m																														
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH1	18/12/24	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1	<1	<1	<1	<1	<1	<10	<1	<1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<10
BH3	18/12/24	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1	<1	<1	<1	<1	<1	<10	<1	<1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<10
BH6	18/12/24	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1	<1	<1	<1	<1	<1	<10	<1	<1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<10
BH8	18/12/24	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1	<1	<1	<1	<1	<1	<10	<1	<1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<10

Notes:

- No criterion / not defined / not tested / not applicable

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Table F2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, VOC (excluding BTEX)

		Sum of detected VOC
	PQL	1
ANZG (2018) 95% LOP Fresh		
NEPC (2013) HSL 2-4m		
Sample ID	Sample Date	µg/L
BH1	18/12/24	<1
BH3	18/12/24	<1
BH6	18/12/24	<1
BH8	18/12/24	<1

Notes:

- No criterion / not defined / not tested / not applicable
PQL Practical quantitation limit
NL Not limiting

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