

Ground and Surface Water Impact Assessment

Newington Masterplan

**200-244 and 221-235 Stanmore Road,
Stanmore NSW**

**Prepared for Council of Newington
College**

Project 234875.00

10 April 2026

Document History

Details

Project No.	234875.00
Document Title	Ground and Surface Water Impact Assessment
Site Address	200-244 and 221-235 Stanmore Road, Stanmore NSW
Report Prepared For	Council of Newington College
Filename	234875.00.R.002.Rev2

Status and Review

Status	Prepared by	Reviewed by	Date issued
Revision 0	Alex Gibson	Will Wright	9 October 2025
Revision 1	Alex Gibson	Will Wright	24 October 2025
Revision 2	Alex Gibson	Will Wright	10 April 2026

Distribution of Copies

Status	Issued to
Revision 0	Chris Taylor, AJC Architects Pty Ltd
Revision 1	Chris Taylor, AJC Architects Pty Ltd
Revision 2	Council of Newington College

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.

Signature

Date

Author	p.p. 	10 April 2026
Reviewer	p.p. 	10 April 2026

Table of Contents

	Page No
1. Introduction.....	1
1.1 Purpose of this report.....	1
1.2 Regulatory framework and guidance.....	2
1.3 Conditions of approval.....	2
2. Proposed development	3
2.1 Proposed development and construction	3
2.1.1 Sevington Site	3
2.1.2 Concordia Site.....	3
2.2 Proposed dewatering and discharge methods	3
3. Site description	4
3.1 Sevington Site	4
3.2 Concordia Site	4
4. Hydrogeological setting	5
4.1 Topography.....	5
4.2 Climate.....	5
4.3 Geology.....	5
4.4 Hydrogeology and groundwater source	6
4.5 Hydrology	6
4.5.1 Sevington Site	6
4.5.2 Concordia Site.....	6
4.6 Surface Water	6
4.7 Groundwater receptors.....	6
4.8 Acid sulfate soils and salinity	7
5. Investigation results	8
5.1 Geotechnical	8
5.2 Groundwater	9
5.2.1 Groundwater levels.....	9
5.2.2 Hydraulic conductivity	10
5.2.3 Groundwater quality.....	10
6. Conceptual hydrogeological model	11
6.1 Sevington Site	11
6.2 Concordia Site	11

6.3	Groundwater Variations.....	12
7.	Groundwater inflow assessment	12
7.1	Methodology	12
7.1.1	Model geometry	12
7.1.2	Model Parameters.....	14
7.1.3	Boundary Conditions	15
7.1.4	Basement Design and Dewatering	15
7.1.5	Simulation	16
7.1.6	Sensitivity scenarios	16
7.2	Modelling results.....	16
7.2.1	Predicted groundwater inflow.....	16
7.2.2	Drawdown and settlement.....	19
8.	Impact assessment	20
8.1	Aquifer Interference Policy consideration	20
8.2	Environmental risk assessment.....	20
9.	Recommended groundwater management	21
9.1	General.....	21
9.2	Groundwater inflow control.....	21
9.2.1	Control measures and monitoring.....	21
9.3	Water quality control.....	21
9.3.1	Proposed testing.....	21
9.3.2	Discharge options and contingency measures.....	22
9.3.3	Water quality acceptance criteria	23
9.3.4	Treatment options	24
9.4	Monitoring and reporting requirements.....	24
9.5	Personnel and responsibilities.....	25
9.6	Contingency plan.....	26
10.	Approvals and licensing	26
10.1	Water Access Licence (WAL) and entitlements.....	26
10.2	Water Supply Works Approval (WSWA).....	27
10.3	Council and EPA approvals.....	27
11.	Conclusion	28
12.	References	28
13.	Limitations	29

Appendix A:	Drawings
Appendix B:	About This Report
Appendix C:	Hydrographs
Appendix D:	Hydraulic testing results
Appendix E:	Water quality summary table
Appendix F:	Laboratory reports

The following general project overview is included in this report at the request of the project planner.

Introduction

Douglas Partners Pty Ltd has been commissioned by the Council of Newington College (the Applicant) to prepare this report in accordance with the technical requirements of the Secretary's Environmental Assessment Requirements (SEARs), and in support of the State Significant Development Application (SSD-78268465) for alterations and additions to the Newington College Senior Campus in Stanmore.

Description of the site and locality

The Newington College Senior Campus is located at 200-244 Stanmore Road, Stanmore and is bordered by Stanmore Road to the north, Newington Road to the south and College Lane to the west. The College boundary also includes the Concordia building to the north at 221-235 Stanmore Road. The main campus is legally described as Lot 8 in DP710369 and the Concordia site is legally described as Lot A in DP109269, Lot 1 in DP49, Lot B in DP330028, and Lot 1 in DP526319.

Key features of the site include:

- The main campus site is a regular shaped allotment with an area of 8.7ha. The Concordia site (and access handle to Cavendish Street), immediately north of the main campus is irregular in shape and is 2,903sqm in area.
- The topography of the main campus is a defining characteristic, particularly the grassed slope from the historic Founders Building down to Johnson Oval. The site has an overall fall of approximately 18m from the north-west corner to south-east corner.
- The at-grade car park adjacent to the Concordia building sits approximately 2.8m above the Stanmore Road street level, and is accessed via Cavendish Street (to the rear).
- The existing school buildings are largely located along the College Lane and Newington Road edges of the site. Existing buildings generally range from 2-4 storeys in scale. The balance of the site comprises at-grade car parking and sporting facilities, including sporting ovals and tennis courts.
- The Concordia building across Stanmore Road is a two-storey building with basement and car parking accessed from Stanmore Road. An at-grade car park is located within the eastern portion of this site, with vehicular access from a driveway to Cavendish Street (to the north).
- The site has a primary frontage to Stanmore Road (which accommodates both vehicular and pedestrian access to the site) and a secondary frontage to Newington Road, which is generally limited to pedestrian access and service vehicles.
- The area surrounding the site is predominantly zoned R2 Low Density Residential and includes a combination of single dwellings and residential flat building ranging from 1-3 storeys in height. Stanmore Train Station is located approximately 220m to the north. An existing pedestrian bridge and signalised traffic lights provide pedestrian access over Stanmore Road to Stanmore Train Station, further north.

The site is identified in the figure overleaf.



Source: Urbis 2024

Project Description

The SSDA seeks consent for staged alterations and additions to the Newington College Senior Campus comprising:

Concept Proposal for the provision of new and upgraded facilities, including:

- Building envelope for the redevelopment of Sevington Courts to accommodate recreational facilities and teaching spaces (refer to detailed Stage 1 Works below).
- Building envelope for alterations and additions to Centenary Hall and development of an adjoining, four storey teaching and learning facility (College Lane building). This development will accommodate a cafeteria and dining hall, lecture theatre, multi-purpose teaching spaces and additional pastoral spaces.
- Building envelope for the redevelopment of the Concordia building to accommodate a performance theatre, multi-purpose gallery and exam centre, new teaching spaces and basement car parking. The Concordia redevelopment includes a new pedestrian bridge across Stanmore Road to the main campus.
- Landscaping design strategy across the campus.
- Car parking provision and circulation arrangements.
- Increase of 368 students and 45 full-time equivalent (**FTE**) staff.

Detailed Stage 1 Works, including:

- Earthworks and the associated demolition of Sevington Courts.
- Construction, fit-out and operation of 3 storey building comprising multi-purpose indoor and rooftop courts, fitness centre, multi-purpose teaching spaces, amenities and basement car parking.
- Construction, fit-out and operation of 4 storey building comprising multi-purpose teaching spaces, administrative functions and amenities.
- Alterations to the existing driveway within the site to facilitate vehicle access to the new basement car park.
- Temporary car park during construction phase of Stage 1 Works.
- Tree removal and new landscaping adjacent to the Stage 1 development site.
- Increase of 368 students and 45 FTE staff.

Dewatering Management Plan

Newington Masterplan

200-244 and 221-235 Stanmore Road, Stanmore NSW

1. Introduction

1.1 Purpose of this report

This report prepared by Douglas Partners Pty Ltd (Douglas) outlines the ground and surface water impact assessment (GIA) for the proposed Newington Masterplan Developments at 200-244 and 221-235 Stanmore Road, Stanmore NSW. The work was undertaken in accordance with Douglas' proposal 234875.00.P.001.Rev0 dated 19 March 2025.

The purpose of this GIA is to support the submission of a State Significant Development Application (SSDA), addressing the assessment requirements specified in Section 1.3. Additionally, this document aims to assist in obtaining the necessary approvals for the disposal of extracted groundwater, where applicable.

The Newington Masterplan Developments comprises six separate development stages across three sites at Newington College. Two of these stages, Stage 1 Sevington and Stage 6 Concordia, are understood to include proposed basement construction, which will intercept the groundwater table and will require dewatering. No basements are proposed for other stages of the development. Therefore, only Stages 1 and 6 are the subject of this assessment. The other Stages were not considered in this assessment, as they are unlikely to have any impacts on groundwater, and will not be mentioned further in this report.

A brief overview of the development is provided in Section 2. The site location is shown on Drawing 1, Appendix A.

This GIA is based on the findings of site-specific investigations and monitoring, including:

- Geotechnical investigation (Douglas, 234875.00.R.001.Rev1, dated 5 September 2025, 2025a); and
- Preliminary site (contamination) investigation with Limited Sampling (Douglas, 234875.01.R.001.Rev1, dated 21 August 2025, 2025b).

The following key information is relevant to the preparation of this GIA:

- The proposed works will intercept the groundwater table.
- Groundwater levels on the Sevington site have been observed at approximately RL 27.8 m.
- Groundwater levels on the Concordia site have been observed at approximately RL 35.7 m
- The depth of the proposed basement at the Sevington site is approximately RL 26 m AHD.
- The depth of the proposed basement at the Concordia site is approximately RL 35.1 m AHD
- The basement is intended to be drained; and
- The extracted groundwater will be disposed of via stormwater.

This GIA is intended as a preliminary document and will be superseded by a detailed dewatering management plan that includes water treatment and discharge schematics, monitoring plans, and triggers to be implemented during construction.

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

1.2 Regulatory framework and guidance

The following key guidelines and documents were consulted in preparation of this report:

- *Guidelines for Groundwater Protection in Australia*, National Water Quality Management Strategy (Australian Government, 2013);
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018);
- *Minimum requirements for building site groundwater investigations and reporting* (NSW DPE, 2022);
- *NSW Aquifer Interference Policy* (DPI-NSW Office of Water, 2012); and
- *NSW Aquifer Interference Policy* (NSW DPI, 2013), supplementary version.
- *Groundwater assessment toolbox for Major Projects in NSW* (NSW DPE, 2022);
- *Guidelines for Groundwater Documentation for SSD/SSI Projects* (NSW DPE, 2022);
- *Minimum Groundwater Modelling Requirements for SSD/SSI Projects* (NSW DPE, 2022); and
- *Cumulative Groundwater Impact Assessment Approaches* (NSW DPE, 2022).

Additional regulatory requirements may also apply, including WaterNSW approvals for water take and disposal (see Section 10), and local council or EPA conditions depending on the nature and location of discharge.

1.3 Conditions of approval

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) dated 3 February 2025 and issued for the SSDA (SSD-78268465). Specifically, this report has been prepared to respond to the SEARs requirements for ground and water conditions as listed in Table 1.

Table 1: Compliance table

Assessment Requirement	Report Section / Response
Provide an assessment of the potential impacts on surface and groundwater resources (quality and quantity), including related infrastructure, hydrology, aquatic and groundwater dependant ecosystems, drainage lines, downstream assets and watercourses.	4.5, 4.6, 4.7, 5.2.3, 8.0
Prepare the assessments in accordance with the Standard Environment and Department of Climate Change, Energy, the Environment and Water (DCCEW) requirements.	This Report

2. Proposed development

2.1 Proposed development and construction

2.1.1 Sevington Site

The “Sevington Courts” site (Stage 1) on the northeast edge of the main campus, on the south side of Stanmore Road, will generally involve demolition of the existing tennis courts and surrounding pavements, and construction of a new four-storey indoor sports and fitness centre over a basement carpark.

The proposed basement carpark finished floor level (FFL) is at approximately RL 26.3 m AHD. Assuming a bulk excavation level (BEL) nominally 0.3 m below the FFL puts the BEL at RL 26 m AHD, which is approximately 5.7 m below the existing court level and a maximum of approximately 7.5 m to 8 m below the existing paved area to the west of the courts and Stanmore Road to the north (decreasing to approximately 6.5 m to 7 m below Stanmore Road at the east end of the basement).

Construction of the proposed basement carpark will likely require bulk excavation to depths ranging to a maximum of approximately 8 m below existing surface levels.

2.1.2 Concordia Site

The “Concordia Redevelopment” (Stage 6), north of the main Newington College campus, on the north side of Stanmore Road, will generally involve demolition of the existing building on the site and construction of a new four-storey school building with a theatre, over a single level basement carpark.

The proposed basement carpark FFL is at approximately RL 35.4 m AHD. Assuming a BEL nominally 0.3 m below the FFL puts the BEL at RL 35.1 m AHD, approximately 1.9 m below the existing lower carpark slab level and approximately 3.2 m below the existing upper outdoor carpark pavement level. It is noted that the existing lower carpark level is already up to approximately 1.5 m below existing surface levels on adjacent sites to the west and north (with existing retaining walls), such that the proposed basement level is a maximum of 3 m to 3.5 m below surface levels on adjacent sites in the northwest of the site.

Construction of the proposed basement carpark will likely require bulk excavation to maximum depths ranging to approximately 3.2 m below existing surface levels on the site. This includes excavation in proximity to residential properties to the north and east of the site forming maximum height differences of 3 m to 3.5 m between the sites, and to a maximum depth of approximately 1.9 m below Stanmore Road on the southwest of the site

2.2 Proposed dewatering and discharge methods

During construction and in the long term, it is anticipated that groundwater flows into the excavations will be controlled by perimeter and subfloor drainage connected to a sump-and-pump system.

3. Site description

3.1 Sevington Site

The Sevington site is a rectangular shaped area of approximately 3,600m², bounded by Stanmore Road to the north, and existing landscaped areas and on-grade pavements to the west, east, and south (on Newington College property).

The site is currently an outdoor tennis/basketball court, and slopes slightly down towards the southeast with surface levels ranging from approximately RL 34 m to RL 30 m AHD; slightly above surrounding levels to the east and south, with a retaining wall up to a maximum height of approximately 1.5 m running along the south and east boundaries of the court.

Along the north and west boundaries of the court, the surrounding surface levels are in the range of 1.2 m to 2 m higher than the court, with existing retaining walls of the same heights running along these boundaries.

At the northern edge of the site, there is a stairway and landing for an existing concrete pedestrian footbridge over Stanmore Road

3.2 Concordia Site

The Concordia site is an irregular shaped area of approximately 2,900 m², bounded by Stanmore Road to the south, residential properties to the west and east, and residential properties then Cavendish Street to the north.

The site is currently occupied by a multi-storey office building with a single level carpark at approximately the same elevation as Stanmore Road at the west end of the site (approximately RL 37 m AHD), and an elevated on-grade carpark at the east end of the site at RL 38.3 m AHD, essentially splitting the site into two relatively flat areas.

The site is situated at the crest of a ridge, with surrounding surface levels falling away to the north and south of the site.

Stanmore Road generally falls gradually to the southeast, resulting in a maximum height difference of approximately 3 m between the raised on-grade carpark and the street, near the southeast corner of the site adjacent to Stanmore Road, supported by a tapered concrete and brick retaining wall along part of the southern and eastern site boundaries.

The lower carpark level is lower than the surrounding site levels to the north and west of the site, with retained heights of up to approximately 1.5 m.

It is noted that Stanmore Road is a classified NSW State Road and Transport for NSW asset.



Figure 1: Site overview showing Sevington and Concordia sites

4. Hydrogeological setting

4.1 Topography

The Concordia site is situated along the crest of an east-west trending ridgeline, with the Sevington site being situated on the south face of the broad hill falling away from that ridgeline, with levels falling gradually towards the south.

4.2 Climate

The average annual rainfall in Sydney is approximately 1.2 m/year (www.bom.gov.au), in a temperate climate with warm summers, mild winters, and no dry seasons.

4.3 Geology

Reference to the Sydney 1:100 000 Series Geological Sheet indicates that the site broadly is underlain by Ashfield Shale of the Wianamatta Group, typically comprising black to light grey shale, siltstone and laminite

4.4 Hydrogeology and groundwater source

Groundwater is anticipated to follow the regional topography, either to the north to Johnstons Creek or to the southeast towards the Cooks River.

Based on the site's geology, it is expected that the perennial groundwater table occurs within the minor fractured aquifers hosted by the underlying Ashfield Shale bedrock. This formation typically acts as an aquitard or aquiclude, although minor secondary permeability can occur where defects are present. Perched seepage water with limited volumes can be expected at levels above the perennial groundwater table.

The site is located within the Sydney Basin Central Groundwater Source and is subject to the Greater Metropolitan Region Groundwater Sources 2023 water sharing plan.

4.5 Hydrology

4.5.1 Sevington Site

The closest watercourse to the site is Johnstons Creek 950 m north of the site. Cooks River is approximately 3 km south (downgradient) of the site.

4.5.2 Concordia Site

The closest watercourse to the site is Johnstons Creek 900 m north (downgradient) of the site.

4.6 Surface Water

Surface water runoff from the site is expected to follow the general regional topography and drain into the local stormwater system. As the sites are situated on local crests or hillsides, the surface water is likely to eventually drain either to Johnstons Creek (from the Concordia site), which is approximately 900 m north of the site, or to the Cooks River (all sites), which is approximately 3 km south of the site.

4.7 Groundwater receptors

A search of the Bureau of Meteorology (BoM)'s groundwater dependent ecosystems Atlas (the GDE Atlas) has been undertaken to identify mapped GDEs within 500 m of the sites (Figure 2). No listed GDEs are mapped within 500 m of either site. A review of the BoM national groundwater information system (NGIS) shows no water bores are registered within 500 m of the site).

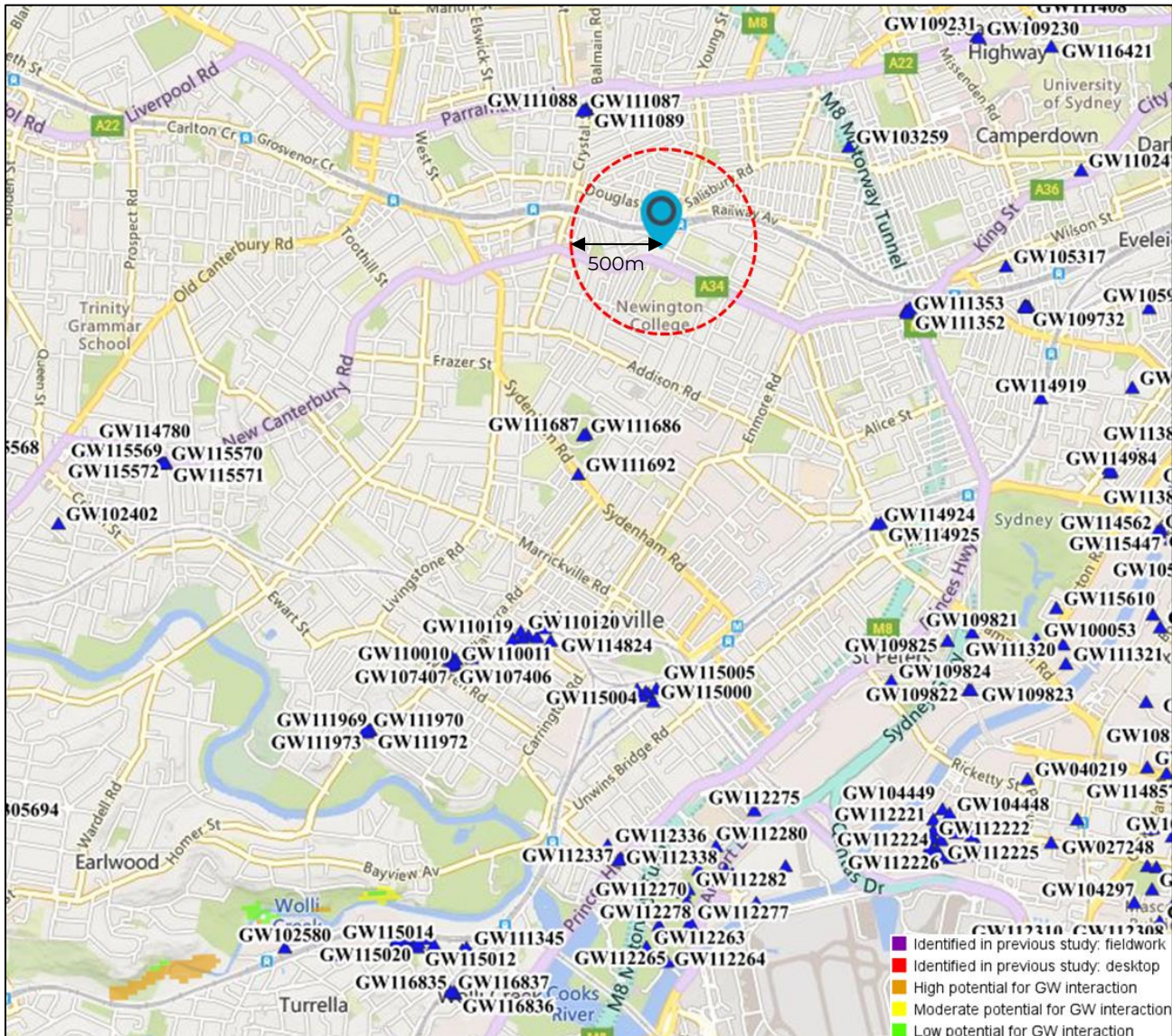


Figure 2: Groundwater receptors

4.8 Acid sulfate soils and salinity

The site was reviewed for the potential presence of acid sulfate soils (ASS) and salinity risks based on regional mapping, soil classification and available site investigation data.

Reference to the published national mapping indicates that the site is located within an area mapped as having “extremely low probability of occurrence” of acid sulfate soil (ASS).

Reference to regional ASS Risk mapping indicates that the site is located within an area mapped as “no known occurrence of acid sulphate soils”.

Acid sulfate soils mostly occur in low-lying marine depositional environments, typically below RL 5 m AHD and rarely above RL 10 m AHD; and are not likely to be present at this site.

No signs of ASS were observed during the geotechnical investigation (Douglas, 2025a).

Reference to NSW DCCEE Hydrogeological Landscapes of NSW and the ACT mapping indicates that the site is in a region mapped as having a “Very High Overall Salinity Hazard”.

It is noted that the salinity mapping generally lumps Wiannamatta Group Shales (and soils derived from them) together as high risk, and while Bringelly Shale is typically associated with a high salinity hazard, this is usually not the case for soils derived from Ashfield Shale.

It is expected that the proposed development will not meaningfully alter the topography and surface or subsurface flow regimes on and around the sites. Furthermore, the results of the laboratory testing undertaken during the geotechnical investigation generally indicate that the soils on-sites are non-saline to slightly saline. It is considered that soil salinity is unlikely to be an issue for this development, and no further assessment or special management of salinity is required for the proposed development

5. Investigation results

5.1 Geotechnical

A geotechnical investigation was undertaken by Douglas in September 2025 (Douglas, 2025a). The test locations are shown in Drawings 2 and 3 (Appendix A). The interpreted geotechnical model is illustrated in four cross-sections (A-A', B-B' [Concordia] C-C', D-D' [Sevington]),.

The interpreted model for both the Sevington and Concordia sites can be summarised as follows:

UNIT 1: FILL:	Including all existing pavements and variable fill materials encountered during the investigation. The fill is considered uncontrolled.
UNIT 2: RESIDUAL CLAY:	Firm, stiff or very stiff; grey mottled red and orange, residual clay.
UNIT 3: EXTREMELY WEATHERED SHALE:	Hard; typically red and grey, clay with very low to medium strength siltstone and ironstone bands, with Ashfield Shale rock fabric evident.
UNIT 4: VERY LOW TO LOW STRENGTH SHALE	Very low and low strength, highly weathered, highly to moderately fractured, dark grey and brown siltstone.
UNIT 5: LOW TO MEDIUM STRENGTH SHALE	Low and medium strength, moderately weathered, moderately to slightly fractured, dark grey siltstone with some sandstone laminations.
UNIT 6: MEDIUM TO HIGH STRENGTH SHALE	Medium and high strength, slightly weathered to fresh, slightly fractured, dark grey siltstone often interlaminated with pale grey fine-grained sandstone in roughly equal proportions (i.e., laminite).

5.2 Groundwater

Three groundwater wells were installed within the sites, two within the Sevington site, one within the Concordia site. One groundwater well was installed within the Centenary Hall site located approximately 170 m to the southwest, and has been included herewith for reference. Groundwater results are summarised in subsequent sections.

Table 2 summarises the monitoring wells' attributes. Their location is shown on Drawing 1 (Appendix A).

Table 2: Monitoring well details

Well ID	Site	Surface (m AHD)	Installation Date	Screened Interval (m) / Material
BH1 ^C	Concordia	37.0	4 April 2025	8.5 – 11.7 / Shale
BH15 ^S	Sevington	28.9	16 April 2025	6.3 – 12.8 / Shale
BH16 ^S		29.6	16 April 2025	1.5 – 4.0 / Residual Clay
BH6 ^{Ce}	Centenary	33.4	11 April 2025	5.4 – 12.1 / Shale

Notes: m bgl: metres below ground level

5.2.1 Groundwater levels

Groundwater levels have been continuously recorded at hourly intervals between 21 May and 1 September 2025 using data loggers installed in the monitoring wells. Hydrographs showing recorded levels in comparison with rainfall data over time are presented in Appendix C.

The groundwater levels in the monitoring wells have continued to be relatively stable with fluctuations of about 0.4 to 0.6 m over the monitoring period. The highest groundwater levels were recorded in late August 2025, following periods of sustained rainfall.

A summary of the measured groundwater levels manually measured within the site is provided in Table 3. Maximum, minimum and average groundwater levels recorded by the dataloggers are presented in Table 4.

Table 3: Groundwater levels – manual measurements

Well ID	Depth to groundwater (m bgl)				Groundwater elevation (m AHD)			
	29-Apr	21-May	29-May	1-Sep	29-Apr	21-May	29-May	1-Sep
BH1 ^C	1.47	1.33	1.23	1.30	35.53	35.67	35.77	35.70
BH15 ^S	3.07	3.04	2.94	2.98	25.83	25.86	25.96	25.92
BH16 ^S	-	1.79	1.67	1.78	-	27.81	27.93	27.82
BH6 ^{Ce}	3.93	3.79	3.65	3.51	29.47	29.61	29.75	29.89

Notes: m bgl: metres below ground level. C = Concordia Site, S = Sevington Site, Ce = Centenary

Table 4: Summary of logger data

Well ID	Depth to groundwater (m bgl)			Groundwater elevation (m AHD)		
	Lowest	Highest	Average	Lowest	Highest	Average
BH1 ^C	1.12	1.56	1.37	35.44	35.88	35.63
BH15 ^S	2.83	3.39	3.15	25.51	26.07	25.75
BH16 ^S	1.54	1.99	1.82	27.61	28.06	27.78
BH6 ^{Ce}	3.39	4.01	3.80	29.39	30.01	29.60

Notes: m bgl: metres below ground level. C = Concordia Site. S = Sevington, Ce = Centenary

5.2.2 Hydraulic conductivity

Rising and falling head hydraulic conductivity tests were carried out at the monitoring wells on 21 May 2025. The tests were undertaken by removing or adding a volume of water from or to the monitoring wells to lower or raise the water level and measurement of the subsequent recovery rate.

Hydraulic conductivity tests were analysed using the Hvorslev (1951) solution for slug testing interpretation. Results are presented in Table 5. The detailed results of the tests are attached in Appendix D.

Table 5: Interpreted hydraulic conductivity results

Well ID	Test Type	Screen depth (m bgl)	Screened lithology	Hydraulic conductivity	
				(m/s)	(m/day)
BH1 ^C	Falling Head	8.05-11.7	Units 4 and 5 / LAMINITE	1.4×10^{-6}	1.2×10^{-1}
BH15 ^S	Falling Head	6.3-12.8	Units 3 – 6 / CLAY and LAMINITE	4.1×10^{-6}	3.5×10^{-1}
BH16 ^S	Rising Head	1.5-4.0	Unit 2 / CLAY	3.9×10^{-8}	3.4×10^{-3}
BH6 ^{Ce}	Falling Head	5.4-12.1	Units 3 – 6 / CLAY and LAMINITE	1.7×10^{-6}	1.5×10^{-1}

5.2.3 Groundwater quality

Groundwater quality testing was undertaken as part of the PSI (Douglas, 2025b) from the monitoring wells. The results provide an indication of background groundwater conditions and inform potential disposal pathways and management requirements (further discussed in Section 9.3).

Groundwater samples were collected and dispatched to a NATA accredited laboratory for the analysis of physical parameters, nutrients, major ions, metals, total recoverable hydrocarbons (TRH), polyaromatic hydrocarbons (PAH), and BTEX.

The results were assessed against the following guideline criteria (further discussed in Section 9.3):

- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018), specifically the 95% level of protection for non-bioaccumulating contaminants, and the 99% level of protection for bioaccumulating contaminants for freshwater ecosystems;
- *NSW Water Quality Objectives*; and
- Relevant discharge criteria of Inner West Council for stormwater disposal.

Groundwater quality results can be summarised as follows:

- pH values ranged from 4.8 to 5.0, indicating acidic conditions.
- Electrical conductivity (EC) values ranged from 350 to 1800 $\mu\text{S}/\text{cm}$, indicating brackish water typical of groundwater within Ashfield Shale.

The results for all analysed samples were below the SAC, with the exception of:

- The concentration of copper in all samples exceeded the ANZG (2018) 95% freshwater guideline of 1.4 $\mu\text{g}/\text{L}$, with BH01, BH06, and BH15 recording values of 17 $\mu\text{g}/\text{L}$, 4 $\mu\text{g}/\text{L}$, and 14 $\mu\text{g}/\text{L}$, respectively;
- The concentration of nickel in sample BH15 at 18 $\mu\text{g}/\text{L}$ exceeded the ANZG (2018) 95% freshwater guideline of 11 $\mu\text{g}/\text{L}$; and
- Zinc in all samples (BH01 at 80 $\mu\text{g}/\text{L}$, BH6 at 49 $\mu\text{g}/\text{L}$, BH15 at 100 $\mu\text{g}/\text{L}$, which exceeded the ANZG (2018) 95% freshwater guideline of 8 $\mu\text{g}/\text{L}$.

The copper, nickel and zinc exceedances are considered likely to be attributed to the ambient concentrations in the urbanised area and are therefore not considered to be significant.

Where exceedances of guideline values were identified, appropriate treatment and disposal controls should be implemented (refer to Section 9.3).

Summary tables of analytical results and laboratory reports are provided in Appendix E and Appendix F, respectively.

6. Conceptual hydrogeological model

6.1 Sevington Site

The geotechnical investigation (Douglas, 2025a) identified that the site is generally underlain by fill and residual clay soil, overlying highly weathered to fresh, very low to medium to high strength shale. Groundwater levels were steady throughout the monitoring period, ranging between 25.5 m and 28.0 m AHD within the residual clay and weathered rock (Units 2 and 3), with the hydraulic gradient sloping downwards towards the southeast, which is consistent with the local topography.

6.2 Concordia Site

The geotechnical investigation (Douglas, 2025a) identified that the site is generally underlain by fill and residual clay soil, overlying highly weathered to fresh, very low to medium to high strength

shale. Groundwater levels were steady throughout the monitoring period, ranging 35.4 m to 35.9 m AHD within the residual clay and weathered rock. Using the groundwater levels in the other groundwater levels, the hydraulic gradient slopes downwards towards the southeast, which is consistent with the local topography.

6.3 Groundwater Variations

It is expected that groundwater recharge would 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 etc.

The logger plots indicate subdued response in groundwater heads to rainfall events, suggesting limited rainfall recharge, consistent with the lower permeability clay soils present near the surface.

It should be noted that groundwater levels are transient and fluctuate with climatic variations and other factors (e.g. adjacent excavations, pumping). Therefore, the water levels will temporarily rise during periods of heavy or prolonged rainfall and fall during dry periods. Groundwater levels can also be affected by the amount of pumping occurring in groundwater extraction bores in the aquifer.

7. Groundwater inflow assessment

7.1 Methodology

Seepage modelling was undertaken to assess the potential inflow rates into the proposed excavations during and after construction, as well as induced groundwater level changes in adjacent and surrounding areas.

A 2-dimensional (2D) numerical groundwater model was developed. The modelling was carried out using the finite element hydrogeological software SEEP/W (a component of GeoStudio) developed by GEOSLOPE International Ltd.

7.1.1 Model geometry

7.1.1.1 Sevington Site

A cross-section in the north-west to south-east direction intercepting the basement footprint was selected to run the 2D analysis. The cross-section is presented in Figure 4.

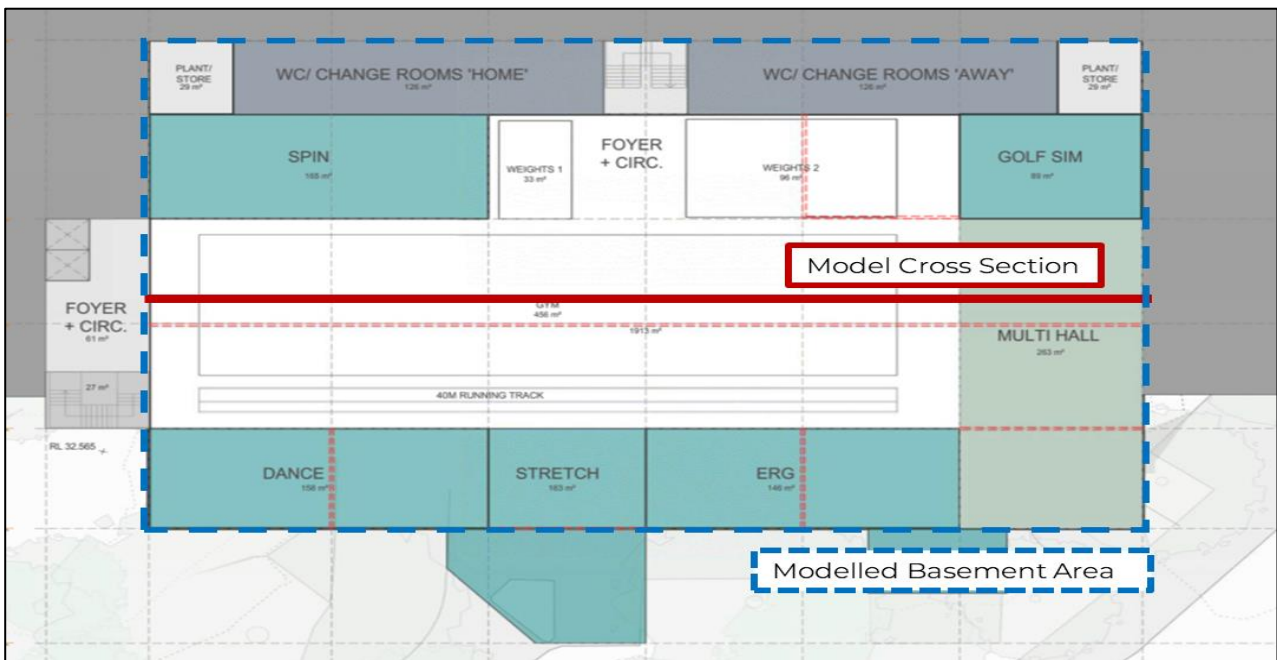


Figure 4: Assumed basement area and modelled cross-section (adapted from preliminary Architectural Drawings by AJC Architects)

The aquifer surrounding the proposed development was simulated as single layer numerical model to represent the subsurface conditions beneath the site and allow simulation of the vertical flow components. The model boundary was extended 100 m from the western and eastern site boundaries.

The SEEP/W results are based on a 2D model and therefore provide seepage rates per unit metre. Inflow volumes were calculated through use of a shape factor based on Kawadas (1992). For the analysis, the excavation was assumed to have an approximately rectangular configuration with an effective width of 48.9 m (B) and a length of 62.8 m (L).

7.1.1.2 Concordia Site

A cross-section in the north-west to south-east direction intercepting the basement footprint was selected to run the 2D analysis. The cross-section is presented in Figure 5.

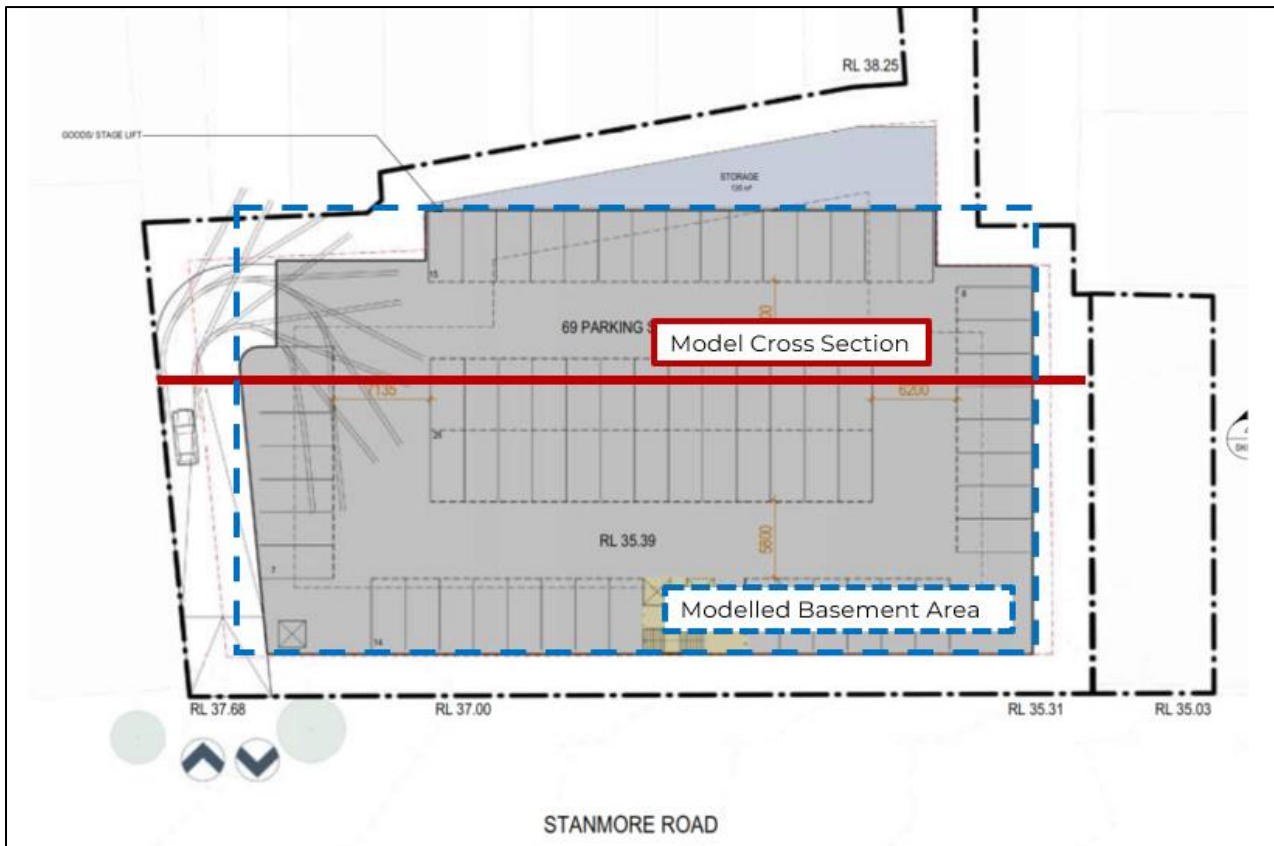


Figure 5: Assumed basement area and modelled cross-section (adapted from preliminary Architectural Drawings by AJC Architects)

The aquifer surrounding the proposed development was simulated as multi-layered numerical model to represent the subsurface conditions beneath the site and allow simulation of the vertical flow components. The model boundary was extended 100 m from the western and eastern site boundaries.

For the analysis, the excavation was assumed to have an approximately rectangular configuration with an effective width of 38 m (B) and a length of 68 m (L).

7.1.2 Model Parameters

The adopted hydraulic properties (base case) are presented in Table 6. Parameters were selected based on the results of the hydraulic conductivity testing (Section 5.2.2), 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 6: Model layers and adopted hydraulic properties (base case)

Layer / Unit	Material	Saturated Kh		Anisotropy Ratio (Kv/Kh)	Effective Porosity (%)	Material Model Adopted
		(m/s)	(m/day)			
1 / Units 1 – 3	Residual Clay and weathered Rock	3.9×10^{-8}	3.4×10^{-3}	0.1	20	Unsaturated / saturated
2 / Units 4 – 6	Laminite	1.4×10^{-6}	1.2×10^{-1}	0.1	20	Unsaturated / saturated

Notes: Kh: Horizontal hydraulic conductivity
 Kv: Vertical hydraulic conductivity

The average annual rainfall in Sydney is 1.2 m/year, however for modelling purposes, the infiltration rate into the site was assumed to be negligible due to the urban setting and low permeability soil and rock surrounding the excavation and therefore was not included in the model.

7.1.3 Boundary Conditions

7.1.3.1 Sevington

The constant head boundary condition in the model was set to 28 m AHD in the west and 26 m AHD in the east, to replicate the highest groundwater levels observed within the site.

7.1.3.2 Concordia

The constant head boundary condition in the model was set to 35.8 m AHD to replicate the highest groundwater levels observed within the site.

7.1.4 Basement Design and Dewatering

The basement walls and sub-floor drainage were simulated as 'Seepage Faces' in SEEP/W with zero hydraulic pressure head along the full perimeter.

7.1.4.1 Sevington Site

The proposed finished floor level for the basement is understood to be RL 26.3 m AHD. A target dewatering level of 25.5 m AHD was used throughout the modelled basement area, which is considered conservative.

7.1.4.2 Concordia Site

The proposed finished floor level for the basement is understood to be RL 35.4 m AHD. A target dewatering level of 34.6 m AHD was used throughout the modelled basement area, which is considered conservative.

7.1.5 Simulation

To simulate the temporary dewatering required during construction, transient flow conditions were modelled in the analysis. For the purpose of the analysis, excavation was assumed to be undertaken in a single stage (i.e., instantaneously) and the subsequent temporary dewatering period was assumed to be up to one year, subdivided into multiple time intervals.

The analysis was also run under 'steady state' conditions to assess long term groundwater inflows (i.e., assuming permanent drained basement, after construction).

7.1.6 Sensitivity scenarios

Sensitivity analyses were run to assess groundwater inflows under higher hydraulic conductivity and higher groundwater level conditions:

- Sensitivity 1: Hydraulic conductivity of the residual clay and extremely weathered rock layers increased to one order of magnitude higher than baseline conditions (i.e. to 3.9×10^{-7}).
- Sensitivity 2: The water table is 1.0 m higher than under base case conditions.
- Sensitivity 3: The extremely weathered rock (Unit 3) has similar hydraulic conductivity as the Laminite (Units 4 – 6) at 1.4×10^{-6} m/s.

7.2 Modelling results

7.2.1 Predicted groundwater inflow

The model assumes excavation and dewatering to target depth is instantaneous, resulting in substantial predicted inflows during the first day of construction. In reality dewatering is expected to be undertaken progressively during excavation to gradually lower the water table to the desired level.

The inflow rates obtained from the modelling represent the estimated total rate of groundwater flowing into the excavation and the volume (per unit time) requiring extraction via the dewatering system, in order to dewater the basement during and after construction.

7.2.1.1 Sevington Site

The estimated inflows from the analysis for the first year (i.e., during construction) and long term for the Sevington Site are summarised in:

- Table 7, for the base case scenarios detailed in previous sections; and
- Table 8, for the sensitivity analysis.

Table 7: Base case - predictive Model of Simulated Groundwater Inflow Rates with time

Elapsed Time	Dewatering Inflow Rate			
	Volume (m ³ / day)	Inflow rate		Cumulative Inflow (ML)
		(L / min)	(L / sec)	
1	2.8	2.0	3.3 × 10 ⁻²	0.14
3	0.8	0.6	9.2 × 10 ⁻³	
7	0.6	0.4	6.8 × 10 ⁻³	
14	0.5	0.3	5.4 × 10 ⁻³	
30	0.4	0.3	4.6 × 10 ⁻³	
60	0.4	0.3	4.3 × 10 ⁻³	
90	0.4	0.2	4.1 × 10 ⁻³	
180	0.3	0.2	4.0 × 10 ⁻³	
365	0.3	0.2	3.9 × 10 ⁻³	
Post-construction	0.3	0.2	3.8 × 10 ⁻³	0.12

Table 8: Sensitivity cases - Simulated groundwater inflow

Elapsed Time	Cumulative dewatering inflow (ML)		
	Sensitivity 1 – high k	Sensitivity 2 – high GWL	Sensitivity 3 – high k XWR
Post-construction	1.0	0.2	0.6

Notes: k: hydraulic conductivity, GWL: groundwater level, XWR: Extremely Weathered Rock

The results of the sensitivity cases for groundwater inflow analysis indicate that:

- Inflow increases will be greater if higher permeability residual clay and weathered bedrock is intersected by the excavation.
- Inflow increases will be minor in the event of heavy rain and elevated groundwater levels; and
- Inflows increase if the extremely weathered rock has similar permeability to the laminite bedrock.

7.2.1.2 Concordia Site

The estimated inflows from the analysis for the first year (i.e. during construction) and long term for the Concordia Site are summarised in:

- Table 9, for the base case scenarios detailed in previous sections; and
- Table 10, for the sensitivity analysis.

Table 9: Base case - predictive Model of Simulated Groundwater Inflow Rates with time

Elapsed Time	Dewatering Inflow Rate			
	Volume (m ³ / day)	Inflow rate		Cumulative Inflow (ML)
		(L / min)	(L / sec)	
1	2.2	1.6	2.6 x 10 ⁻²	0.12
3	0.6	0.4	7.0 x 10 ⁻³	
7	0.5	0.3	5.3 x 10 ⁻³	
14	0.4	0.3	4.4 x 10 ⁻³	
30	0.3	0.2	3.9 x 10 ⁻³	
60	0.3	0.2	3.6 x 10 ⁻³	
90	0.3	0.2	3.5 x 10 ⁻³	
180	0.3	0.2	3.4 x 10 ⁻³	
365	0.3	0.2	3.3 x 10 ⁻³	
Post-construction	0.2	0.2	3.3 x 10 ⁻³	0.12

Table 10: Sensitivity cases - Simulated groundwater inflow

Elapsed Time	Cumulative dewatering inflow (ML)		
	Sensitivity 1 – high k	Sensitivity 2 – high GWL	Sensitivity 3 – high k XWR
Post-construction	0.68	0.19	0.2

Notes: k: hydraulic conductivity, GWL: groundwater level, XWR: Extremely Weathered Rock

It should be noted that these volumes are 'estimates' of the average inflows. It is possible that localised zones of higher permeability may be present within the site, through which the rate of inflow could be significantly higher, and considering the subsurface heterogeneity and fractured aquifer system, a safety margin for application in the field should be considered.

Also, simulated dewatering rates and drawdown are dependent on the dewatering scheme adopted for the site, and construction design, as included in the numerical models. 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.

The results of the sensitivity cases for groundwater inflow analysis undertaken for both sites indicate that:

- Inflow increases will be greater if higher permeability residual clay and weathered bedrock is intersected by the excavation; and

- Groundwater inflow increases will be limited in the event of heavy rain and elevated groundwater levels; and
- Inflows increase if the extremely weathered rock has similar permeability to the laminite bedrock.

7.2.2 Drawdown and settlement

7.2.2.1 Sevington Site

The simulated lowered groundwater levels, or impact to the water table, outside the basement footprint over the long term are summarised in Table 11. The model results indicate a maximum drawdown close to the excavation of about 1.5 m, reducing to 0.2 m at a distance of 80 m from the excavation. As the groundwater drawdown is expected to occur within the very stiff to hard residual clay soil and extremely weathered rock underlying the site, settlements on adjacent structures due to dewatering are expected to be in the order of 2 – 4 mm.

Table 11: Predictive model simulated drawdown (Sevington)

	Distance from Excavation (m)				
	0	10	20	40	80
Drawdown Depth (m) West	1.5	1.0	0.7	0.5	0.2
Drawdown Depth (m) East	1.2	0.5	0.3	0.2	0.2

7.2.2.2 Concordia Site

The simulated lowered groundwater levels, or impact to the water table, outside the basement footprint over the long term are summarised in Table 12. The model results indicate a maximum drawdown close to the excavation of about 1.2 m, reducing to 0.1 m at a distance of 80 m from the excavation. As the groundwater drawdown is expected to occur within the very stiff to hard residual clay soil and extremely weathered rock underlying the site, settlements on adjacent structures due to dewatering are expected to be in the order of 1 – 2 mm.

Table 12: Predictive model simulated drawdown (Concordia)

	Distance from Excavation (m)			
	0	10	20	40
Drawdown Depth (m) West	1.2	0.5	0.3	0.1
Drawdown Depth (m) East	1.2	0.4	0.2	0.1

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.

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

- Less than or equal to 10% cumulative variation in water table 40 m from any high priority GDE or high priority culturally significant site;
- A cumulative pressure head decline of no more than a 2 m at any water supply work; and
- Any change in groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity.

8.2 Environmental risk assessment

An assessment of the potential effects of dewatering on neighbouring properties and groundwater receptors has been summarised in Table 13.

Table 13: Assessment of Potential Effects of Dewatering

Item	Comment
Impacts on potential GDEs	Drawdown effects due to dewatering are unlikely to have an impact on GDEs within 1 km of the site. The closest GDE to the site is approximately 2 km south.
Water supply losses by neighbouring groundwater users	There are no registered groundwater supply bores within 1 km of the site.
Potential subsidence of neighbouring structures	Groundwater drawdown is predicted to occur within the very stiff to hard residual clay soil and extremely weathered bedrock. Therefore, risk of subsidence due to lowering of the water table is expected to be minimal.
Mounding of water upgradient of structure	As the basements are proposed to be drained, mounding of groundwater is not expected upgradient of either site.

9. Recommended groundwater management

9.1 General

Dewatering will be required during the construction of the project. This section outlines the proposed management strategy based on the preferred methodology for dewatering and disposal.

The proposed dewatering and discharge approach is outlined in Section 2.2 and forms the basis of the groundwater inflow assessment and impact assessment given in Section 7 and 8, respectively.

Appropriate management strategies will be required during construction and operation, to ensure that the impact and inflows arising from dewatering remain within the expected values.

9.2 Groundwater inflow control

9.2.1 Control measures and monitoring

Effective management and monitoring of groundwater inflow should be undertaken to support safe excavation, minimise impacts and satisfy the regulatory requirements. The proposed control measures will be selected based on site-specific hydrogeological conditions, construction methodology and relevant guidelines, and will be detailed in construction drawings and specifications.

Groundwater inflow control measures may include:

- Perimeter drainage to capture and divert groundwater;
- Inflow reduction measures. Such as grouting or ground improvement.

Groundwater level and inflow monitoring should be undertaken during construction to:

- Validate inflow predictions and performance of control measures;
- Ensure drawdown remains within acceptable limits to prevent environmental or structural impacts; and
- Implement trigger contingency responses if unexpected inflow or impacts occur.

More information on recommended monitoring is provided in Section 9.4.

9.3 Water quality control

Groundwater inflows would require disposal. As outlined in Section 2.2, the preferred disposal option is discharge to the stormwater, subject to approval from relevant authorities, and appropriate testing and treatment as described in subsequent sections.

9.3.1 Proposed testing

Groundwater quality must be tested prior to discharge to prevent contamination and adverse impacts during construction.

The recommended methodology for water quality testing is as follows:

- Collection of water samples and quality control samples from water stored in the sumps;
- Measurement of general groundwater physical parameters (EC, pH and temperature) using a calibrated water quality meter;
- Analysis of the samples by a NATA accredited laboratory for the analytes presented in Table 14 below; and
- Review and update of this water quality testing methodology as required.

Water quality sampling should be conducted in accordance with Geoscience Australia's Groundwater Sampling and Analysis – A Field Guide (Geoscience Australia 2009).

Quality assurance / quality control (QA/QC) procedures should be used to establish accurate, reliable and precise results. QA/QC procedures should include: calibration of equipment, analyses of samples within holding times, keeping samples chilled and wearing gloves during sampling.

Table 14: Proposed suite of analytes for water quality monitoring

Category	Analytes
Field parameters	T, EC, pH, turbidity
Physical properties	TDS, TSS
Major ions	Calcium, magnesium, sodium, potassium, chloride, sulphate and alkalinity (total, carbonate and bicarbonate)
Metals (total and dissolved)	Arsenic, aluminium, cadmium, chromium, copper, iron, mercury, manganese, nickel, lead and zinc
Nutrients	Total nitrogen, total Kjeldahl nitrogen, nitrite, nitrate, ammonia, total phosphorus and reactive phosphorus
Organics	TRH / TPH, BTEX, phenols, PAH, VOC, oil and grease

Notes: EC: electrical conductivity | TDS: total dissolved solids | TSS: total suspended solids
 TRH: total recoverable hydrocarbons | TPH: total petroleum hydrocarbons
 BTEX: benzene, toluene, ethylbenzene and xylenes
 PAH: polycyclic aromatic hydrocarbons
 VOC: volatile organic compounds

9.3.2 Discharge options and contingency measures

Management options for groundwater disposal are presented in Table 15.

Based on groundwater quality testing and predicted dewatering rates, Option 1 (disposal to stormwater) is considered feasible. The other two options listed in Table 15 are provided as contingency plans.

Table 15: Summary of possible management options

Management Option	Comments
<u>Option 1:</u>	Generally applicable where the treatment required is routine, e.g., solids removal, alum dosing and pH adjustment. Treatment of

Management Option	Comments
On-site treatment (if required) and disposal to stormwater.	specific contaminants may require more physical space and result in higher treatment costs. Stormwater disposed water is typically required to meet general NSW DPE requirements (NSW DPE 2021 & 2022), ANZG (2018) water quality standards for the relevant receiving water body and any associated uses (Section 9.3.3). Further requirements may be enforced depending on the specific approval documentation.
<u>Option 2:</u> * Disposal to the sewer under a Trade Waste Agreement with Sydney Water.	Generally, will require further negotiation and establishment of water quality criteria prior to disposal. Water quality screening levels will depend on the specific trade waste agreement with Sydney Water.
<u>Option 3:</u> ** Tanker off-site for disposal at an aqueous treatment plant by a suitably licenced contractor.	May be suitable for more heavily contaminated liquids where on-site treatment is not practicable. Appropriate as a contingency strategy. Can be limited in applicability for larger volumes of water. Water quality screening levels will depend on specific requirements of the contractor.

Notes: * Sydney Water has a general policy of only issuing a trade waste agreement for disposal of water from excavations where all other options have been exhausted.

** Off-site disposal of water by a tanker is generally only considered suitable in cases where periodic / batch disposal of groundwater is required (e.g., ephemeral water sources / rainfall / minor seepage only). Where continuous discharge is anticipated, this option is not feasible from an economic and / or environmental (i.e., emissions) perspective given the requirement to transport large volumes via truck at distance. It may be considered as a contingency strategy if any notable contamination which may be outside the operating capacity of the on-site treatment system is identified prior to disposal.

9.3.3 Water quality acceptance criteria

Groundwater quality results should be assessed against site assessment criteria (SAC) for each analyte prior to disposal. The SAC should be chosen based on the receiving receptor's water quality, relevant guidelines and Council's requirements.

In line with Inner West Council's stormwater system and WateNSW's requirements, the following assessment criteria are recommended as a screening level for disposal to stormwater:

- ANZG, 'Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2018' (ANZG, 2018);
- ANZECC, 'Australian Water Quality Guidelines 2000', Tables 3.3.2 to 3.3.3 Default trigger values for physical and chemical stressors in south-east Australia for slightly disturbed ecosystems (ANZECC, 2000); and
- NSW DPE (2021) requirements.

For stormwater disposal in urban setting, the recommended SAC are the 95% level of protection for non-bioaccumulating contaminants, and the 99% level of protection for bioaccumulating contaminants for freshwater ecosystems.

9.3.4 Treatment options

Potential treatment options for managing groundwater quality prior to discharge may include:

- Sediment control: Settling tanks or flocculation to reduce turbidity and suspended solids.
- pH adjustment: Dosing with lime or acid to achieve acceptable discharge pH.
- Hydrocarbon removal: Use of oil-water separators or activated carbon filters.
- Metals removal: Filtration or chemical precipitation, if metal concentrations exceed guidelines.

The treatment system will be designed by the dewatering contractor based on construction specifications, groundwater quality results and the SACs. A detailed treatment schematic will be provided in the detailed DMP prior to construction.

9.4 Monitoring and reporting requirements

The following monitoring program and associated reporting is to be adopted until the end of excavation and construction works on-site. Groundwater level monitoring should be continued one month after completion of construction.

Monitoring should be undertaken in a minimum of three monitoring wells. It is recommended that where possible, the existing monitoring wells used for the groundwater investigation could be used during and after construction. Any wells damaged during construction should be replaced in a timely manner.

Table 16: Monitoring and reporting requirements

Item	Monitoring requirements	Methodology
Visual inspection	No visible oil and grease, sheen, significant discolouration or odours.	Daily inspections (by contractor). HOLD POINT - If indicators are observed, discharge must be suspended pending analytical confirmation.
Groundwater level monitoring	Monitor drawdown at a minimum of three wells in the vicinity of the site.	• Continuous groundwater level monitoring using data logger (minimum six-hourly frequency). • Quarterly manual readings. • Monitoring to continue for one month post-construction dewatering. HOLD POINT - If drawdown exceeds predictions by >2 m, construction must be halted and contingency measures activated.
Water quality sampling and testing	Samples to be collected from the sumps to assess compliance with parameters in Table 14.	• Weekly or pre-discharge event testing. • Physical parameters (pH, EC, turbidity) using field probes.

Item	Monitoring requirements	Methodology
		- Sampling and analysis by a NATA-accredited laboratory. - Chain of Custody (COC) documentation to accompany all samples. HOLD POINT - If water exceeds assessment criteria (SAC), discharge must be halted and managed per contingency strategy.
Quality control sampling	Replicate sampling to verify lab result accuracy.	- Conducted during each sampling event. - Testing suite: dissolved metals, TRH, BTEX, PAHs. - COC documentation to accompany all samples. - Results to be included in final dewatering completion report.
Quantity of groundwater inflows	Measurements of groundwater volumes (as per Section 9.2).	- Weekly monitoring and reporting of groundwater abstraction volumes. - Weekly reporting of volumes to the Environmental Consultant. - Results to be included in final dewatering completion report. HOLD POINT - If volumes exceed trigger levels or Council discharge allowance, works must be halted to minimise inflow (e.g., via grouting).
Dewatering completion report	Final documentation of the dewatering program.	Prepared by a suitably qualified consultant and to include: - Summary of contractor records (e.g. visual inspections, unexpected finds) - Full analytical and quality control results. - Records of dewatering volumes. - Commentary on compliance and any non-conformances with the DMP.

Notes: Testing frequency, assessment criteria and analysis requirements may be reviewed in consultation with the Environmental Consultant based on ongoing results.

9.5 Personnel and responsibilities

Table 17 below outlines the proposed project personnel and relevant responsibilities as part of the management plan.

Table 17: Personnel and Responsibilities

Role	Responsibilities
Site Manager / Contractor (TBC)	Routine visual inspection. Monitoring / recording of dewatering / discharge volumes. Maintaining any unexpected / contingency records.
Dewatering Contractor (TBC)	Design / specification and ongoing maintenance of the dewatering system.
Geotechnical Consultant (Douglas Partners)	Groundwater level monitoring and review of disposal volumes. Assist in preparation of the dewatering completion report.
Environmental Consultant (Douglas Partners)	Water quality sampling (analysis using NATA accredited laboratories). Interim advice for each sampling event to confirm (or otherwise) compliance with discharge requirements. Quality control sampling. Assist in preparation of the dewatering completion report.

9.6 Contingency plan

As per Section 9.3.4, at any hold point if any non-conformance is encountered then dewatering will be suspended. The following general contingency plan will be enacted:

- Should water quality be deemed unsuitable for disposal, suspend dewatering and treat water prior to discharge;
- Should dewatering volumes be higher than predicted or higher than discharge limits provided by relevant authorities, suspend construction and reduce pumping rates. Options could include grouting to reduce groundwater inflows;
- Notify the Site Manager / Contractor and Environmental Consultant;
- Environmental Consultant to inspect the site / unexpected finds and collect additional water quality samples as advised;
- Off-site tankering may be adopted to meet disposal requirements; and
- Written confirmation by the Environmental Consultant that disposal may resume (e.g. upon receipt of laboratory results).

10. Approvals and licensing

This section outlines the approvals, licences and other authorisations required for the proposed dewatering activities, consistent with the *Water Management Act 2000*, WaterNSW requirements, and any relevant local council or EPA obligations.

10.1 Water Access Licence (WAL) and entitlements

Dewatering of groundwater for construction purposes constitutes an aquifer interference activity under the *Water Management Act 2000* and may require a Water Access Licence (WAL) and

appropriate water entitlement units (share and extraction components), depending on the water source and proposed take.

The site is located within the Sydney Basin Central Groundwater Source and is subject to the Greater Metropolitan Region Groundwater Sources 2023 water sharing plan.

Groundwater modelling undertaken for the project predicts that groundwater inflow rates will be low (less than 1 ML/year estimated under baseline conditions). Results of the sensitivity scenarios also suggest results of up to about 1 ML/year although higher flow rates could occur during prolonged wetter periods. These predictions are estimates based on the information available; actual flow rates may vary from these and will only be known once the excavation is complete and inflow rates can be measured. Additionally, should basement excavations intersect the higher permeability shale, higher inflows may be expected. Localised deeper excavations such as lift pits should also be expected to generate higher groundwater inflows if taken into shale bedrock.

As of recent changes, any volume of groundwater taken in connection with the construction (but not ongoing maintenance) of buildings and infrastructure in designated coastal areas, is now eligible for a WAL exemption. All water extracted under the exemption must still be recorded and reported to the Natural Resources Access Regulator (NRAR).

Given that the long-term predicted inflow is less than 3 ML/year, the proposed drained basement may also be eligible for an ongoing Water Access Licence exemption from WaterNSW. However, this will be subject to review and approval by WaterNSW.

10.2 Water Supply Works Approval (WSWA)

An approval to construct and operate a water supply work (e.g., dewatering system) is required under the *Water Management Act 2000*, unless exempt. This is typically obtained through the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW), however it may be granted as part of the SSD approval and may not require a separate application.

10.3 Council and EPA approvals

Depending on the proposed discharge route and water quality:

- Discharge to stormwater: Council approval may be required. Acceptance criteria typically align with ANZG guidelines and site-specific conditions – refer to Section 9.3
- Discharge to sewer: A trade waste agreement may be required from the relevant water utility – refer to Section 9.3
- Discharge off-site: A licensed contractor must be engaged, and records of transport and disposal must be maintained – refer to Section 9.3
- Environmental Protection Licence (EPL): May be required if discharge volumes or quality trigger thresholds under the Protection of the Environment Operations Act 1997.
- Council approval status: [Obtained / Required / Not required – insert details]
- Sewer/trade waste agreement: [Required / Not required – insert details]

11. Conclusion

This hydrogeological assessment considers that the proposed drained basement is feasible without any significant impact to surrounding properties. In addition, the use of a drained basement is not considered likely to influence any GDEs or groundwater supply works in accordance with the AIP minimal impact considerations.

Based on the results of the inflow analysis, groundwater inflows of 0.14 ML/year are predicted for the Sevington site, and 0.12 ML/year for the Concordia site. However, based on the sensitivity analysis, inflows of up to 1.0 ML/year and 0.68 ML/year for Sevington and Concordia, respectively, should be considered in the design of dewatering systems.

Additionally, should basement excavations intersect the higher permeability shale, higher inflows may be expected. Localised deeper excavations such as lift pits should be expected to generate higher groundwater inflows if taken into shale bedrock. However, these localised higher groundwater inflows are expected to be temporary provided the lift pit structure is tanked.

Groundwater quality results suggested that some background metal concentrations exceed the adopted guideline values. Disposal criteria should be selected prior to dewatering based on background concentrations and relevant guideline values. Should disposal criteria be exceeded, treatment may be required prior to disposal. Long term disposal options for drained water should be considered.

Construction of a drained basement will be subject to review and approval from the DCCEEW and other relevant authorities.

12. References

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

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

Australian Government (2013). *Guidelines for Groundwater Protection in Australia – National Water Quality Management Strategy*. Department of Agriculture, Water and the Environment, Canberra.

Douglas. (2025a). Geotechnical investigation report.

Douglas. (2025b). Preliminary site (contamination) investigation report.

Geoscience Australia. (2009). *Groundwater Sampling and Analysis - A Field Guide*. Commonwealth of Australia.

NSW DPE. (2021). *Minimum requirements for building site groundwater investigations and reporting*.

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

NSW DPI – Water. (2013). *Aquifer Interference Policy: NSW Policy for Managing the Impacts of Groundwater Extraction*.

WaterNSW. Fact Sheet – *Construction dewatering – Information for councils and applicants*.

WaterNSW. Fact Sheet – *Construction dewatering – General terms of approval*.

13. Limitations

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project at 200-244 and 221-235 Stanmore Road, Stanmore NSW in line with Douglas' proposal dated 19/03/2025 and acceptance received from Ross Xenos of Council of Newington College. The work was carried out under Douglas' Engagement Terms. This report is provided for the exclusive use of Council of Newington College 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 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



LEGEND

Sevington Courts Redevelopment Site

Centenary Hall Redevelopment Site

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	16.05.2025	EC
1	UPDATES	03.09.2025	EC

SCALE:
0 10 20 30 40 50 m
1:1000 @ A3

Douglas

PARTNERS

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

CLIENT:

Newington College

NOTE:

1: Basemap from Metromap (Dated 20.09.2024)

COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 56

PROJECT NAME:

Newington Masterplan

PROJECT ADDRESS:

244 Stanmore Road,
Stanmore

DRAWING TITLE:

Site Overview

PROJECT NO:

234875.00

DRAWING NO:

1

REVISION:

1



- LEGEND**
- Concordia Redevelopment Site
 - Proposed Footbridge for Concordia Redevelopment
 - Cored Borehole (2005)
 - Cored Borehole (2025)
 - Hand Auger Borehole (2025)
 - Interpreted Geotechnical Cross Section
 - Standpipe Piezometer

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	16.05.2025	EC
1	UPDATES	03.09.2025	EC

SCALE: 0 5 10 15 20 25 m
1:500 @ A3

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

CLIENT:
Newington College

NOTE:
1: Basemap from Metromap (Dated 20.09.2024)

COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 56

PROJECT NAME:
Newington Masterplan

PROJECT ADDRESS:
**244 Stanmore Road,
Stanmore**

DRAWING TITLE:
**Test Location Plan –
Concordia Redevelopment
Site**

PROJECT NO:
234875.00

DRAWING NO:
2

REVISION:
1



LEGEND

Sevington Courts Redevelopment Site

Cored Borehole (2025)

Interpreted Geotechnical Cross Section

Standpipe Piezometer

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	30.05.2025	EC
1	UPDATES	02.09.2025	EC

SCALE:

0

5

10

15

20

25 m

1:500 @ A3

N

Douglas
PARTNERS

OFFICE: SYDNEY

96-98 Hermitage Rd, West Ryde NSW 2114

(02)9809 0666

CLIENT:

Newington College

NOTE:

1: Basemap from Metromap (Dated 14.07.2025)

COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 56

PROJECT NAME:

Newington Masterplan

PROJECT ADDRESS:

**244 Stanmore Road,
Stanmore**

DRAWING TITLE:

**Test Location Plan –
Sevington Courts
Redevelopment Site**

PROJECT NO:

234875.00

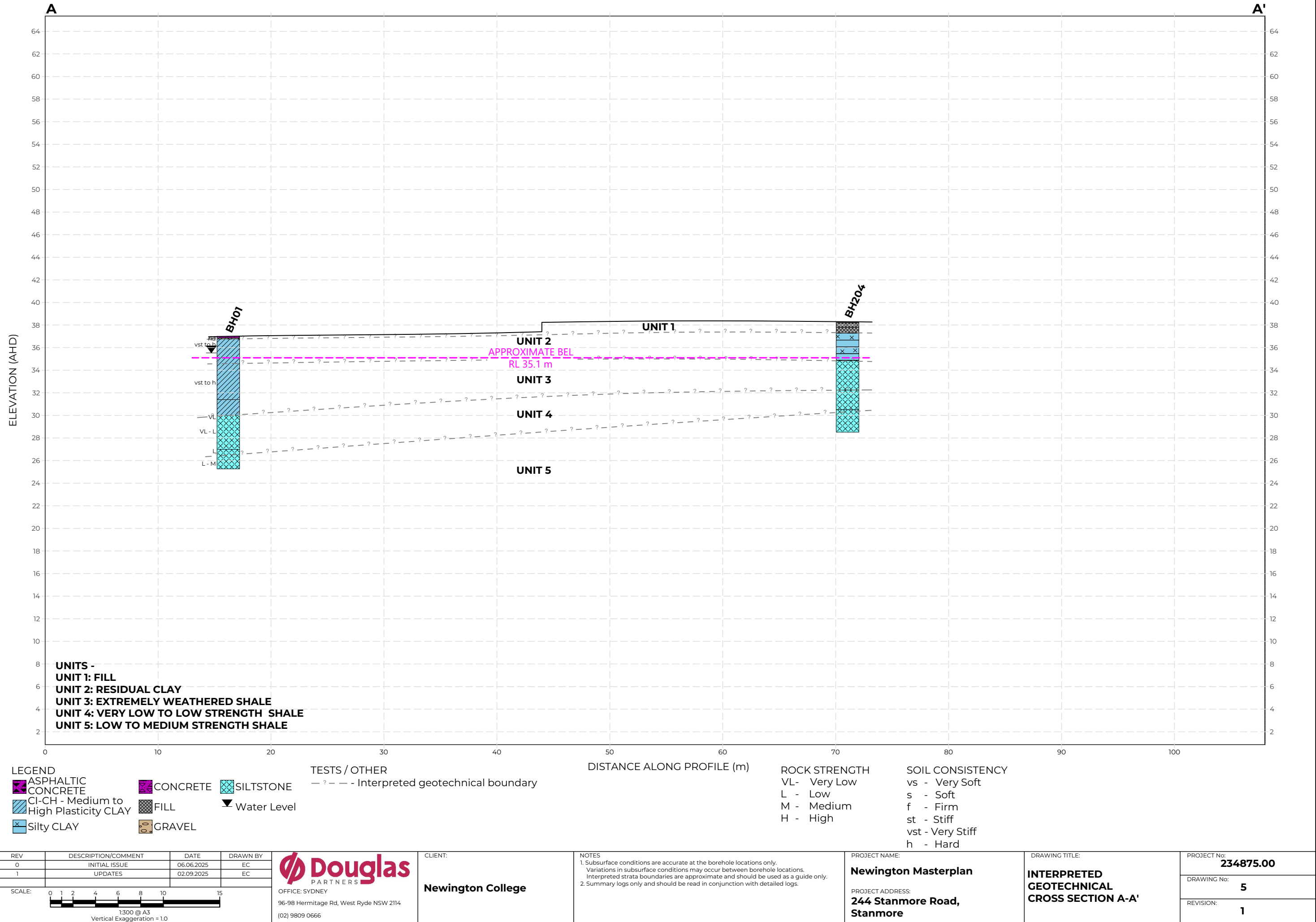
DRAWING NO:

3

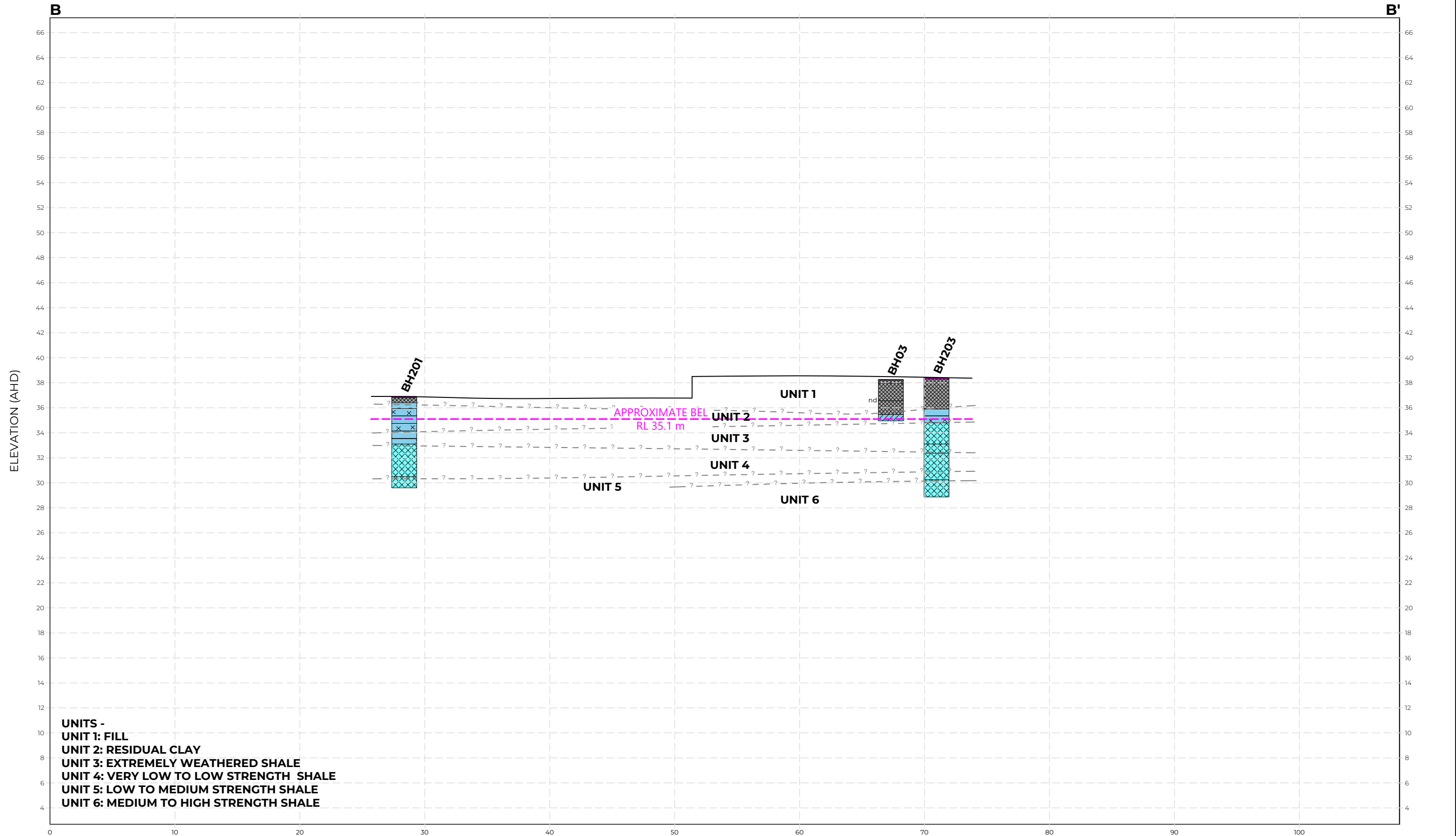
REVISION:

1

P:\234875\00 - STANMORE, 244 Stanmore Road, Geo\7.0 Drawings\7.2 Out\234875\00.D\005-010.Rev1_Cross Sections A-F.dwg



P:\234875.00 - STANMORE, 244 Stanmore Road, Geo\7.0 Drawings\7.2 Out\234875.00.D.005-010.Rev1_Cross Sections A-F.dwg



- LEGEND
- ASPHALTIC CONCRETE
 - CONCRETE
 - CLAY
 - Silty CLAY
 - FILL
 - SILTSTONE

TESTS / OTHER
- ? - - - Interpreted geotechnical boundary

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	06.06.2025	EC
1	UPDATES	02.09.2025	EC

SCALE: 1:300 @ A3
Vertical Exaggeration = 1.0

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

CLIENT:
Newington College

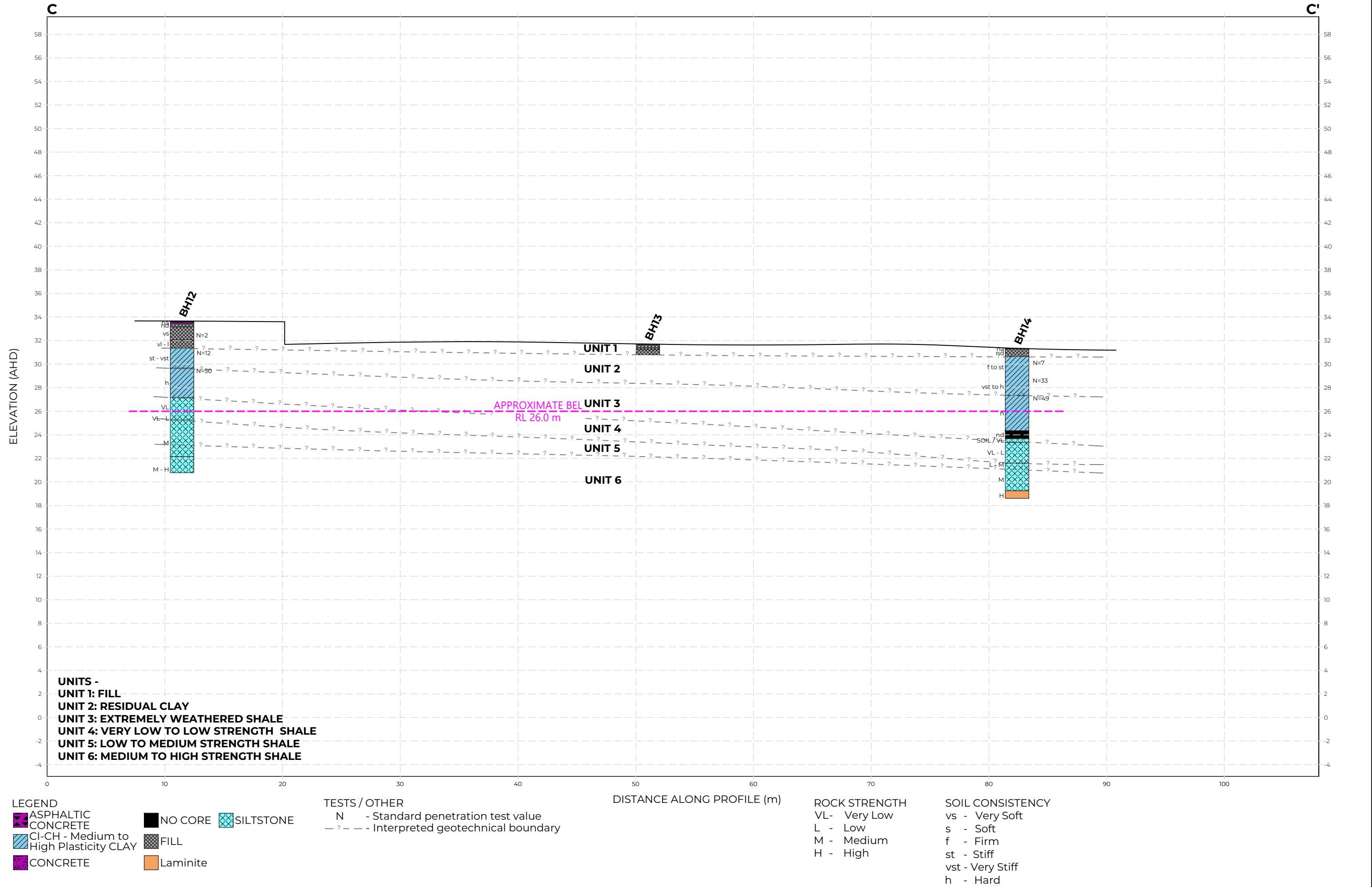
NOTES
1. Subsurface conditions are accurate at the borehole locations only.
Variations in subsurface conditions may occur between borehole locations.
Interpreted strata boundaries are approximate and should be used as a guide only.
2. Summary logs only and should be read in conjunction with detailed logs.

PROJECT NAME:
Newington Masterplan
PROJECT ADDRESS:
**244 Stanmore Road,
Stanmore**

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

PROJECT No:
234875.00
DRAWING No:
6
REVISION:
1

P:\234875\00 - STANMORE, 244 Stanmore Road, Geo\7.0 Drawings\7.2 Out\234875\00.D.005-010.Rev1_Cross Sections A-F.dwg



REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	06.06.2025	EC
1	UPDATES	02.09.2025	EC

SCALE: 0 1 2 4 6 8 10 15
1:300 @ A3
Vertical Exaggeration = 1.0

Douglas
PARTNERS

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

CLIENT:
Newington College

NOTES
1. Subsurface conditions are accurate at the borehole locations only.
Variations in subsurface conditions may occur between borehole locations.
Interpreted strata boundaries are approximate and should be used as a guide only.
2. Summary logs only and should be read in conjunction with detailed logs.

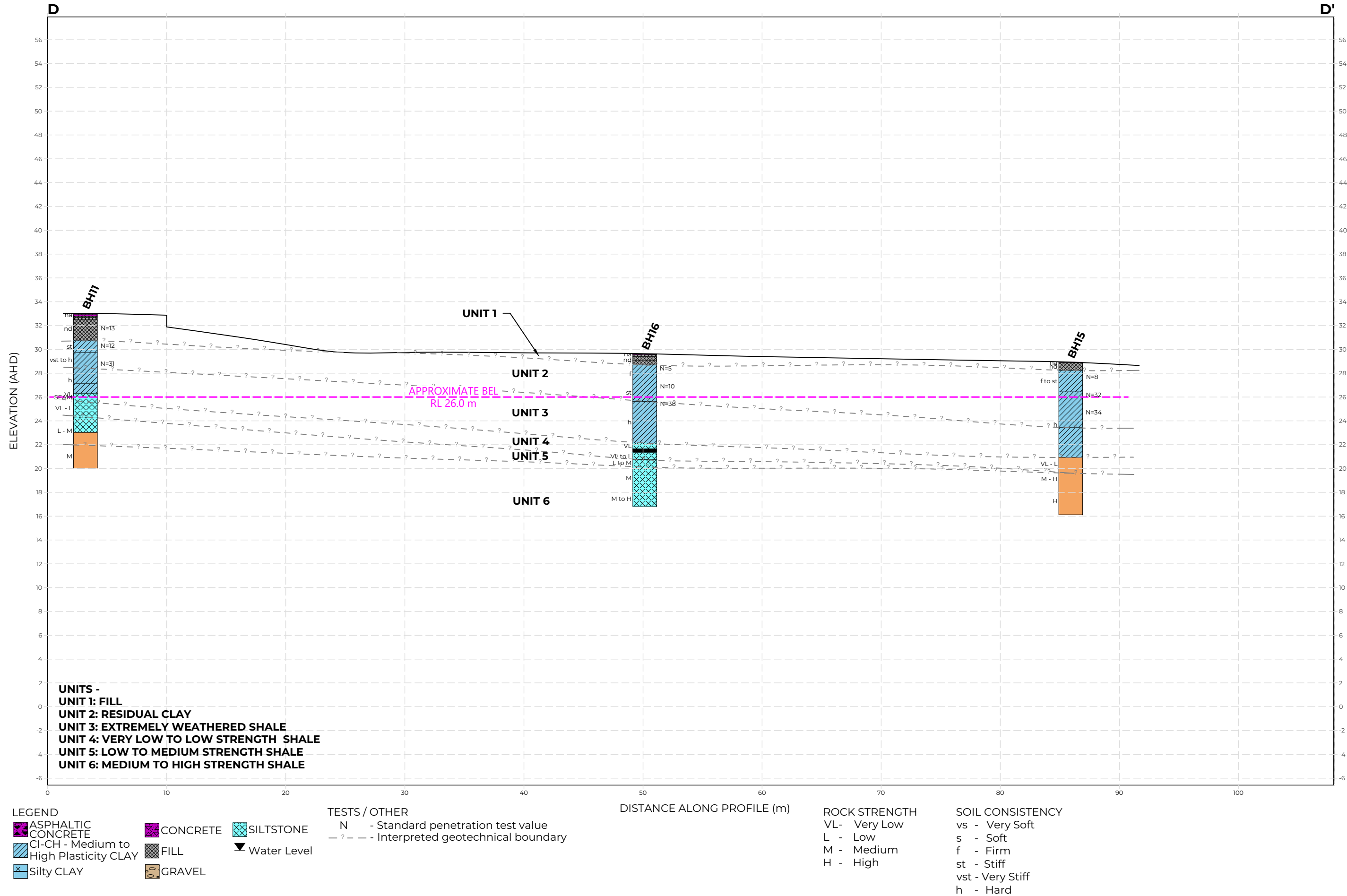
PROJECT NAME:
Newington Masterplan

PROJECT ADDRESS:
**244 Stanmore Road,
Stanmore**

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

PROJECT No: 234875.00
DRAWING No: 7
REVISION: 1

P:\234875\00 - STANMORE, 244 Stanmore Road, Geo\7.0 Drawings\7.2 Out\234875\00.D\005-010.Rev1_Cross Sections A-F.dwg



REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	06.06.2025	EC
1	UPDATES	02.09.2025	EC

SCALE: 0 1 2 4 6 8 10 15
1:300 @ A3
Vertical Exaggeration = 1.0

Douglas
PARTNERS

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

CLIENT:
Newington College

NOTES
1. Subsurface conditions are accurate at the borehole locations only.
Variations in subsurface conditions may occur between borehole locations.
Interpreted strata boundaries are approximate and should be used as a guide only.
2. Summary logs only and should be read in conjunction with detailed logs.

PROJECT NAME:
Newington Masterplan

PROJECT ADDRESS:
**244 Stanmore Road,
Stanmore**

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

PROJECT No: 234875.00
DRAWING No: 8
REVISION: 1

Appendix B

About this Report

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

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

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.

intentionally blank

intentionally blank

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

¹ Rock strength classification is based on UCS. The UCS to $I_{s(50)}$ ratio varies significantly for different rock types and specific ratios may be required for each site. The point load Index ranges shown above are as suggested in AS1726 and should not be relied upon without supporting evidence.

The following abbreviation codes are used for soil layers or seams of material “within rock” but for which the equivalent UCS strength is less than 0.6 MPa.

Scenario	Abbreviation Code
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The properties of the material encountered over this interval are described in the “Description of Strata” and soil properties columns.	SOIL
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The prominence of the material is such that it can be considered to be a seam (as defined in Table 22 of AS1726-2017) and the properties of the material are described in the defect column.	SEAM

Degree of Weathering

The degree of weathering of rock is classified as follows:

Weathering Term	Description	Abbreviation Code
Residual Soil ¹	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.	RS
Extremely weathered ¹	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	XW
Highly weathered	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.	HW
Moderately weathered	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.	MW
Slightly weathered	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.	SW
Fresh	No signs of decomposition or staining.	FR
Note: If HW and MW cannot be differentiated use DW (see below)		
Distinctly weathered	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching or may be decreased due to deposition of weathered products in pores.	DW

¹ The parent rock type, of which the residual/extremely weathered material is a derivative, will be stated in the description (where discernible).

Degree of Alteration

The degree of alteration of the rock material (physical or chemical changes caused by hot gasses or liquids at depth) is classified as follows:

Term	Description	Abbreviation Code
Extremely altered	Material is altered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.	XA
Highly altered	The whole of the rock material is discoloured, usually by staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is changed by alteration. Some primary minerals are altered to clay minerals. Porosity may be increased by leaching or may be decreased due to precipitation of secondary materials in pores.	HA
Moderately altered	The whole of the rock material is discoloured, usually by 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.	MA
Slightly altered	Rock is slightly discoloured but shows little or no change of strength from fresh rock	SA
Note: If HA and MA cannot be differentiated use DA (see below)		
Distinctly altered	Rock strength usually changed by alteration. The rock may be highly discoloured, usually by staining or bleaching. Porosity may be increased by leaching or may be decreased due to precipitation of secondary minerals in pores.	DA

Degree of Fracturing

The following descriptive classification apply to the spacing of natural occurring fractures in the rock mass. It includes bedding plane partings, joints and other defects, but excludes drilling breaks. These terms are generally not required on investigation logs where fracture spacing is presented as a histogram, and where used are presented in an unabbreviated format.

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:

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

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

These terms may be used to describe the spacing of bedding partings in sedimentary rocks. Where used, these terms are generally presented in an unabbreviated format

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

Rock Descriptions

Terminology
Symbols
Abbreviations

Defect Descriptions

Defect Type

Term	Abbreviation Code
Bedding plane	B
Infilled seam	IS
Cleavage	CV
Crushed zone	CZ
Decomposed seam	DS
Fault	F
Joint	JT
Lamination	LAM
Parting	P
Shear zone	SZ
Vein	VN
Drilling/handling break	DB , HB
Fracture	FC

Rock Defect Orientation

Term	Abbreviation Code
Horizontal	H
Vertical	V
Sub-horizontal	SH
Sub-vertical	SV

Rock Defect Coating

Term	Abbreviation Code
Clean	CN
Coating	CT
Healed	HE
Infilled	INF
Stained	SN
Tight	TI
Veneer	VNR

Rock Defect Infill

Term	Abbreviation Code
Calcite	CA
Carbonaceous	CBS
Clay	CLAY
Iron oxide	FE
Manganese	MN

intentionally blank

Rock Defect Shape/Planarity

Term	Abbreviation Code
Curved	CU
Irregular	IR
Planar	PR
Stepped	ST
Undulating	UN

Rock Defect Roughness

Term	Abbreviation Code
Polished	PO
Rough	RF
Slickensided	SL
Smooth	SM
Very rough	VR

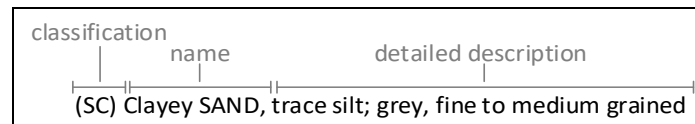
Defect Orientation

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

intentionally blank

Introduction

All materials which are not considered to be “in-situ rock” are described in general accordance with the soil description model of AS 1726-2017 Part 6.1.3, and can be broken down into the following description structure:



The “classification” comprises a two character “group symbol” providing a general summary of dominant soil characteristics. The “name” summarises the particle sizes within the soil which most influence its behaviour. The detailed description presents more information about composition, condition, structure, and origin of the soil.

Classification, naming and description of soils require the relative proportion of particles of different sizes within the whole soil mixture to be considered.

Particle size designation and Behaviour Model

Solid particles within a soil are differentiated on the basis of size.

The engineering behaviour properties of a soil can subsequently be modelled to be either “fine grained” (also known as “cohesive” behaviour) or “coarse grained” (“non cohesive” behaviour), depending on the relative proportion of fine or coarse fractions in the soil mixture.

Particle Size Designation	Particle Size (mm)	Behaviour Model	
		Behaviour	Approximate Dry Mass
Boulder	>200	Excluded from particle behaviour model as "oversize"	
Cobble	63 - 200		
Gravel ¹	2.36 - 63	Coarse	>65%
Sand ¹	0.075 - 2.36		
Silt	0.002 - 0.075	Fine	>35%
Clay	<0.002		

¹ – refer grain size subdivision descriptions below

The behaviour model boundaries defined above are not precise, and the material behaviour should be assumed from the name given to the material (which considers the particle fraction which dominates the behaviour, refer “component proportions” below), rather than strict observance of the proportions of particle sizes. For example, if a material is named a “Sandy CLAY”, this is indicative that the material exhibits fine grained behaviour, even if the dry mass of coarse grained material may exceed 65%.

Component proportions

The relative proportion of the dry mass of each particle size fraction is assessed to be a “primary”, “secondary”, or “minor” component of the soil mixture, depending on its influence over the soil behaviour.

Component Proportion Designation	Definition ¹	Relative Proportion	
		In Fine Grained Soil	In Coarse Grained Soil
Primary	The component (particle size designation, refer above) which dominates the engineering behaviour of the soil	The clay/silt component with the greater proportion	The sand/gravel component with the greater proportion
Secondary	Any component which is not the primary, but is significant to the engineering properties of the soil	Any component with greater than 30% proportion	Any granular component with greater than 30%; or Any fine component with greater than 12%
Minor ²	Present in the soil, but not significant to its engineering properties	All other components	All other components

¹ As defined in AS1726-2017 6.1.4.4.

² In the detailed material description, minor components are split into two further sub-categories. Refer "identification of minor components" below.

Composite Materials

In certain situations, a lithology description may describe more than one material, for example, collectively describing a layer of interbedded sand and clay. In such a scenario, the two materials would be described independently, with the names preceded or followed by a statement describing the arrangement by which the materials co-exist. For example, "INTERBEDDED Silty CLAY AND SAND".

Classification

The soil classification comprises a two character group symbol. The first character identifies the primary component. The second character identifies either the grading or presence of fines in a coarse grained soil, or the plasticity in a fine grained soil. Refer AS1726-2017 6.1.6 for further clarification.

Soil Name

For most soils, the name is derived with the primary component included as the noun (in upper case), preceded by any secondary components stated in an adjective form. In this way, the soil name also describes the general composition and indicates the dominant behaviour of the material.

Component ¹	Prominence in Soil Name
Primary	Noun (eg "CLAY")
Secondary	Adjective modifier (eg "Sandy")
Minor	No influence

¹ – for determination of component proportions, refer component proportions on previous page

For materials which cannot be disaggregated, or which are not comprised of rock or mineral fragments, the names "ORGANIC MATTER" or "ARTIFICIAL MATERIAL" may be used, in accordance with AS1726-2017 Table 14.

Commercial or colloquial names are not used for the soil name where a component derived name is possible (for example "Gravelly SAND" rather than "CRACKER DUST").

Materials of "fill" or "topsoil" origin are generally assigned a name derived from the primary/secondary component (where appropriate). In log descriptions this is preceded by uppercase "FILL" or "TOPSOIL". Origin uncertainty is indicated in the description by the characters (?), with the degree of uncertainty described (using the terms "probably" or "possibly" in the origin column, or at the end of the description).

Identification of minor components

Minor components are identified in the soil description immediately following the soil name. The minor component fraction is usually preceded with a term indicating the relative proportion of the component.

Minor Component Proportion Term	Relative Proportion	
	In Fine Grained Soil	In Coarse Grained Soil
With	All fractions: 15-30%	Clay/silt: 5-12% sand/gravel: 15-30%
Trace	All fractions: 0-15%	Clay/silt: 0-5% sand/gravel: 0-15%

The terms "with" and "trace" generally apply only to gravel or fine particle fractions. Where cobbles/boulders are encountered in minor proportions (generally less than about 12%) the term "occasional" may be used. This term describes the sporadic distribution of the material within the confines of the investigation excavation only, and there may be considerable variation in proportion over a wider area which is difficult to factually characterise due to the relative size of the particles and the investigation methods.

Soil Composition

Plasticity

Descriptive Term	Laboratory liquid limit range	
	Silt	Clay
Non-plastic materials	Not applicable	Not applicable
Low plasticity	≤50	≤35
Medium plasticity	Not applicable	>35 and ≤50
High plasticity	>50	>50

Note, Plasticity descriptions generally describe the plasticity behaviour of the whole of the fine grained soil, not individual fine grained fractions.

Grain Size

Type	Particle size (mm)	
	Gravel	Sand
Gravel	Coarse	19 - 63
	Medium	6.7 - 19
	Fine	2.36 - 6.7
Sand	Coarse	0.6 - 2.36
	Medium	0.21 - 0.6
	Fine	0.075 - 0.21

Grading

Grading Term	Particle size (mm)
Well	A good representation of all particle sizes
Poorly	An excess or deficiency of particular sizes within the specified range
Uniformly	Essentially of one size
Gap	A deficiency of a particular size or size range within the total range

Note, AS1726-2017 provides terminology for additional attributes not listed here.

Soil Condition

Moisture

The moisture condition of soils is assessed relative to the plastic limit for fine grained soils, while for coarse grained soils it is assessed based on the appearance and feel of the material. The moisture condition of a material is considered to be independent of stratigraphy (although commonly these are related), and this data is presented in its own column on logs.

Applicability	Term	Tactile Assessment	Abbreviation code
Fine	Dry of plastic limit	Hard and friable or powdery	w<PL
	Near plastic limit	Can be moulded	w=PL
	Wet of plastic limit	Water residue remains on hands when handling	w>PL
	Near liquid limit	"oozes" when agitated	w=LL
	Wet of liquid limit	"oozes"	w>LL
Coarse	Dry	Non-cohesive and free running	D
	Moist	Feels cool, darkened in colour, particles may stick together	M
	Wet	Feels cool, darkened in colour, particles may stick together, free water forms when handling	W

The abbreviation code **NDF**, meaning "not-assessable due to drilling fluid use" may also be used.

Note, observations relating to free ground water or drilling fluids are provided independent of soil moisture condition.

Consistency/Density/Compaction/Cementation/Extremely Weathered Material

These concepts give an indication of how the material may respond to applied forces (when considered in conjunction with other attributes of the soil). This behaviour can vary independent of the composition of the material, and on logs these are described in an independent column and are generally mutually exclusive (i.e it is inappropriate to describe both consistency and compaction at the same time). The method by which the behaviour is described depends on the behaviour model and other characteristics of the soil as follows:

- In fine grained soils, the "consistency" describes the ease with which the soil can be remoulded, and is generally correlated against the materials undrained shear strength;
- In granular materials, the relative density describes how tightly packed the particles are, and is generally correlated against the density index;
- In anthropogenically modified materials, the compaction of the material is described qualitatively;
- In cemented soils (both natural and anthropogenic), the cemented "strength" is described qualitatively, relative to the difficulty with which the material is disaggregated; and
- In soils of extremely weathered material origin, the engineering behaviour may be governed by relic rock features, and expected behaviour needs to be assessed based the overall material description.

Quantitative engineering performance of these materials may be determined by laboratory testing or estimated by correlated field tests (for example penetration or shear vane testing). In some cases, performance may be assessed by tactile or other subjective methods, in which case investigation logs will show the estimated value enclosed in round brackets, for example **(VS)**.

Consistency (fine grained soils)

Consistency Term	Tactile Assessment	Undrained Shear Strength (kPa)	Abbreviation Code
Very soft	Extrudes between fingers when squeezed	<12	VS
Soft	Mouldable with light finger pressure	>12 - ≤25	S
Firm	Mouldable with strong finger pressure	>25 - ≤50	F
Stiff	Cannot be moulded by fingers	>50 - ≤100	St
Very stiff	Indented by thumbnail	>100 - ≤200	VSt
Hard	Indented by thumbnail with difficulty	>200	H
Friable	Easily crumbled or broken into small pieces by hand	-	Fr

Relative Density (coarse grained soils)

Relative Density Term	Density Index	Abbreviation Code
Very loose	<15	VL
Loose	>15 - ≤35	L
Medium dense	>35 - ≤65	MD
Dense	>65 - ≤85	D
Very dense	>85	VD

Note, tactile assessment of relative density is difficult, and generally requires penetration testing, hence a tactile assessment guide is not provided.

Soil Descriptions

Terminology
Symbols
Abbreviations

Compaction (anthropogenically modified soil)

Compaction Term	Abbreviation Code
Well compacted	WC
Poorly compacted	PC
Moderately compacted	MC
Variably compacted	VC

Cementation (natural and anthropogenic)

Cementation Term	Abbreviation Code
Moderately cemented	MOD
Weakly cemented	WEK

Extremely Weathered Material

AS1726-2017 considers weathered material to be soil if the unconfined compressive strength is less than 0.6 MPa (i.e. less than very low strength rock). These materials may be identified as “extremely weathered material” in reports and by the abbreviation code **XWM** on log sheets. This identification is not correlated to any specific qualitative or quantitative behaviour, and the engineering properties of this material must therefore be assessed according to engineering principles with reference to any relic rock structure, fabric, or texture described in the description.

Soil Origin

Term	Description	Abbreviation Code
Residual	Derived from in-situ weathering of the underlying rock	RS
Extremely weathered material	Formed from in-situ weathering of geological formations. Has strength of less than ‘very low’ as per as1726 but retains the structure or fabric of the parent rock.	XWM
Alluvial	Deposited by streams and rivers	ALV
Estuarine	Deposited in coastal estuaries	EST
Marine	Deposited in a marine environment	MAR
Lacustrine	Deposited in freshwater lakes	LAC
Aeolian	Carried and deposited by wind	AEO
Colluvial	Soil and rock debris transported down slopes by gravity	COL
Slopewash	Thin layers of soil and rock debris gradually and slowly deposited by gravity and possibly water	SW
Topsoil	Mantle of surface soil, often with high levels of organic material	TOP
Fill	Any material which has been moved by man	FILL
Littoral	Deposited on the lake or seashore	LIT
Unidentifiable	Not able to be identified	UID

Cobbles and Boulders

The presence of particles considered to be “oversize” may be described using one of the following strategies:

- Oversize encountered in a minor proportion (when considered relative to the wider area) are noted in the soil description; or
- Where a significant proportion of oversize is encountered, the cobbles/boulders are described independent of the soil description, in a similar manner to composite soils (described above) but qualified with “MIXTURE OF”.

intentionally blank

Introduction to Terminology, Symbols and Abbreviations

Douglas Partners' reports, investigation logs, and other correspondence may use terminology which has quantitative or qualitative connotations. To remove ambiguity or uncertainty surrounding the use of such terms, the following sets of notes pages may be attached Douglas Partners' reports, depending on the work performed and conditions encountered:

- Soil Descriptions;
- Rock Descriptions; and
- Sampling, insitu testing, and drilling methodologies

In addition to these pages, the following notes generally apply to most documents.

Abbreviation Codes

Site conditions may also be presented in a number of different formats, such as investigation logs, field mapping, or as a written summary. In some of these formats textual or symbolic terminology may be presented using textual abbreviation codes or graphic symbols, and, where commonly used, these are listed alongside the terminology definition. For ease of identification in these note pages, textual codes are presented in these notes in the following style **XW**. Code usage conforms with the following guidelines:

- Textual codes are case insensitive, although herein they are generally presented in upper case; and
- Textual codes are contextual (i.e. the same or similar combinations of characters may be used in different contexts with different meanings (for example `PL` is used for plastic limit in the context of soil moisture condition, as well as in `PL(A)` for point load test result in the testing results column)).

Data Integrity Codes

Subsurface investigation data recorded by Douglas Partners is generally managed in a highly structured database environment, where records "span" between a top and bottom depth interval. Depth interval "gaps" between records are considered to introduce ambiguity, and, where appropriate, our practice guidelines may require contiguous data sets. Recording meaningful data is not always appropriate (for example assigning a "strength" to a concrete pavement) and the following codes may be used to maintain contiguity in such circumstances.

Term	Description	Abbreviation Code
Core loss	No core recovery	KL
Unknown	Information was not available to allow classification of the property. For example, when auguring in loose, saturated sand auger cuttings may not be returned.	UK
No data	Information required to allow classification of the property was not available. For example, if drilling is commenced from the base of a hole predrilled by others	ND
Not Applicable	Derivation of the properties not appropriate or beyond the scope of the investigation. For example, providing a description of the strength of a concrete pavement	NA

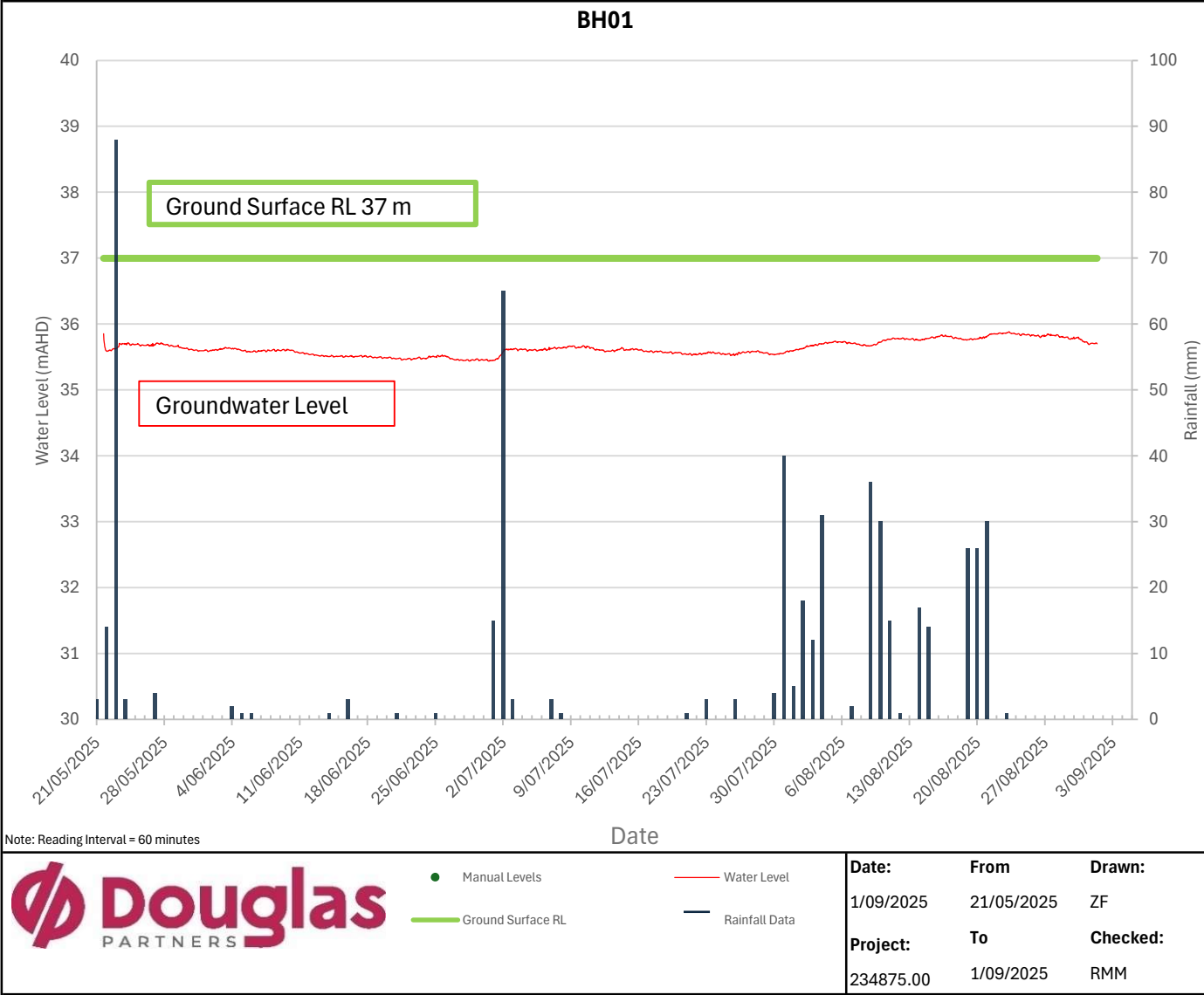
Graphic Symbols

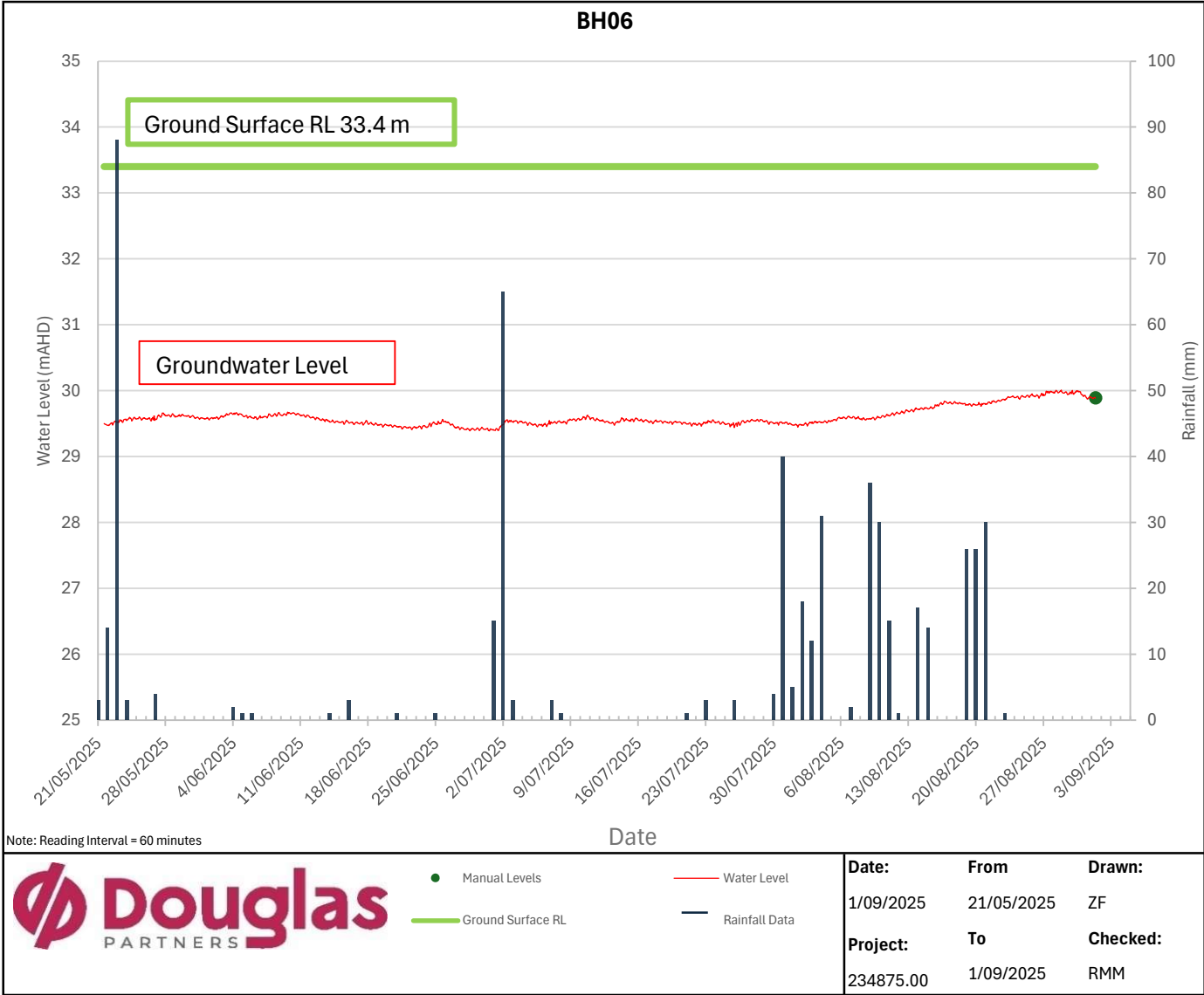
Douglas Partners' logs contain a "graphic" column which provides a pictorial representation of the basic composition of the material. The symbols used are directly representing the material name stated in the adjacent "Description of Strata" column, and as such no specific graphic symbology legend has been provided in these notes.

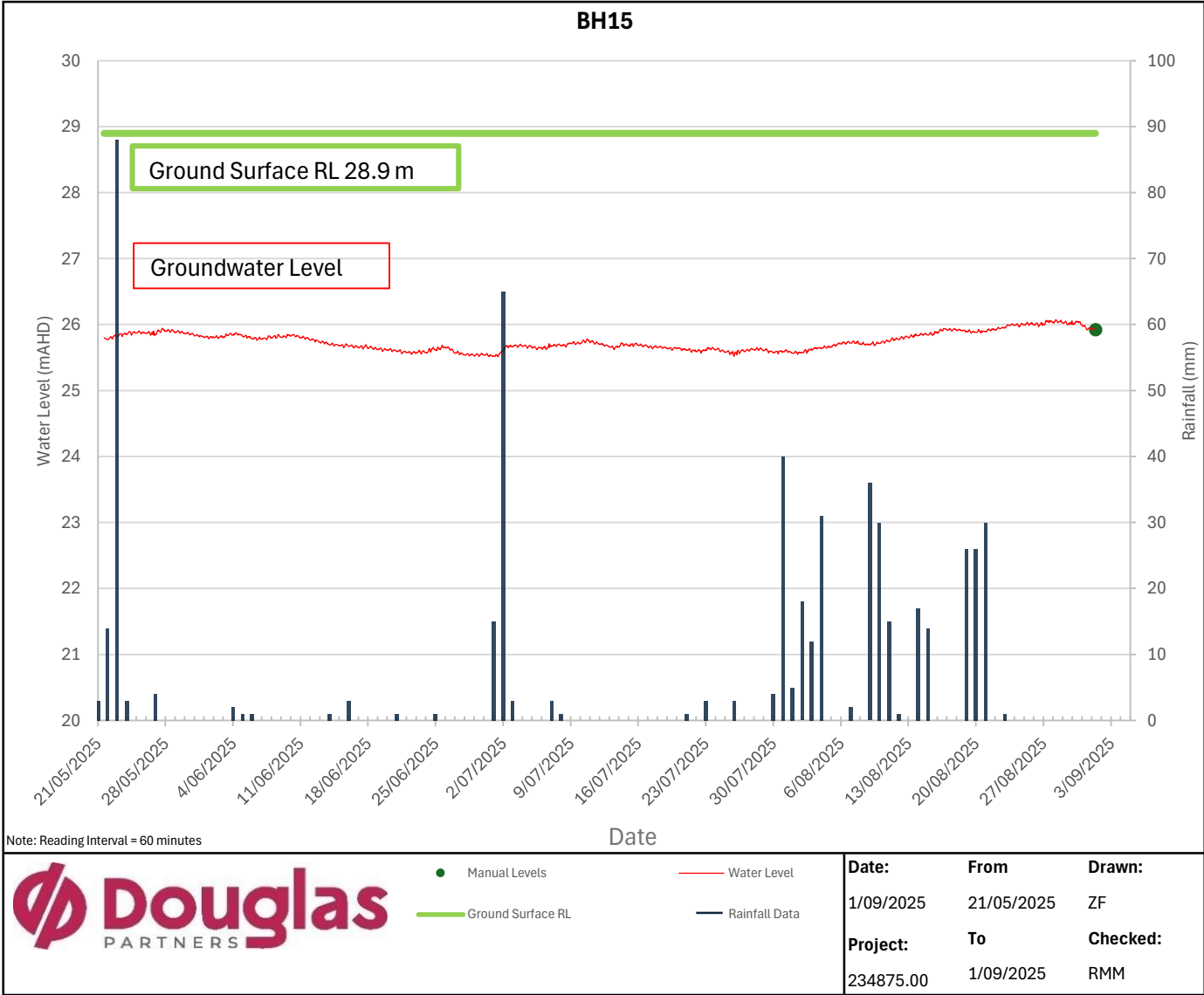
intentionally blank

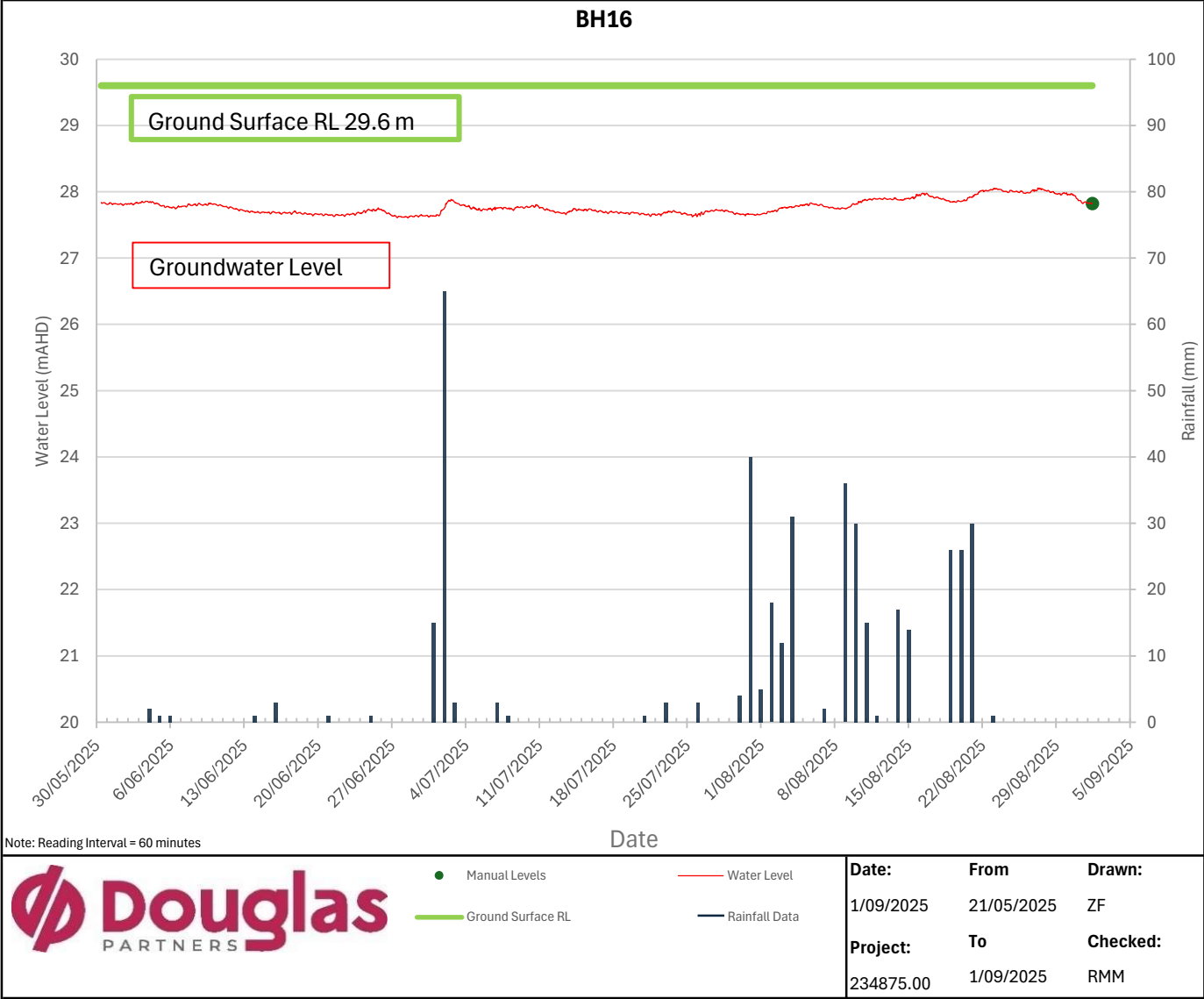
Appendix C

Hydrographs









Appendix D

Hydraulic Testing Results

Permeability Testing - Falling Head Test Report

Client: Project: Location:	Newington College Newington Masterplan 244 Stanmore Road, Stanmore	Project No: Test date: Tested by:	234875.00 21-May-25 SA
----------------------------------	--	---	------------------------------

Test Location BH6
Description: Standpipe in borehole
Material type: XW and laminite

Test No. BH6-1
Easting: 330003.9 m
Northing 6247685.1 m
Surface Level: 33.4 m AHD

Details of Well Installation

Effective diameter (2re)	50	mm	Depth to water before test	3.44	m
borehole diameter (2R)	76	mm	Depth to water at start of test	2.20	m
Effective Length of well screen (Le)	6.70	m	Depth of top of gravel pack	5.40	m
			Depth of base of screen	12.10	m

Test Results

Time (s)	Depth (m)	Change in Head dH (m)	dH/Ho
0	2.199	1.24	1.000
20	2.391	1.05	0.845
105	2.870	0.57	0.460
120	2.906	0.54	0.431
150	2.960	0.48	0.387
180	3.003	0.44	0.353
210	3.039	0.40	0.324
240	3.066	0.38	0.303
270	3.091	0.35	0.282
300	3.115	0.33	0.263

To = 140 Second

Theory:

Falling Head Permeability calculated using equation by Hvorslev

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

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

Hydraulic Conductivity

k = 1.7E-06 m/sec

= 0.149 m/day

Permeability Testing - Falling Head Test Report

[illegible]

Permeability Testing - Rising Head Test Report

[illegible]

Appendix E

Water Quality Summary Table

[illegible]

Phase		Key Performance Indicators (KPIs)										Overall Status		Activities & Culture										Activities & Culture - Detailed											
Supervisors		Team Members		Manager		Director		Executive		Strategic		Operational		Financial		Marketing		Sales		Customer		Human Resources		Information Technology		Legal		Public Relations		Community		Government		Non-Profit	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34		
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L		Team M		Team N		Team O		Team P		Team Q		Team R	
Team A		Team B		Team C		Team D		Team E		Team F		Team G		Team H		Team I		Team J		Team K		Team L													

Appendix F

Laboratory Reports

CERTIFICATE OF ANALYSIS 390726

Client Details

Client	Douglas Partners Pty Ltd
Attention	Rhys McMillan
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	<u>234875.00 Sydney</u>
Number of Samples	3 Water
Date samples received	12/09/2025
Date completed instructions received	12/09/2025

Analysis Details

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

Samples were analysed as received from the client unless as indicated below in the method summaries. Results relate specifically to the samples as received.

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

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

Report Details

Date results requested by	19/09/2025
Date of Issue	18/09/2025

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

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

Results Approved By

Dragana Tomas, Senior Chemist
 Giovanni Agosti, Group Technical Manager
 Loren Bardwell, Development Chemist
 Priya Samarawickrama, Senior Chemist
 Stuart Chen, Asbestos Approved Identifier/Report coordinator

Authorised By

Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Water				
Our Reference		390726-1	390726-2	390726-3
Your Reference	UNITS	BH01	BH06	BH15
Date Sampled		12/09/2025	12/09/2025	12/09/2025
Type of sample		Water	Water	Water
Date extracted	-	12/09/2025	12/09/2025	12/09/2025
Date analysed	-	15/09/2025	15/09/2025	15/09/2025
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	<1	<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	%	103	104	103
Surrogate Toluene-d8	%	99	99	98
Surrogate 4-Bromofluorobenzene	%	93	94	92

svTRH (C10-C40) in Water				
Our Reference		390726-1	390726-2	390726-3
Your Reference	UNITS	BH01	BH06	BH15
Date Sampled		12/09/2025	12/09/2025	12/09/2025
Type of sample		Water	Water	Water
Date extracted	-	15/09/2025	15/09/2025	15/09/2025
Date analysed	-	15/09/2025	15/09/2025	15/09/2025
TRH C ₁₀ - C ₁₄	µg/L	<50	<50	<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	<50	<50
TRH >C ₁₀ - C ₁₆	µg/L	<50	<50	<50
TRH >C ₁₀ - C ₁₆ less Naphthalene (F2)	µg/L	<50	<50	<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	<50	<50
Surrogate o-Terphenyl	%	90	106	89

HM in water - dissolved				
Our Reference		390726-1	390726-2	390726-3
Your Reference	UNITS	BH01	BH06	BH15
Date Sampled		12/09/2025	12/09/2025	12/09/2025
Type of sample		Water	Water	Water
Date prepared	-	15/09/2025	15/09/2025	15/09/2025
Date analysed	-	15/09/2025	15/09/2025	15/09/2025
Arsenic-Dissolved	µg/L	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1
Copper-Dissolved	µg/L	17	4	14
Lead-Dissolved	µg/L	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	5	8	18
Zinc-Dissolved	µg/L	80	49	100

HM in water - total				
Our Reference		390726-1	390726-2	390726-3
Your Reference	UNITS	BH01	BH06	BH15
Date Sampled		12/09/2025	12/09/2025	12/09/2025
Type of sample		Water	Water	Water
Date prepared	-	15/09/2025	15/09/2025	15/09/2025
Date analysed	-	15/09/2025	15/09/2025	15/09/2025
Arsenic-Total	µg/L	<1	6	<1
Cadmium-Total	µg/L	<0.1	<0.1	<0.1
Chromium-Total	µg/L	5	9	3
Copper-Total	µg/L	77	88	30
Lead-Total	µg/L	8	19	3
Mercury-Total	µg/L	<0.05	<0.05	<0.05
Nickel-Total	µg/L	8	15	16
Zinc-Total	µg/L	230	86	100

Metals in Waters - Acid extractable				
Our Reference		390726-1	390726-2	390726-3
Your Reference	UNITS	BH01	BH06	BH15
Date Sampled		12/09/2025	12/09/2025	12/09/2025
Type of sample		Water	Water	Water
Date prepared	-	15/09/2025	15/09/2025	15/09/2025
Date analysed	-	15/09/2025	15/09/2025	15/09/2025
Phosphorus - Total	mg/L	<0.05	1.1	0.2

Miscellaneous Inorganics				
Our Reference		390726-1	390726-2	390726-3
Your Reference	UNITS	BH01	BH06	BH15
Date Sampled		12/09/2025	12/09/2025	12/09/2025
Type of sample		Water	Water	Water
Date prepared	-	15/09/2025	15/09/2025	15/09/2025
Date analysed	-	15/09/2025	15/09/2025	15/09/2025
pH	pH Units	4.9	4.8	5.0
Electrical Conductivity	µS/cm	350	860	1,800
Total Suspended Solids	mg/L	38	2,400	300
Total Dissolved Solids (grav)	mg/L	210	410	1,100
Ammonia as N in water	mg/L	0.01	0.04	0.11
Nitrate as N in water	mg/L	0.02	0.10	0.67
Nitrite as N in water	mg/L	<0.005	<0.005	<0.005
NOx as N in water	mg/L	0.02	0.10	0.67
Organic Nitrogen as N	mg/L	<0.2	4.6	4.7
Phosphate as P in water	mg/L	<0.005	0.10	0.02
Total Nitrogen in water	mg/L	0.2	4.8	5.5
TKN in water	mg/L	0.1	4.7	4.8

Microbiological Testing				
Our Reference		390726-1	390726-2	390726-3
Your Reference	UNITS	BH01	BH06	BH15
Date Sampled		12/09/2025	12/09/2025	12/09/2025
Type of sample		Water	Water	Water
Date of testing	-	13/09/2025	13/09/2025	13/09/2025
Total Coliforms	MPN/100mL	40	20	<18

Ion Balance				
Our Reference		390726-1	390726-2	390726-3
Your Reference	UNITS	BH01	BH06	BH15
Date Sampled		12/09/2025	12/09/2025	12/09/2025
Type of sample		Water	Water	Water
Date prepared	-	15/09/2025	15/09/2025	15/09/2025
Date analysed	-	15/09/2025	15/09/2025	15/09/2025
Calcium - Dissolved	mg/L	4	1	2
Potassium - Dissolved	mg/L	0.5	2	5.3
Sodium - Dissolved	mg/L	46	160	350
Magnesium - Dissolved	mg/L	2	4	11
Hardness (calc) equivalent CaCO ₃	mg/L	18	20	50
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	<5	<5	<5
Bicarbonate Alkalinity as CaCO ₃	mg/L	14	16	11
Carbonate Alkalinity as CaCO ₃	mg/L	<5	<5	<5
Total Alkalinity as CaCO ₃	mg/L	14	16	11
Sulphate, SO ₄	mg/L	74	160	310
Chloride, Cl	mg/L	26	89	210
Ionic Balance	%	-4.0	8.0	13

Method ID	Methodology Summary
Ext-008	Subcontracted to Sonic Food & Water Testing. NATA Accreditation No. 4034.
Inorg-001	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-018	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180+/-10°C. NOTE: Where the EC of the sample is <100µS/cm, the TDS will typically be below 70mg/L (as the sample is very likely to be at least drinking water quality). Therefore to ensure data quality for TDS, the TDS is typically calculated as per the equation below:- $\text{TDS} = \text{EC} * 0.6$
Inorg-019	Suspended Solids - determined gravimetrically by filtration of the sample. The samples are dried at 104+/-5°C.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 15% ie total anions = total cations +/-15%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055	Nitrite - determined colourimetrically based on APHA latest edition NO2- B. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055/062/127	Total Nitrogen - Calculation sum of TKN and oxidised Nitrogen. Alternatively analysed by combustion and chemiluminescence.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-060	Phosphate determined colourimetrically based on EPA365.1 and APHA latest edition 4500 P E. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-062	TKN - determined colourimetrically based on APHA latest edition 4500 Norg. Alternatively, TKN can be derived from calculation (Total N - NOx).
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

Method ID	Methodology Summary
Metals-020	Determination of various metals/elements by ICP-AES. Total Phosphate determined stoichiometrically from Phosphorus (assumed to be present as Phosphate). Where salts (oxides, chlorides etc.) are calculated from the element concentration stoichiometrically there is no guarantee that the salt form is completely soluble in the acids used in the preparation. Submission of low masses of sample e.g. for dust samples, may result in raised PQLs. Where molecular anion forms are calculated from an element (e.g. SO₄ from S or PO₄ from P stoichiometrically), the assumption is that the element is only present in that molecular anion form.
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. Where salts (oxides, chlorides etc.) are calculated from the element concentration stoichiometrically there is no guarantee that the salt form is completely soluble in the acids used in the preparation.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C₁₀-C₁₆)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C₆-C₁₀)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W8	[NT]
Date extracted	-			12/09/2025	1	12/09/2025	15/09/2025		12/09/2025	[NT]
Date analysed	-			15/09/2025	1	15/09/2025	16/09/2025		15/09/2025	[NT]
TRH C ₆ - C ₉	µg/L	10	Org-023	<10	1	<10	<10	0	97	[NT]
TRH C ₆ - C ₁₀	µg/L	10	Org-023	<10	1	<10	<10	0	97	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	97	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	95	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	95	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	99	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	100	[NT]
Naphthalene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	98	1	103	107	4	98	[NT]
Surrogate Toluene-d8	%		Org-023	98	1	99	99	0	100	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	93	1	93	92	1	110	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	390726-2
Date extracted	-			15/09/2025	1	15/09/2025	15/09/2025		15/09/2025	15/09/2025
Date analysed	-			15/09/2025	1	15/09/2025	15/09/2025		15/09/2025	15/09/2025
TRH C ₁₀ - C ₁₄	µg/L	50	Org-020	<50	1	<50	<50	0	101	108
TRH C ₁₅ - C ₂₈	µg/L	100	Org-020	<100	1	<100	<100	0	112	112
TRH C ₂₉ - C ₃₆	µg/L	100	Org-020	<100	1	<100	<100	0	100	92
TRH >C ₁₀ - C ₁₆	µg/L	50	Org-020	<50	1	<50	<50	0	101	108
TRH >C ₁₆ - C ₃₄	µg/L	100	Org-020	<100	1	<100	<100	0	112	112
TRH >C ₃₄ - C ₄₀	µg/L	100	Org-020	<100	1	<100	<100	0	100	92
Surrogate o-Terphenyl	%		Org-020	95	1	90	90	0	114	106

QUALITY CONTROL: HM in water - dissolved						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date prepared	-			15/09/2025	2	15/09/2025	15/09/2025		15/09/2025	[NT]
Date analysed	-			15/09/2025	2	15/09/2025	15/09/2025		15/09/2025	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	2	<1	[NT]		99	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	2	<0.1	[NT]		99	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	2	<1	[NT]		96	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	2	4	[NT]		98	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	2	<1	[NT]		105	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	2	<0.05	<0.05	0	95	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	2	8	[NT]		97	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	2	49	[NT]		96	[NT]

QUALITY CONTROL: HM in water - total						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date prepared	-			15/09/2025	1	15/09/2025	15/09/2025		15/09/2025	[NT]
Date analysed	-			15/09/2025	1	15/09/2025	15/09/2025		15/09/2025	[NT]
Arsenic-Total	µg/L	1	Metals-022	<1	1	<1	[NT]		102	[NT]
Cadmium-Total	µg/L	0.1	Metals-022	<0.1	1	<0.1	[NT]		96	[NT]
Chromium-Total	µg/L	1	Metals-022	<1	1	5	[NT]		101	[NT]
Copper-Total	µg/L	1	Metals-022	<1	1	77	[NT]		102	[NT]
Lead-Total	µg/L	1	Metals-022	<1	1	8	[NT]		98	[NT]
Mercury-Total	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0.05	0	91	[NT]
Nickel-Total	µg/L	1	Metals-022	<1	1	8	[NT]		101	[NT]
Zinc-Total	µg/L	1	Metals-022	<1	1	230	[NT]		100	[NT]

QUALITY CONTROL: Metals in Waters - Acid extractable						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			15/09/2025	[NT]	[NT]	[NT]	[NT]	15/09/2025	[NT]
Date analysed	-			15/09/2025	[NT]	[NT]	[NT]	[NT]	15/09/2025	[NT]
Phosphorus - Total	mg/L	0.05	Metals-020	<0.05	[NT]	[NT]	[NT]	[NT]	100	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W8	390726-2
Date prepared	-			15/09/2025	1	15/09/2025	15/09/2025		15/09/2025	15/09/2025
Date analysed	-			15/09/2025	1	15/09/2025	15/09/2025		15/09/2025	15/09/2025
pH	pH Units		Inorg-001	[NT]	1	4.9	4.8	2	101	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	<1	1	350	350	0	112	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	<5	1	38	[NT]		91	[NT]
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	<5	1	210	[NT]		84	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.01	0.02	67	97	92
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.02	0.02	0	98	94
Nitrite as N in water	mg/L	0.005	Inorg-055	<0.005	1	<0.005	<0.005	0	97	109
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.02	0.03	40	98	94
Organic Nitrogen as N	mg/L	0.2	Inorg-055/062/127	<0.2	1	<0.2	[NT]		[NT]	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	1	<0.005	<0.005	0	109	99
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	<0.1	1	0.2	[NT]		99	[NT]
TKN in water	mg/L	0.1	Inorg-062	<0.1	1	0.1	[NT]		[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	3	15/09/2025	15/09/2025		[NT]	[NT]
Date analysed	-			[NT]	3	15/09/2025	15/09/2025		[NT]	[NT]
pH	pH Units		Inorg-001	[NT]	3	5.0	[NT]		[NT]	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	[NT]	3	1800	[NT]		[NT]	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	[NT]	3	300	260	14	[NT]	[NT]
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	[NT]	3	1100	[NT]		[NT]	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	[NT]	3	0.11	[NT]		[NT]	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	[NT]	3	0.67	[NT]		[NT]	[NT]
Nitrite as N in water	mg/L	0.005	Inorg-055	[NT]	3	<0.005	[NT]		[NT]	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	[NT]	3	0.67	[NT]		[NT]	[NT]
Organic Nitrogen as N	mg/L	0.2	Inorg-055/062/127	[NT]	3	4.7	[NT]		[NT]	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	[NT]	3	0.02	[NT]		[NT]	[NT]
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	[NT]	3	5.5	[NT]		[NT]	[NT]
TKN in water	mg/L	0.1	Inorg-062	[NT]	3	4.8	[NT]		[NT]	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W8	[NT]
Date prepared	-			15/09/2025	1	15/09/2025	15/09/2025		15/09/2025	[NT]
Date analysed	-			15/09/2025	1	15/09/2025	15/09/2025		15/09/2025	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	4	[NT]		81	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	0.5	[NT]		86	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	46	[NT]		86	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	2	[NT]		85	[NT]
Hardness (calc) equivalent CaCO ₃	mg/L	3	Metals-020	[NT]	1	18	[NT]		[NT]	[NT]
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	5	Inorg-006	<5	1	<5	<5	0	[NT]	[NT]
Bicarbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	1	14	15	7	[NT]	[NT]
Carbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	1	<5	<5	0	[NT]	[NT]
Total Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	1	14	15	7	103	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	1	74	75	1	103	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	1	26	26	0	93	[NT]
Ionic Balance	%		Inorg-040	[NT]	1	-4.0	[NT]		[NT]	[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.

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.

Air volumes are typically provided by customers (often as flow rate(s) and sampling time(s) and/or simply volumes) sampled or exposure times (determines 'volume' passive badges are exposed to)). Hence in such circumstances the volume measurement is inevitably not covered by Envirolab's NATA accreditation. An exception may occur where Envirolab Newcastle does the sampling where accreditation exists for certain types of sampling and hence volume determination(s). Note air volumes are often used to determine concentrations for dust and/or analyses on filters, sorbents and in impingers. For canister sampling, the air volume is covered by Envirolab's NATA accreditation.

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.

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.

For Dust Deposit Gauge (DDG) analysis the sampling, sampling period and funnel exposure area do not fall under Envirolab's NATA accreditation (unless the Newcastle laboratory where responsible for the sampling), hence the annotation on the DDG units of reporting.

Urine Analysis - The BEI values listed are taken from the 2022 edition of "TLVs and BEIs Threshold Limits" by ACGIH.

Report Comments

Microbiology analysed by Sonic Food & Water Testing. Report no. W2520832.

The time between collection and the commencement of testing should not exceed 24 hours. Samples tested outside this time may have their results compromised.

CHAIN OF CUSTODY DESPATCH SHEET

[illegible]

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Pty Ltd
Attention	Rhys McMillan

Sample Login Details

Your reference	234875.00 Sydney
Envirolab Reference	390726
Date Sample Received	12/09/2025
Date Instructions Received	12/09/2025
Date Results Expected to be Reported	19/09/2025

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	3 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	2
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie

Phone: 02 9910 6200
Fax: 02 9910 6201
Email: ahie@envirolab.com.au

Jacinta Hurst

Phone: 02 9910 6200
Fax: 02 9910 6201
Email: jhurst@envirolab.com.au

Analysis Underway, details on the following page:



Sample ID	Water Quality Parameters																													
	VTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	HM in water - dissolved	HM in water - total	Metals in Waters - Acid extractable	pH	Electrical Conductivity	Total Suspended Solids	Total Dissolved Solids (grav)	Ammonia as N in water	Nitrate as N in water	Nitrite as N in water	NOx as N in water	Organic Nitrogen as N	Phosphate as P in water	Total Nitrogen in water	TKN in water	Microbiological Testing	Calcium - Dissolved	Potassium - Dissolved	Sodium - Dissolved	Magnesium - Dissolved	Hardness (calc) equivalent CaCO3	Hydroxide Alkalinity (OH-) as CaCO3	Bicarbonate Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulphate, SO4	Chloride, Cl	Ionic Balance
BH01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH06	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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.