Douglas PARTNERS

GROUNDED EXPERTISE

Specialist Advice

Report on Geotechnical Investigation

Affordable Housing

211A-215 Harbour Drive, Coffs Harbour NSW

Prepared for Homes NSW

Project 89890.01

8 September 2025

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

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

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Table of Contents

Report on Geotechnical Investigation
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1. Introduction

1.1 Overview

This geotechnical report has been prepared by Douglas Partners Pty Ltd (Douglas) on behalf of Homes NSW for a State Significant Development Application (SSD-83294209) for construction of a residential flat building up to four storeys with a total of 60 apartments for the purpose of affordable housing at 211A-215 Harbour Drive, Coffs Harbour NSW (the 'site').

The purpose of this Geotechnical Investigation Report is to provide geotechnical due-diligence comments and to address the geotechnical components of the Secretary's Environmental Assessment Requirements (SEARs) for the project issue on 2 May 2025, which identified the specific assessment requirements shown in Figure 1.

12. Ground and Groundwater Conditions • Assess potential impacts on soil resources and related infrastructure and riparian lands on and near the site and including soil erosion. • Where required provide a Groundwater Impact Assessment in accordance with relevant Groundwater Guidelines. If the proposed development is on land identified as having high salinity or acid sulfate soil potential in an EPI provide a Salinity Management Plan or Acid Sulfate Soil Management Plan that includes appropriate management measures and strategies.	Geotechnical Assessment If required: Groundwater Impact Assessment Salinity Management Plan Acid Sulfate Soils Management Plan

Figure 1: Extract of Relevant SEARS

The report has identified that a Groundwater Impact Assessment is appropriate in relation to the works. The Groundwater Impact Assessment report (including a Dewatering Management Plan) will be prepared separately to this geotechnical report.

1.2 Background

Homes NSW has identified the site as an opportunity to deliver 60 new, quality affordable housing apartments in a well-located area that is serviced by a high level of amenity, services and public active transport.

1.3 Report Context

The geotechnical investigation and reporting has been informed by the following information provided by Homes NSW:

- Architectural plans and elevations by Studio Johnston (RevA, dated 29 August 2025);
- Landscaping plans by Jane Irwin Landscape Architecture (LD-201, dated 29 August 2025); and
- Detail survey drawings by LTS dated 14 March 2025.

It is understood that the proposed development of the site will include the construction of a four-storey residential building with one level of basement ("Lower Ground") carparking under part of the building footprint, partially embedded in the sloping site. The proposed lower ground floor level is about 4.6 AHD – approximately at existing site levels in the western corner of the basement, and approximately 3.5 m below site levels in the eastern corner of the basement.

The investigation works outlined in this report were undertaken in conjunction with an investigation for contamination assessment purposes. The investigation included the drilling of three deep geotechnical boreholes and a further eight shallow boreholes were drilled for contamination assessment purposes. Selected, geotechnically relevant information from the contamination investigation (particularly borehole logs) have been included in this report. Reference should be made to the following contamination reports for further details:

- Preliminary Site (Contamination) Investigation by Douglas (report reference 89890.01.R.001); and
- Detailed Site (Contamination) Investigation by Douglas (report reference 89890.01.R.003).

The details of the field work are presented in this report, together with information on the items noted above. This report must be read in conjunction with all appendices including the notes provided in Appendix A.

Douglas has performed a previous geotechnical investigation at the site (Douglas, 2018) which included six augered boreholes (Bores 1 to 6) to 4.95 m depth. The results of that investigation are considered to be consistent with those of the current investigation.

2. Site description

The site is located at 211A-215 Harbour Drive, Coffs Harbour, in City of Coffs Harbour Local Government Area (LGA).

The site has a total site area of 3,807 m^2 and has two street frontages; Harbour Drive to the south-west and North Street to the east, as shown in Figure 2.

Figure 2: Site location (provided by Client)

The site is within 200m of the Coffs Harbour City Centre and is close to local schools, open space and recreational areas. A bus stop is located immediately in front of the site, along Harbour Drive and providing bus services throughout Coffs Harbour.

At the time of the investigation, the site was vacant and grassed, with some trees in parts (refer Figure 3 and Figure 4). An existing sewer main crossed the north-eastern part of the property. Low-rise, commercial buildings were present to the east and west, and residential buildings to the north and east of the site.

Figure 3: View south across the site

Figure 4: View north across the site

The ground surface generally sloped down towards the west at about 4°. The project survey drawings indicate surface elevation of about 10.5 AHD in the eastern part of the property adjacent to North Street and 4.5 AHD in the western corner of the property adjacent to Harbour Drive.

Reference to the regional 2 m elevation contours indicates that the site is on a short hillslope, falling from a low and irregular, local spur (approximately along North Street, to the east of the site), sloping down towards a gully on the western side of Curacoa Street and a tributary in Carralls Gully, feeding Coffs Creek.

3. Published data

3.1 Geology

Reference to the NSW Northern Coastal Comprehensive Assessment (NCCA) bedrock geology mapping sheet, indicates that the majority of the site is underlain by residual soil and weathered rocks of the Coffs Harbour Block (Coramba Beds) which typically comprises lithofeldspathic wacke, siltstone, mudstone, metabasalt, chert, jasper and felsic volcanics.

The NCCA Quaternary mapping indicates that the far western corner of the site is underlain by quaternary aged alluvial plain / terrace material which typically comprises silt, clay, fluvial sand and gravel.

An extract of the NCCA geology mapping is shown in Figure 5.

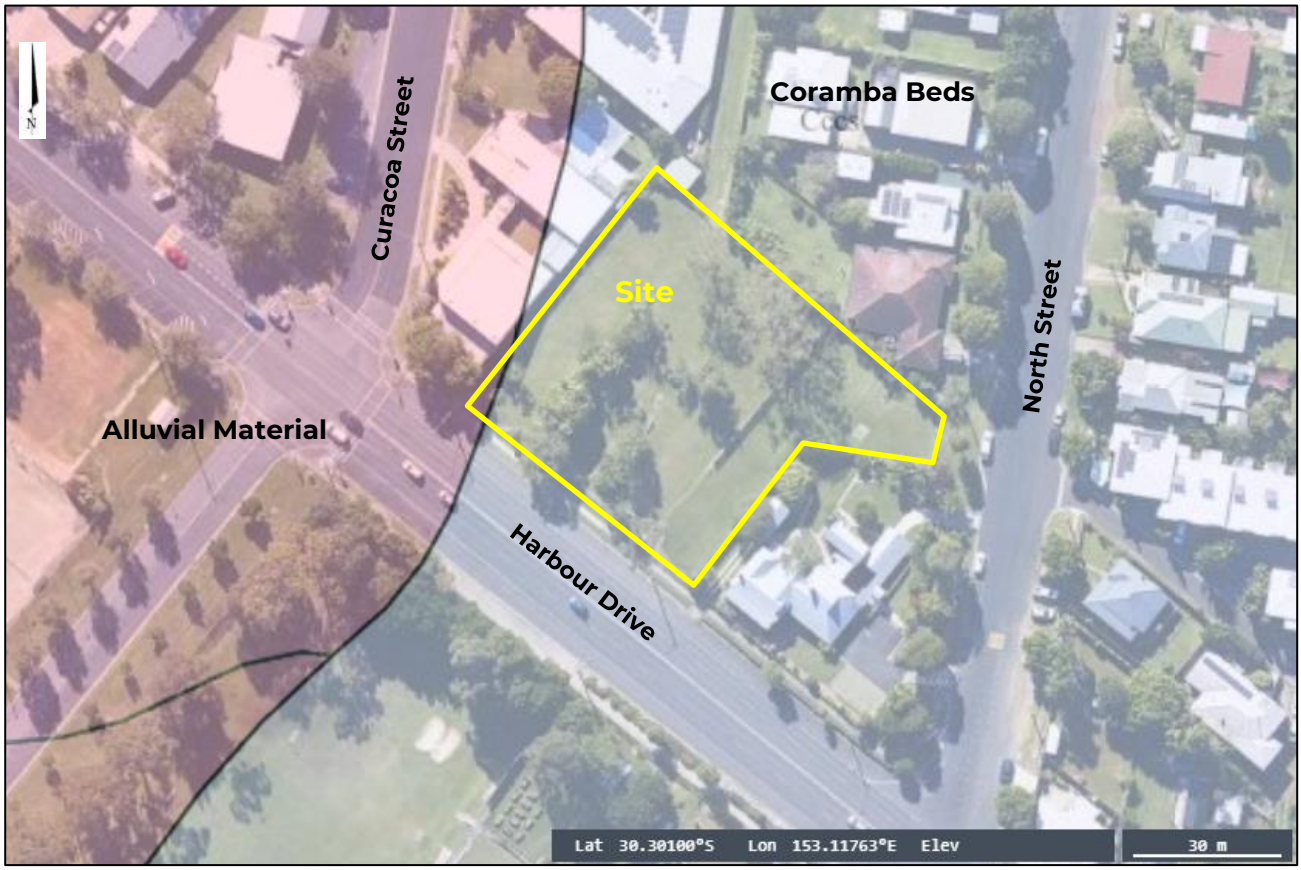

Figure 5: Extract of NCCA geology mapping with approximate property / site location

3.2 Soil landscape

Reference to the Coffs Harbour 1:100,000 soil landscapes sheet indicates that the site is underlain by Megan erosional soils. Megan erosional soils typically comprise brown-black earthy loam topsoil underlain by dark red-brown clay loam and red-brown pedal light clay subsoil which are underlain by a red-brown to orange silty clay loam to silty light clay.

3.3 Acid sulfate soils

Reference to the NSW 1:25,000 Acid Sulfate Soil Risk Mapping indicates there is a low probability of occurrence of acid sulfate soil (ASS) in the far western corner of the site and is generally not expected to contain ASS materials in this area. The mapping also indicates that the majority of the site is located outside of areas of known acid sulfate soil risk mapping. ASS risk mapping is shown in Figure 6.

Figure 6: Extract of acid sulfate soil mapping

With reference to the Environmental Planning Instruments (EPI) maps for Acid Sulfate Soils (Coffs Harbour LEP, 2013), these risk zones correspond to Class 4 in the areas of low probability of ASS occurrence, with the majority of the site mapped as Class 5, reflecting the 500m "buffer zone".

3.4 Salinity

The site is located outside of high salinity risk and high salinity hazard as per the AUS salinity mapping data. The site is outside of salinity zones indicated by the EPI map (EPI - Salinity, State Government of NSW and NSW Department of Planning, Housing and Infrastructure, 2017)

3.5 Groundwater

Reference to digital data provided by the NSW Department of Climate Change, Energy, Environment and Water – Water Group, based on the Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources (2016) indicates that the site is underlain by aquifers of the New England Fold Belt Coast Groundwater Source, near the boundary with the Coffs Harbour Area Coastal Floodplain Alluvial Groundwater Source (to the west) – governed by the North Coast Fractured and Porous Rock Groundwater Sources 2016 and Coffs Harbour Area Unregulated and Alluvial Water Sources 2022 Water Sharing Plans, respectively..

Reference to the regional groundwater dependent ecosystem (GDE) mapping of High Ecological Value Aquatic Ecosystems (HEVAE) (State Government of NSW and NSW DCCEEW 2025) indicates that high priority GDEs are present adjoining Carralls Gully, approximately 130 m north-west of the site.

4. Field work

4.1 Field work methods

The field work for the geotechnical investigation included three (3) deep boreholes across the site drilled using a track-mounted geotechnical drilling rig operated by Ground Test. The field work was undertaken from 15 to 16 April and 6 to 8 May 2025. A further eight (8) shallow boreholes were drilled across the proposed site area for the purpose of contamination assessment and/or installation of groundwater monitoring wells between 15 and 17 April 2025. Supervision of the drilling and logging of the boreholes (geotechnical) was completed by an experienced engineering geologist from Douglas.

The geotechnical boreholes (101, 108 and 109) were initially drilled using 100 mm diameter solid flight auger and wash bore rotary drilling methods to depths ranging from 11.1 m to 18.2 m. Regular standard penetration tests (SPTs) were undertaken within the soils in order to provide information on the engineering properties of the soils and to obtain soil samples for visual and tactile assessment and for subsequent laboratory testing. The boreholes were then continued into the underlying bedrock using diamond core drilling techniques to reach final depth of between 15.0 m and 19.6 m. The strength of the recovered rock core was assessed by examination of the recovered rock cores and subsequent correlations with Point Load Strength Index ($Is_{(50)}$) tests.

The contamination boreholes (101A, 102, 103, 104, 105, 106, 107, 108A, 109A, 110 and 111) were augered to depths of between 1 m and 2 m for environmental soil sampling purposes using a track-mounted drill rig operated by Ground Test or hand auger, depending on access and time constraints. Regular disturbed samples were taken while augering, for visual and tactile assessment and for subsequent laboratory testing. Bores 101A, 108A and 109A were drilled to depths ranging from 5 m to 10 m to facilitate installation of groundwater monitoring wells.

Coordinates and surface levels for all borehole locations were recorded using a differential Global Positioning System (dGPS) receiver, which typically has an accuracy of ±0.1 m however can vary based on satellite coverage and other factors. Coordinates are in GDA2020 / MGA Zone 56 format (Geocentric Datum of Australia 2020 base with Map Grid of Australia projection) and levels are relative to Australian Height Datum (AHD).

A summary of the borehole spatial and termination depth information is given in Table 1. Borehole locations are shown on Drawing 1 in Appendix B.

Table 1: Summary of Boreholes

Borehole	Purpose[2]	Surface RL (m AHD)	Easting (m)[1]	Northing (m)[1]	Final depth (m)
101	Geotechnical & well	5.8	511623.7	6647936.0	15.0
101A	Contamination & well	5.8	511622.9	6647935.0	5.0
102	Contamination	7.1	511635.0	6647927.7	1.3
103	Contamination	8.9	511657.6	6647911.5	1.0
104	Contamination	10.1	511674.4	6647897.7	1.0
105	Contamination	5.4	511613.4	6647926.6	1.5
106	Contamination	6.1	511617.6	6647908.4	2.0
107	Contamination	7.6	511641.2	6647901.5	1.4
108	Geotechnical & well	8.0	511643.4	6647886.8	19.6
108A	Contamination & well	8.0	511642.7	6647886.0	10.0
109	Geotechnical	4.6	511594.2	6647899.8	15.3
109A	Contamination & well	4.7	511595.4	6647900.0	8.0
110	Contamination	6.4	511619.9	6647895.4	2.0
111	Contamination	7.4	511630.6	6647868.8	1.4

Note: 1 - MGA2020 Zone 56
2 - Purpose reflects whether the borehole was drilled and located for primarily geotechnical purposes, or contamination assessment purposes. The purpose influenced the drilling method, testing, sampling and depth of investigation.

Following the completion of drilling of the geotechnical boreholes, piezometer standpipes / groundwater monitoring wells were installed in Bores 101 and 108 to obtain information on hydrogeological conditions and enable sampling of groundwater. Three additional shallow standpipes / groundwater monitoring wells (Bores 101A, 108 A and 109A) were installed for groundwater contamination assessment and supplement the data from the geotechnical groundwater monitoring wells. The standpipes were generally installed using the following methodology:

- Bores were reamed to HQ-size (96 mm diameter) for the length of the proposed standpipe to facilitate installation;
- 'Blank' and 'slotted' PVC pipe was installed in the bore, with a gravel pack backfilled around the 'slotted' PVC pipe at the target depth;
- The 'slotted length' and gravel pack was isolated from the overlying and (where relevant) underlying backfill by bentonite plugs (seals); and
- The surface was finished by a shallow bentonite plug (seal), with a gatic cover concreted in at ground surface.

A summary of the standpipe installation details is provided in Table 2.

Table 2: Summary of standpipe installation details

Borehole	Screened and gravel pack interval[1] (m)	Screened Material[2]
101	4.4-8.0	Silty Clay
101A	1.5–5.0	Silty Clay
108	11.7-17.3	Clayey Gravel
108A	6.5-10.0	Silty clay
109A	4.4-8.00	Clay

Notes: 1 – refers to depth interval of both slotted screen and surrounding gravel pack
2 – refers to lithology in which the standpipe is screened

4.2 Field work results

4.2.1 Geotechnical conditions

The subsurface conditions encountered in the boreholes are presented on the engineering logs in Appendix C, along with standard notes defining the descriptive terms and the classification methods used. The typical subsurface strata encountered at the test locations may be broadly summarised as follows (refer to borehole logs in Appendix C for further detail):

- **Fill**: Typically comprising dark brown silty clay and/or silty sand to 0.2 m / 0.4 m depth with trace brick fragments, gravel, metal, asphalt and concrete at some locations, and upper topsoil; underlain by,
- **Silty Clay / Clay**: generally residual, with shallow alluvial at Bore 109 only; stiff to hard to 8.5 m / 11.2 m, and firm in parts; soft to firm at 8.2 m to 9.2 m in Bore 109; underlain by,
- **Gravelly Silt / Clayey Gravel (extremely weathered material)**: Generally very stiff to hard to 12.23 m / 18.2 m (Bores 101 and 108), underlain by,
- **Metabasalt**: Typically medium to high strength metabasalt to bore termination at 15.0 m / 19.6 m depth.

4.2.2 Hydrogeological conditions

Groundwater seepage was initially observed at depths of 0.8 m to 8.0 m whilst augering at the borehole locations. The shallow termination depth (at contamination boreholes) or necessary introduction of water to the borehole while wash boring or rock coring precluded further groundwater observations during drilling.

Some significant losses of drilling fluid were also observed whilst drilling, including at 12.8 m depth in Bore 109.

Details of groundwater observations whilst drilling, and drilling fluid losses are recorded on the relevant borehole logs.

It is noted that groundwater levels rose to near ground level of Bore 109 within approximately 16 hours of drilling (refer Figure 7), following installation of a standpipe.

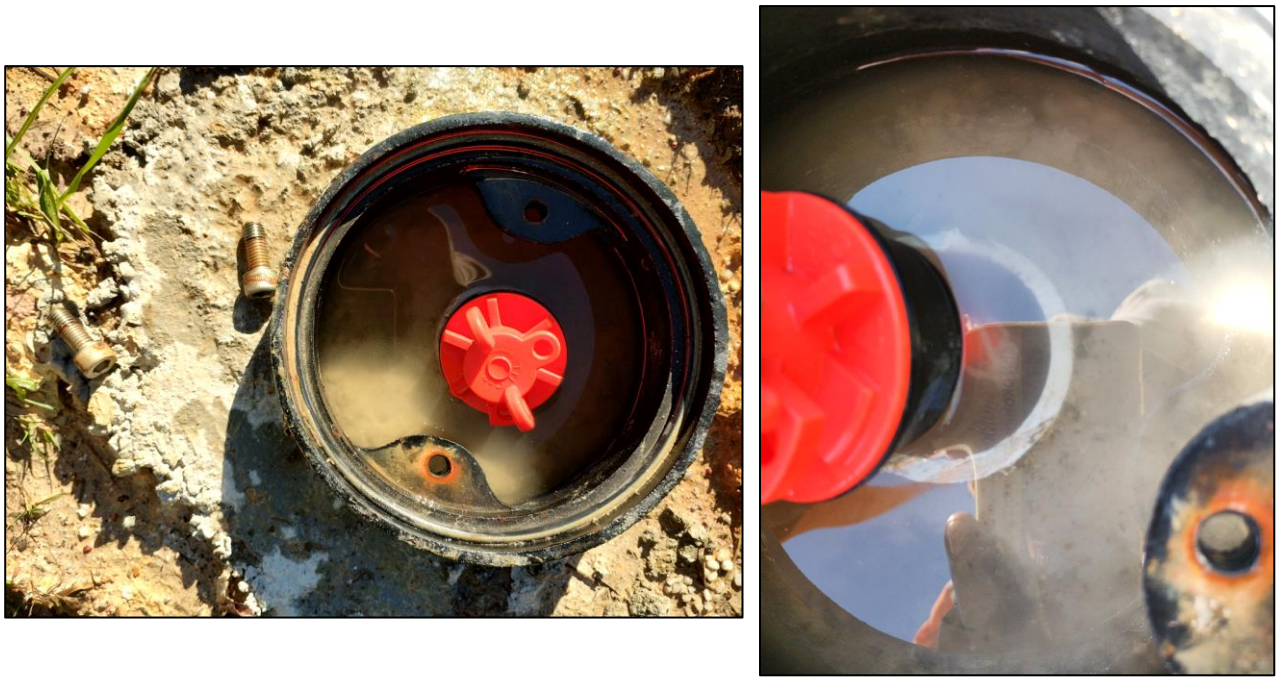

Figure 7: Groundwater at surface of monitoring well at Bore 109A (7 May 2025)

Groundwater was observed between 0.05 m and 1.76 m depth in the standpipes prior to development. Following installation and development of the geotechnical standpipes, a datalogger was installed in Bores 101, 108 and 109 to allow continuous groundwater level monitoring. The monitoring results will be provided in the Groundwater Impact Assessment.

Supplementary groundwater observations made at the site during the geotechnical investigation works are summarised in Table 3.

Table 3: Summary of Groundwater Observations

Bore	Ground Level (m AHD)	Standing Water Levels			
		Depth (m)		RL (m, AHD)	
		23/5/25*	29/5/25	23/5/25*	29/5/25
101	5.8	NM	0.05	N/A	5.75
101A	5.8	0.46	NM	5.34	N/A
108	8.0	NM	1.44	N/A	6.56
108A	8.0	0.64	NM	7.36	N/A
109A	4.6	NM	At surface level	N/A	4.6

Note: Rainfall observations at Coffs Harbour Airport indicate that these readings were obtained during, and shortly after periods of rainy weather.
NM: Not measured
*Immediately prior to borehole development

It should be noted that groundwater levels are affected by a number of factors including recent weather conditions and soil permeability and will vary with time.

Supplementary testing for hydraulic conductivity, and monitoring of groundwater levels will be separately reported in the Groundwater Impact Assessment (to be reported in a Dewatering Management Plan (DMP)) for the site.

5. Laboratory testing

5.1 Soil aggressivity

Soil aggressivity laboratory testing was performed on four selected soil samples at a NATA registered laboratory in Lismore. The results of the laboratory testing are provided in detail in the test report sheets in Appendix D and are summarised in Table 4.

Table 4: Summary of soil aggressivity test results

Bore	Depth (m)	Material	pH	Sulfate (mg/kg)	Chloride (mg/kg)	Electrical conductivity (µS/cm)
101A	3.5	Silty Clay	5.8	33	19.5	41
101	8.5-8.95	Gravelly Silt	6.7	7	10.0	23
108	10-10.45	Silty Clay	6.1	16	18.8	28
109	4-4.45	Clay	6.8	18	55.4	65

Groundwater laboratory testing was undertaken to support contamination assessment at the site, including some testing relevant to aggressivity. The results of the laboratory testing are provided in detail in the test report sheets in Appendix D and selected results are summarised in Table 5.

Table 5: Summary of groundwater test results

Bore	pH	Sulfate (mg/kg)	Chloride (mg/kg)	Electrical conductivity (µS/cm)
101A	5.6	13	32	180
108A	5.6	23	14	140
109	6.2	6	57	320

Comparison of the above results to Tables 6.4.2(C) and Table 6.5.2(C) of AS 2159 (2009) indicates that the soil conditions are:

- Generally consistent with a non-aggressive exposure classification for buried concrete in soil; and,
- Generally consistent with a non-aggressive exposure classification for buried steel in soil.

Adopting conversion factors of 6 to 8.5 for light to heavy clays, these results suggest that the soils tested are non-saline.

5.2 Acid sulfate soils

Six (6) soil samples from Bore 109 (the bore closest to ASS mapping of low probability of occurrence of acid sulfate soil) were submitted to Envirolab, a NATA accredited laboratory for acid sulfate soil (ASS) tests. It should be noted that ASS screening tests are a qualitative screening test which provides a preliminary indication of the presence of ASS conditions. The results of the screening tests indicate that four (4) samples returned positive indicators for potential acid sulfate soil (PASS) – refer bold results in Table 6.

Acid base accounting (ABA) via the chromium reducible sulfur (S_{Cr}) test, is a quantitative measurement and takes precedence over the screening test results when evaluating the presence or absence of ASS. The S_{Cr} results can also be used to correlate with the pH_F and pH_{Fox} screening test results.

Therefore, upon completion of the ASS screening tests one sample was selected for further detailed acid sulfate S_{cr} testing. The results of the ASS tests and ASS action criteria for greater than 1000 tonnes of soil disturbance are summarised in Table 6. The detailed ASS test results indicate the material tested is below the trigger level for the ASS action criteria for disturbance / excavation of soil at the site. Detailed laboratory test results are included in Appendix D.

Table 6: Summary of Acid Sulfate Laboratory Test Results

Sample information						Screening test results				Laboratory analysis results (acid base accounting)								
Assessment criteria (pH units)						**<4**	**<3**	-	**1.0**	Action criteria (%S)		Coarse texture: sands to loamy sands and peats						0.03
												Medium texture: clayey sand to light clays						0.06[a]/0.03[b]
												Fine texture: light medium to heavy clays						0.1[a]/0.03[b]
Location ID	Depth from (m)	Depth to (m)	Reduced level (AHD)	Sample Description	Adopted Texture	pH_F (pH units)	pH_{FOX} (pH units)	Reaction Strength	pH change (pH units)	pH_{KCl} (pH units)	S_{KCl} (%S)	S_{HCl} (%S)	Scr (%S)	TAA (%S)	S_{NAS} (%S)	ANC_{BT} (%S)	ANC corroborated (Y/N or NA)	Net Acidity (%S)
109	**2.50**	**2.70**	2.10 to 1.90	Clayey Silt	C	6.1	5.1	L	**1.0**	-	-	-	-	-	-	-	-	-
109	**3.50**	**3.70**	1.10 to 0.90	Clayey Silt	C	6.2	5.2	L	**1.0**	-	-	-	-	-	-	-	-	-
109	**4.50**	**4.70**	0.10 to -0.10	Clay	C	6.7	5.1	L	**1.6**	6.1	NT	NT	0.008	<0.01	NT	NT	N	0.014
109	**5.50**	**5.70**	-0.90 to -1.10	Clay	C	5.9	5.1	L	0.8	-	-	-	-	-	-	-	-	-
109	**6.50**	**6.70**	-1.90 to -2.10	Clay	C	6.3	5.2	L	**1.1**	-	-	-	-	-	-	-	-	-
109	**7.50**	**7.70**	-2.90 to -3.10	Clay	C	6.0	5.1	L	0.9	-	-	-	-	-	-	-	-	-

Notes:
Adopted texture - C = coarse, M = medium, F = fine
pH_F - Soil pH in water
pH_{FOX} - Soil pH in peroxide

Reaction strength: L - Low , M - Medium, H - High, X - Extreme, V - Volcanic, F - Frothing (indicative of organic material)

pH change = pH_F - pH_{FOX}

pH_{KCL} - KCl extractable pH

S_{KCl} - KCl extractable sulfur

S_{HCl} - HCl extractable sulfur

S_{cr} - potential sulfidic acidity
TAA - titratable actual acidity (reported if pH_{KCL}<6.5)
S_{NAS} – retained acidity (reported if pHkCl < 4.5)
ANC_{BT} – acid neutralising capacity (reported if pH_{KCl} ≥ 6.5)
NT - Not tested

Blue depths indicate where samples have been collected at or below the groundwater table
Bold results are indicators of ASS conditions, noting:
- Assessment criteria are considered a reasonable initial screening for AASS or PASS
- pH_F<4 is indicative of the presence of actual ASS (AASS), although it is not conclusive of ASS on its own as naturally occurring non ASS soils can have pH_F<5
- pH_{FOX}<3 or pH Change ≥1 may indicate potential ASS (PASS), although exceptions apply. Laboratory testing required to confirm presence of Reduced Inorganic Sulfur (RIS)
- Refer to Table 5.1, A2, A3 of Sullivan,L. et al (2018) for further details

Shaded results trigger action (i.e. equal to or exceed the action criteria). Criteria is specific for soil texture and anticipated tonnage of soil disturbed.

Net Acidity can only include the measured ANC where the ANC has been corroborated by other data (for example slab incubation data) that demonstrates the soil material does not experience acidification

a - Action criterion for disturbance of 1-1000 tonnes of material
b - Action criterion for disturbance of more than 1000 tonnes of material
The action criteria apply only to ASS materials and not to other acidic soils such as acidic peatlands and coastal heaths.

6. Proposed development

The proposed development comprises the construction of a new residential building to accommodate 60 apartments to be used for affordable housing, a communal room, basement car parking including excavation, tree removal and associated servicing, landscaping and public domain works.

Based on the information provided, it is understood that excavation will be required for:

- one partial basement level ("Lower Ground" level) under part of the building footprint, emerging near ground level on the lower part of the site, with a finished floor level (FFL) or RL 4.6; and locally deeper excavation for an OSD towards the south, with a floor level of RL 4.0; and,
- locally in the east, where higher ground levels are present, for the Ground Floor level (FFL at RL 7.9), for construction and stepped landscaping.

The footprints for the lower ground and ground floor works are shown superimposed on the site plan in Drawing 1.

Assuming excavation to at least 0.5 m below FFL during construction, this corresponds to excavation depths of 0.5 m below ground level in the western corner of the basement, increasing to 4 m in the eastern corner of the basement, and local excavation to depths up to approximately 2.5 m for ground floor levels at the eastern corner of the building, beyond the basement footprint.

Stepped retaining walls are proposed as part of the landscaping works around the excavated, eastern corner of the building.

7. Comments

7.1 Geotechnical and hydrogeological model

Based on the results of the geotechnical investigation, and initial information on groundwater levels at the site, a geotechnical model has been developed for the site, summarised in Table 7.

Table 7: Summary of the Geotechnical Model

Unit	Summary	Typical Description
1	Fill / Topsoil	Typically comprising dark brown silty clay and/or silty sand fill to 0.2 m to 0.4 m depth with trace brick fragments, gravel, metal, asphalt and concrete at some locations, upper topsoil.
2	Alluvial	Typically orange brown and pale grey, stiff and very stiff silty clay and clayey silt, identified at BH109 only, to a depth of up to 4.0 m.
3	Residual	Generally stiff to hard silty clay and clay to depths of 8.5 m to 10.0 m, but with weaker consistency with depth, including firm layers in BH101 and BH109; and soft to firm layers from 8.2 m to 9.2 m at Bore 109.
4	Extremely weathered material	Generally consistently very stiff and hard gravelly silt and clayey gravel to 12.2 m to 18.2 m; includes an upper transitional layer, as residual soils grade from residual to extremely weathered material.
5	Metabasalt	Typically medium to high strength, fragmented to fractured metabasalt to bore termination at 15.0 m to 19.6 m depth.

Interpreted geotechnical sections indicating these layers, and the water level observations during and shortly after field work, are included in Drawings 2 and 3 in Appendix B.

It should be noted that substantial variation can occur in the subsurface profile between and away from the boreholes.

Shortly after development, the observed groundwater levels ranged from RL 4.6 m (Bore 109) to 7.4 m (Bore 108) in the monitoring wells at the site, ranging from ground surface, to 1.5 m below ground surface. It is possible that this is in response to prior rainfall. Longer term monitoring will be separately reported.

Ephemeral seepage or 'perched' groundwater may occur within the fill / topsoil that is underlain be less permeable clay material.

Where groundwater is encountered during construction the groundwater may potentially rise to the ground surface level. The flow rate of groundwater is difficult to estimate as the groundwater flow is a function of a number of factors including recent weather conditions, fissures within the clay soil, more permeable material (e.g. gravel / rocky bands) and groundwater recharge potential.

Groundwater seepage is likely to largely occur through the soil mass and along fractures within the underlying metabasalt.

While the hydraulic conductivity of the residual clay soils may be relatively low, higher permeability is anticipated in the event of encountering fissured clay or other more permeable soils during construction.

7.2 Geotechnical suitability

Noting the ground conditions outlined above, from a geotechnical perspective the site conditions are generally considered suitable for the proposed development outlined in Section 6.

Established methods of design and construction are likely to be appropriate to manage any potential geotechnical impacts within and beyond the site, as outlined within this report.

From a hydrogeological perspective, design and construction options around the basement geometry and temporary and long-term management of potential groundwater ingress into the basement may be important influences on design development and project costs. These items are discussed in Section 7.3.

Noting the previous residential usage of the site, developments around the site and shallow groundwater table, the proposed development is not expected to have a significant impact on soil resources.

7.3 Groundwater and dewatering

7.3.1 Preliminary assessment

The results of the investigation indicate that groundwater will be intercepted by the proposed basement excavation, and therefore that groundwater must be managed during the proposed works.

Clay material is anticipated at basement excavation level. Typical hydraulic conductivity estimates for clay range from about 10^{-7}m/s to 10^{-9}m/s, but may be higher in fissured clays. It is noted that while basement excavations in the local area are infrequent, Douglas is familiar with a site in the local area (within approximately 500 m) where shallow excavation into clay for a basement, below groundwater, was associated with only minor inflows.

Estimates of potential groundwater inflows to a basement, and associated impacts, are strongly influenced by hydraulic conductivity, the proposed depth and geometry of proposed excavation at the site, and any management measures integrated into the proposed basement construction. These are further discussed in Section 7.3.2. Groundwater conditions may also fluctuate over time in response to human influences, weather and climate.

Given the proximity of the proposed basement to Class 4 acid sulfate soil mapping, and the presence of high priority groundwater dependent ecosystems (GDE) 130 m to the north-west of the site (off Carralls Gully), assessment of dewatering impacts is warranted, though impacts may be limited by the relatively shallow excavations at the site, and by fluctuations in groundwater levels over time.

Further groundwater monitoring, testing and assessment will be separately reported in the Groundwater Impact Assessment, which will also reflect key design decisions in relation to groundwater management..

7.3.2 Groundwater management

Key design and construction decisions for groundwater management will include the selection of a tanked or drained basement, noting the following:

- The use of a **tanked basement** would limit groundwater management requirements to the construction stage – but would require design of the basement for significant uplift and hydrostatic forces, generally adding significant costs at construction stage. A fully tanked basement would generally require tanking to ground surface, and to design flood levels where relevant.
- A **drained basement**, by contrast, would require ongoing management of any groundwater ingress in the vicinity of and above basement floor level for the life of the building (including potential changes in conditions for the life of the structure, such as may arise from offsite contamination or climate change).
- A **partially-tanked** basement, may allow for the basement to be designed for lower uplift and hydrostatic pressures than a fully-tanked basement. The design should include drainage to prevent uplift pressures exceeding the design levels. Accordingly, some long-term or periodic groundwater ingress may still occur to the basement - depending on the adopted design tanking level and variability in groundwater level. Long-term groundwater management measures, including reporting of inflow events, would still need to be implemented to manage these potential inflows.

Cut off walls may also be used to reduce short and/or long-term inflows to excavations or basements; and to manage groundwater impacts.

Given the existing ground conditions, and presumptive hydraulic conductivities, it is likely that groundwater inflows can be readily managed during construction by sump-and-pump management methods, possibly in conjunction with cut-off walls.

A drained basement may be feasible in the long-term, subject to impact assessment, the relevant approvals and acceptance of the long-term responsibilities associated with drained basement management. Regulatory responsibilities are outlined in Section 7.3.3. The client may prefer to adopt a tanked or partially tanked basement, to reduce the risks and ongoing costs associated with a drained basement. The Client's decision will be reflected in the Groundwater Impact Assessment.

Due to differing treatment, management and (regulatory) reporting requirements, the development should allow for any groundwater inflows to be stored and managed separately from stormwater, once the construction of the superstructure allows.

It is preferable to use contractors who are familiar with the impacts of groundwater on construction, including on stability, inflows and management of regulatory (monitoring and reporting) requirements.

The disposal of groundwater inflows / ingress / seepage to the proposed basement may require groundwater treatment, to ensure that the quality of groundwater being disposed is consistent with the requirements of the relevant disposal authority (e.g. Council). Where ongoing groundwater treatment costs or requirements are considered prohibitive, then a tanked basement may be the preferred approach for long-term management.

Both during construction, and in the long-term use post construction, appropriate groundwater management is generally required to ensure that groundwater inflow volumes ("take") and impacts remain consistent with the expected impacts and approval conditions, and for groundwater treatment to a quality consistent with disposal requirements.

7.3.3 Regulatory context

For SSDA projects, most regulation of groundwater impacts, inflow and disposal is generally managed through the SSDA process, including the SSDA conditions. A preliminary Dewatering Management Plan (DMP), including a Groundwater Impact Assessment (GIA) specific to the development, including the proposed design and construction approaches and groundwater management measures, is appropriate for submission for SSDA. After approval, further development of the DMP and/or associated monitoring plans is generally required to incorporate the conditions arising from SSDA, and to allow ready implementation during construction.

Separate approvals (e.g. for Water Supply Works or Water Use) are not generally required for works under SSDA, provided that inflow volumes remain within, and the impacts and disposal of groundwater is consistent with the SEARs submissions and SSD approval conditions.

Subject to inflows remaining within those estimated in the Groundwater Impact Assessment, and approved by SSDA, Water Access Licence requirements are summarised as follows:

- For temporary dewatering – a WAL exemption applies for coastal construction of buildings and infrastructure for the subject water sharing plans.
- For long-term dewatering after construction – a Water Access Licence (WAL) and appropriate entitlements will be required for the works only if long-term groundwater inflows - following construction - may exceed 3ML/year, for a water year from July to June. A WAL exemption applies for ongoing take of 3ML or less of incidental groundwater take for drained basements.

In all cases, monitoring and reporting of groundwater inflows, will be required in accordance with reporting conditions for exemptions and/or meet licence conditions whilst dewatering, including in the long-term - unless the basement is fully tanked.

Written authorisation for (temporary, or long-term) disposal of groundwater to stormwater or sewer would be required from the relevant authority, with appropriate treatment and testing to ensure that water quality requirements are being met, both during construction and for any long-term dewatering. Allowance should be made in design for the spatial requirements of any long-term groundwater inflow storage and/or treatment equipment.

A completion report, including the results of ongoing inflow volumes, monitoring, treatment and quality testing would generally need to be provided to the regulator at the completion of construction to support an occupancy certificate.

An operational dewatering management plan would then be implemented to manage ongoing dewatering, unless a tanked basement has been constructed. For a tanked basement, dewatering may only be of concern if temporary penetrations of the tanking are required for maintenance and upgrades.

7.4 Excavation stability and shoring

7.4.1 General

Based on a proposed bulk excavation level of approximately RL 4.0, bulk excavation depths of approximately 0.5 m (in the vicinity of Bore 109) to 4.0 m (in the vicinity of Bore 108) are anticipated. The bores typically encountered topsoil / fill to about 0.3 m depth underlain by alluvial and residual soil for the depth of proposed basement excavation.

The opportunity for use of batters at this site is very limited due to potential instability arising from shallow groundwater, the proximity of property boundaries on the eastern, southern and western parts of the basement, and the existing sewer adjacent to the north-eastern part of the basement. The potential use of batters as part of the development and/or as part of temporary excavation works would need to be reviewed in light of the specific proposed works. Shoring / excavation support will generally be required to facilitate the basement excavation.

Decisions around groundwater management may influence the preferred approach to shoring at the site, potentially influencing construction and design.

7.4.2 Shoring

Shoring will generally be required around the proposed basement excavation.

If the shoring walls will also need to serve as cut-off walls, then secant pile walls may be required where cut-off is desired to extend below the bulk excavation level or, where the cut-off is not required to extend below bulk excavation, by contiguous piles with infill panels designed for that purpose. Where short-term inflows are not critical, cut-off could otherwise be achieved by an appropriately designed permanent structure, constructed within a drained basement excavation. Hydrostatic loading would need to be considered for such structures.

Where drained shoring is appropriate, then soldier piles socketed below the bulk and local excavation level could be suitable at this site, with infill shotcrete panels constructed between the piles as excavation proceeds.

For a drained wall, typical soldier pile spacings of 1.5 m to 2 m are likely to be suitable for the support of stiff clay material. Tighter spacings may be required if movement sensitive structures are to be retained, or to manage soil loss between piles. Relatively rapid construction of the infill panels may be required, especially given the presence of clayey silt soils. Test pits could be used to assess the stability of soils and allow revision of pile spacings to suit conditions, in advance of detailed design.

For drained basement walls, appropriate drainage (e.g. strip drains against the excavation face) should be incorporated into the design and construction of the infill panels.

During excavation, if the adopted pile spacing is found to be unsuitable to ensure soil stability between piles, then it may be necessary to backfill and add additional piles and/or use jet grouting methods to stabilise the soil overburden for the installation of infill panels. Bored or continuous flight auger (CFA) concrete piles may be suitable for the construction of soldier piles and secant piles at this site. It is likely that temporary casing may be required for construction of bored piles to prevent side wall material falling into the (open) pile excavation, and tremie

methods may be required for the placement of concrete below the groundwater table. The use of CFA piles would eliminate the need for casing while also being able to effectively manage concreting in the presence of groundwater.

Working platforms may be required to support piling works at the site, depending on applied ground pressures from the construction equipment. The existing clay soils may soften relatively rapidly in wet conditions and placement of an all-weather access (e.g. rock fill material) will likely be required. Boggy conditions were noted at existing ground surface, at the time of geotechnical investigation.

Geotechnical inspections are recommended during bored pile excavation to allow for geotechnical assessment of the foundation material, deepening of the piles where necessary, and advance notice of areas where poorer ground conditions may be present. Construction of CFA piles generate only limited auger cuttings of the soil / rock material penetrated and therefore geotechnical assessment of auger cuttings are somewhat limited, however some geotechnical oversight is considered beneficial. The foundation condition of CFA piles should be confirmed by the piling contractor. Modern CFA rigs have substantial instrumentation which may allow the piling contractor to provide some comment on whether the piles need to be deepened, or if conditions appear to change along the length or depth of the pile hole excavation, but this may be ineffective, depending on the precise ground conditions and capability / specifications of the CFA piling rig. CPT testing can assist with further characterisation of the soil profile if required.

Inspections of the material exposed in the excavated face between soldier piles during excavation is also recommended at 1.5 m drops (depth intervals), prior to placement of mesh and shotcrete, to allow assessment of adverse material which might require additional support.

Cantilevered piles may be suitable for most areas of shoring. In areas of deeper excavation, or where shoring movements need to be better controlled, 'tie-back' ground anchors (or possibly temporary propping of the wall from within the basement excavation) may be required around part of the basement to provide temporary lateral support to the shoring wall, with final support provided by the basement structure.

All shoring piles should be taken down to bear at appropriate depth below the bulk excavation, and below local and potential accidental over-excavation depths, due to the potential presence of adverse material – noting that the loads on the anchors and shoring would be influenced by settlements or unstable bearing of the piles. This may also be influenced by the cleanliness of the pile excavation and the approach to concrete placement, which should be carefully managed by the contractor.

For a shoring wall supported by a single row of anchors or props, preliminary design may be based on a triangular pressure distribution, based on the lateral earth pressure coefficients given in Table 8.

Table 8: Preliminary Lateral Earth Coefficients and Pressures

Material	Active lateral earth pressure coefficient (K_a)[2]	Passive lateral earth pressure coefficient (K_p)[1]
Stiff / very stiff clay	0.35	2
Hard clay	0.25	2.5

Notes to Table 8
1. Ultimate passive pressures may only develop at large displacements, which should be considered in the context of the 'ultimate' performance permitted for the structure. A factor of safety of 3 is often applied to these values, which are provided for preliminary purposes only and also may be influenced by jointing, particularly where sockets are shallow.
2. For preliminary design purposes a Ko value at least 50% higher than the Ka values could be considered. These coefficients assume that the ground surface is level behind the wall. Batters will result in increased Ka values.

Hydrostatic loading would be additional to the preliminary design inputs given above.

Allowance should be made for the provision of drainage behind retaining structures, or alternatively the walls should be designed for full hydrostatic pressures. Appropriate drainage (e.g. strip or core drains) should be included to prevent hydrostatic water levels rising above the design hydrostatic level of the shoring / retaining wall / cut-off wall design.

7.4.3 Movements associated with excavation

Typical horizontal movements in the order of 0.15% of the wall height would be expected for a well-constructed and designed, high stiffness shoring wall (i.e. with at least one row of anchors) but depending on the excavation and support sequence and support provided. For a 4 m high shoring wall, this corresponds with movement of up to about 6 mm.

The sensitivity of adjacent structures and services should be considered in the shoring wall design.

Survey monitoring of the excavation and retaining walls would generally be appropriate to assess movement of any shoring walls during excavation, particularly where any deflection-sensitive structures or services are present behind the walls.

7.4.4 Design regulation

The advice included within this report should be considered specialist advice and does not comprise design.

Noting the residential use of the proposed building, the detailed design of the shoring walls and anchors for the basement will need to be prepared in accordance with the Design and Building Practitioners Act, including meeting the regulated design requirements for shoring and ground anchors given in the Ministerial Order (Government Gazette 78, 2022). This includes the need for 'reasonable steps' to be taken to assess the footings of structures within the zone of influence of the designed excavation, which may include investigation.

Broadly speaking, a preliminary 'zone of influence' for basement shoring wall design could be taken as the zone of soil above a line drawn from the base of excavation depth, at 1(Horizontal):1(Vertical) above the horizontal to the top of rock, then at 2(H):1(V) in soils to the ground surface. This 'zone' should be evaluated by the designers once the shoring and excavation geometry is known.

The detailed design of shoring / retaining walls is normally undertaken using software that can account for the soil-structure interaction during the progressive excavation and support installation sequence, as well as the loads acting behind the wall, and provide estimates of wall movements (e.g. Wallap, FLAC, Plaxis).

Appropriate permissions from adjacent landowners will be required where support measures (e.g. anchors) are proposed across site boundaries. Anchors should also be de-stressed following the provision of permanent lateral support, usually by the basement structure.

Maximum allowable wall movements and/or movements beyond the wall, arising from structural requirements of neighbouring buildings and services, may be a key performance requirement influencing the design of shoring walls and anchors at this site.

7.5 Excavation conditions

7.5.1 Excavatability

Based on a proposed bulk excavation level of approximately RL 4.0, excavation is anticipated to generally encounter fill / topsoil to about 0.3 m depth underlain by stiff to hard (alluvial and residual) silty clay for the remaining depth of basement excavation. Interpreted geotechnical sections at the proposed basement site are shown in Drawing 2 and Drawing 3 in Appendix B.

The stiff to hard clay should be readily excavated using conventional earthmoving equipment.

The existing clay soils are likely to soften readily upon exposure, particularly when exposed to water (e.g. near onsite perimeter drainage, sumps, or generally following wet weather). The potential for poor trafficability within the site should be considered in design and construction.

It is recommended that tenderers review the detailed logs and photographs to assess conditions based on their plant and experience.

7.5.2 Vibrations

Ground vibration can be strongly perceptible to humans at levels above 2.5 mm/s vector sum peak particle velocity (VSPPV). This is generally much lower than the vibration levels required to cause structural damage to buildings. The Australian Standard AS2631.2-2014 “Evaluation of human exposure to whole-body vibrations – continuous and shock induced vibrations in buildings (1-80 Hz)” indicates an acceptable day time limit of 8 mm/s VSPPV for human comfort.

Based on the experience of Douglas and with reference to AS2631.2, it is suggested that an initial VSPPV limit of 8 mm/s applicable at the foundation level of existing adjacent buildings be provisionally adopted for this site for both architectural and human comfort considerations. Appropriate enquiries should be made to neighbouring property (and utility) owners to check if the presence of sensitive equipment or structures may require a lower vibration limit.

No significant ground vibration issues are anticipated during ground works, given the likely construction methods outlined in this report and ground conditions at this site.

7.5.3 Waste classification

All excavated materials will need to be disposed of in accordance with the provisions of the current legislation and guidelines including the Waste Classification Guidelines (EPA, 2014). This includes fill and natural materials that may be removed from the site.

Where material is classed as VENM, the material can be re-used in accordance with EPA guidelines.

Reference should be made to the separate contamination reports prepared for this site for detailed information regarding soil waste classification at the site.

7.6 Footings

7.6.1 Piles

Given the relatively high loads anticipated from the multi-storey structure, and presence of soft to firm layers within the soils (see BH109), it is generally recommended that footings for the proposed structure be taken down to bear on bedrock. Deep footings (e.g. bored or CFA piles) would generally be required.

Noting the presence of soft to firm soils above bedrock, piles founded within the soils would generally require further evaluation (refer Section 7.6.2). Such piles may be suitable if only lightly vertically loaded and/or where piles are relatively insensitive to settlements (e.g. shoring).

Table 9 below provides suggested design parameters for piles founded at a depth of at least 4 pile diameters below the finished surface.

Table 9: Preliminary Pile Design Parameters

Material	Allowable End Bearing Pressure (kPa)[1]	Allowable Shaft Adhesion (kPa)[2]
Very stiff or hard clay	400	15
Medium strength or stronger metabasalt	3500	350

Notes: 1. For pile depths greater than 4 x pile diameters below finished ground level
2. Shaft adhesion should only be calculated for the section of shaft greater than 1.5 x pile diameters below finished ground level.

Bored pile excavations should be cleaned of all loose material and if water is present in the pile hole the water should be removed or tremie mix concrete should be added to the base of the pile hole using a tremie pipe to displace water above the concrete. Accordingly, it is recommended that Douglas be engaged during excavation of the pile holes to undertake pile hole inspections and assess whether ground conditions are consistent with design prior to the placement of reinforcement and concrete.

Piling contractors should consider the risk of groundwater inflows into pile footings (creating unfavourable conditions for concreting) and potential need for penetration of medium and higher strength metabasalt with an irregular bedrock / soil interface. The use of reputable contractors and of piling rigs with high torque capacity is recommended.

7.6.2 Shallow footings

Given the apparent soft to firm consistency of some soils above the bedrock, further assessment would generally be required to evaluate footing options within the soil (e.g. possible raft, pad or shallower pile footings). The assessment would require information on the proposed loads, depth of loading and variability of subsurface conditions. Additional testing of the soil strength across the site (e.g. by cone penetration testing) would generally be required, but may indicate that conditions are unsuitable for the proposed loads.

7.7 Acid sulfate soil assessment

Acid sulfate soils are soils and sediments that contain iron sulfides, which, when oxidised by draining or exposure to air, form sulfuric acid. The main form of iron sulfide present is pyrite or iron disulfide. Acid sulfate soils are typically located in low-lying coastal areas such as estuaries, floodplains, tidal flats, mangrove swamps, lakes and wetlands. Coastal ASS generally occurs below 5 m AHD. ASS can form in an anoxic, aqueous environment where sulfate reducing bacteria are provided with organic matter and available sulfate ions.

Acid sulfate soil laboratory test results are presented in Section 5.

The action criteria which define the requirement for management of acid sulfate soils vary depending on the amount of soil disturbed and the textural classification of the soil.

The adopted textural classification for the soil was fine and for greater than 1,000 tonnes of soil and reference to Sullivan, et al (2018), the action criteria to determine whether the acidity levels are above which would be require management (i.e. trigger levels) are as follows:

- Fine textured soils (light, medium to heavy clays) 0.03% S

A review of the detailed ASS laboratory test results indicated that the materials tested are below the trigger levels for greater than 1,000 tonnes of soil disturbance. Therefore, on this basis, management of ASS for soil disturbance and an acid sulfate soil management plan (ASSMP) is not required.

7.8 Further assessment

There is an existing sewer line at the northern part of the site. Confirmation should be obtained with the asset owner regarding design and construction requirements regarding the existing sewer.

Geotechnical design work for the proposed building would need to be undertaken in accordance with the Design and Building Practitioners Act.

Groundwater impact assessment, including the results of supplementary groundwater monitoring, testing and analysis, will be separately reported.

Given the presence of soft to firm and firm layers, additional investigation of the site to characterise the soils, by CPTs or similar, would be warranted if high level footings are proposed.

8. References

AS 2159. (2009). *Piling - Design and Installation*. Standards Australia.

Douglas. (2018). *Report on Preliminary Geotechnical Investigation and Contamination Assessment (Waste Classification), Proposed New Housing Development, 211A - 215 Harbour Drive, Coffs Harbour*. Douglas Partners Pty Ltd, Reference 89890.00.R.001.Rev0, dated 8 August 2018.

State Government of NSW and NSW Department of Climate Change, Energy, the Environment and Water (2025), *Spatial Layer of HEVAE Vegetation Groundwater Dependent Ecosystems Value in NSW*, accessed from The Sharing and Enabling Environmental Data Portal [https://datasets.seed.nsw.gov.au/dataset/c2aa2b9e-3f9a-40ab-a21f-ed4eb14d99ee], date accessed 2025-06-18.

9. Limitations

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project at 211A-215 Harbour Drive, Coffs Harbour NSW in line with Douglas' proposal dated 21 March 2025 based on the award of Contract No. LAHC 2024/622 Geotechnical Services Due Diligence – HAFF by Homes NSW; and including the approved variation letter dated 3 April 2025. This report is provided for the exclusive use of Homes NSW for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and/or their agents.

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

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

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical and 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.

This report provides specialist advice only and no part of it is considered a Regulated Design under the Design and Building Practitioner Act 2020 (NSW).

Appendix A

About this Report

About this Report

October 2024

Introduction

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

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

Copyright

Borehole and Test Pit Logs

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

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

Groundwater

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

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

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

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, Douglas 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, Douglas 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, Douglas will be pleased to assist with investigations or advice to resolve the matter.

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, Douglas 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. Douglas would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

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

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Appendix B

Drawings

LEGEND

- Approximate Borehole Location (Previous Investigation)
- Environmental Borehole and Groundwater Well Location
- Environmental Borehole Location
- Geotechnical Borehole and Groundwater Well Location
- Geotechnical Borehole Location
- Approximate Site Boundary
- Approximate Outline Of Ground Floor
- Approximate Outline Of Lower Ground Floor
- Interpreted Geotechnical Cross Section

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	Initial Issue	04.07.2025	EC
1	Building Outline Updated	07.08.2025	MN

SCALE: 0 4 8 12 16 20 m
1:400 @A3

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

CLIENT:
Homes NSW

NOTE:
1: Drawing projection GDA2020/MGA zone 56, adapted from aerial imagery from Metromap.com (Dated 10.06.2024)
2: Boundaries shown are approximate only
3: Test locations are approximate only and were located using a differential GPS typically accurate to +/- 0.1m depending on satellite coverage
4. Outlines from Studio Johnston, Project No 2507, Drawing No. SK-110-L01, Revision 03 (Dated 01.08.2025)

COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 56

PROJECT NAME:
Affordable housing

PROJECT ADRESS:
211A - 215 Harbour Drive, Coffs Harbour

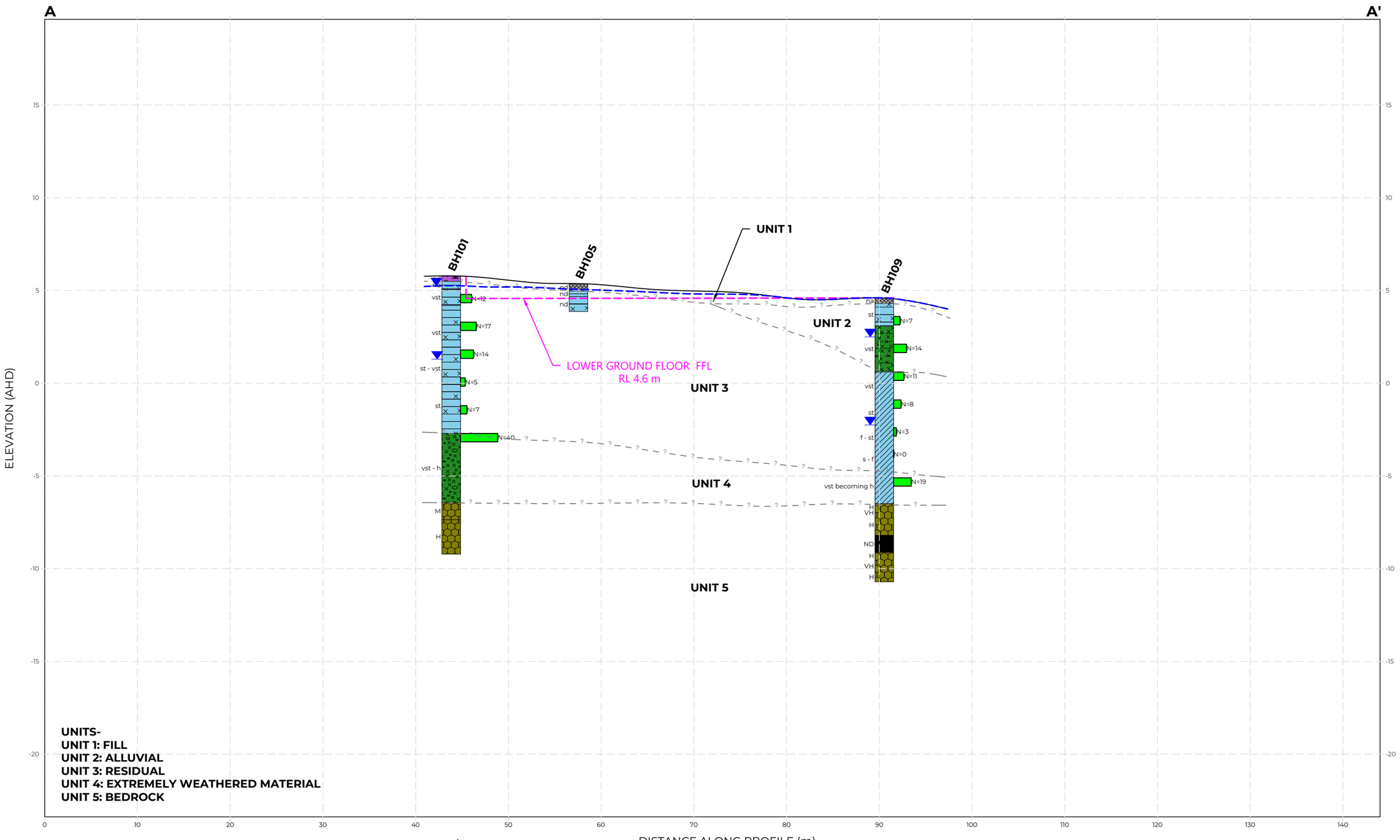
DRAWING TITLE:
Test Location Plan

PROJECT NO: **89890.01**
DRAWING NO: **1**
REVISION: **1**

\\DPCFHNAS01\Projects\89890.01 - COFFS HARBOUR, Harbour Drive Development\7.0 Drawings\7.3 QGIS\89890.01 (Updated by 31.07.2025).Qgz

A

A'



UNITS-
UNIT 1: FILL
UNIT 2: ALLUVIAL
UNIT 3: RESIDUAL
UNIT 4: EXTREMELY WEATHERED MATERIAL
UNIT 5: BEDROCK

LEGEND

BASALT | NO CORE | TOPSOIL | Water Level
CLAY | FILL | Clayey SILT
Silty CLAY | GC - Clayey GRAVEL | SPT

TESTS / OTHER
N - Standard penetration test value
— ? — - Interpreted geotechnical boundary
– – – – - Estimated Ground Water Level

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

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

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	18.06.2025	EC
1	Building levels updated	31.07.2025	MN

SCALE: 0 2 4 6 8 10 15 20
1:400 @ A3
Vertical Exaggeration = 2.0

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

CLIENT:
Homes NSW

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

PROJECT NAME:
Affordable housing

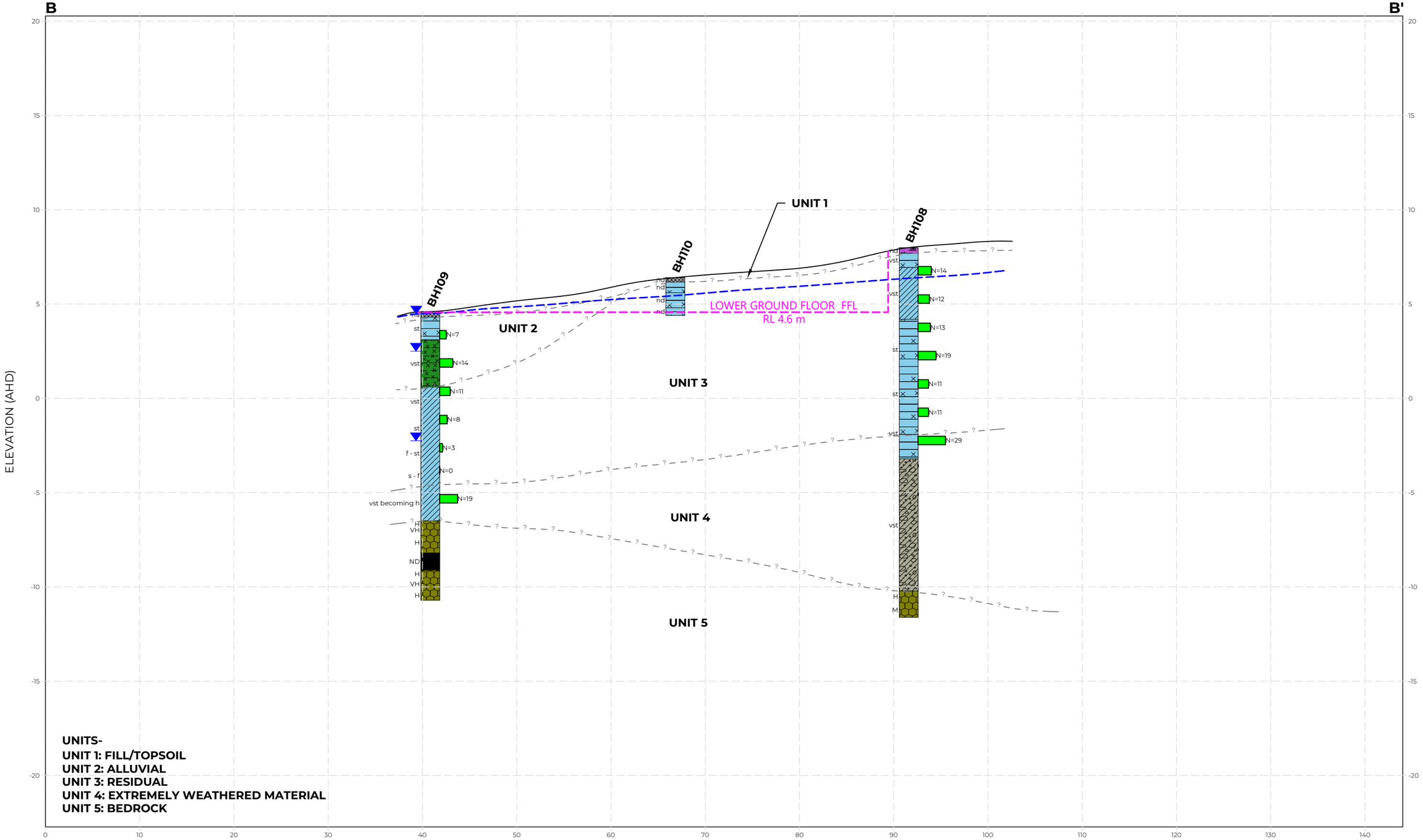
PROJECT ADDRESS:
211A - 215 Harbour Drive, Coffs Harbour

DRAWING TITLE:
INTERPRETED GEOTECHNICAL CROSS SECTION A-A'

PROJECT No: **89890.01**
DRAWING No: **2**
REVISION: **1**

B

B'



LEGEND

BASALT | NO CORE | TOPSOIL | Water Level

CLAY | FILL | Clayey SILT

Silty CLAY | GC - Clayey GRAVEL | SPT

TESTS / OTHER

N - Standard penetration test value

— ? — — - Interpreted geotechnical boundary

– – – – - Estimated Ground Water Level

ROCK STRENGTH

VL- Very Low

L - Low

M - Medium

H - High

SOIL CONSISTENCY

vs - Very Soft

s - Soft

f - Firm

st - Stiff

vst - Very Stiff

h - Hard

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	18.06.2025	EC
1	Building levels updated	31.07.2025	MN

SCALE: 0 2 4 6 8 10 15 20

1:400 @ A3

Vertical Exaggeration = 2.0

Douglas PARTNERS

OFFICE: SYDNEY

96-98 Hermitage Rd, West Ryde NSW 2114

(02) 9809 0666

CLIENT:

Homes NSW

NOTES

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

PROJECT NAME:

Affordable housing

PROJECT ADDRESS:

211A - 215 Harbour Drive, Coffs Harbour

DRAWING TITLE:

INTERPRETED GEOTECHNICAL CROSS SECTION B-B'

PROJECT No: **89890.01**

DRAWING No: **3**

REVISION: **1**

Appendix C

Terminology, Symbols and Abbreviations

Soil and Rock Descriptions

Borehole Logs

Photoplates

Terminology, Symbols and Abbreviations

November 2023

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.

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Soil Descriptions

Terminology
Symbols
Abbreviations

March 2024

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".

Soil Descriptions

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	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.

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
Fluvial	Deposited by channel fill and overbank (natural levee, crevasse splay or flood basin)	FLV
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".

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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:

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

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

Stratification Spacing

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

Defect Descriptions

Defect Type

Term	Abbreviation Code
Bedding plane	B
Cleavage	CL
Crushed seam	CS
Crushed zone	CZ
Drilling break	DB
Decomposed seam	DS
Drill lift	DL
Extremely Weathered seam	EW
Fault	F
Fracture	FC
Fragmented	FG
Handling break	HB
Infilled seam	IS
Joint	JT
Lamination	LAM
Shear seam	SS
Shear zone	SZ
Vein	VN
Mechanical break	MB
Parting	P
Sheared Surface	S

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
Pyrite	Py
Secondary material	MS
Silt	M
Quartz	Qz
Unidentified material	MU

Rock Defect Shape/Planarity

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

Rock Defect Roughness

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

Defect Orientation

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

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BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 5.8 AHD
COORDINATE: E:511623.7, N:6647936.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 101
PROJECT No: 89890.01
DATE: 08/05/25
SHEET: 1 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK STRENGTH	ROCK RECOVERY (%)	ROCK RQD	ROCK FRACTURE SPACING (m)	ROCK DEFECTS & REMARKS	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TESTING TEST TYPE	TESTING RESULTS AND REMARKS	BACKFILL	WELL PIPE
inferred 08/05/25	5	0.30	TOPSOIL / Silty CLAY (CI) trace rootlets: dark brown; medium plasticity.	TS TS	TOP or possibly FILL	ND	w=PL									A		0.10			Concrete	
			Silty CLAY (CI-CH) trace gravel: orange brown; medium to high plasticity; sub-rounded (up to 6mm), volcanoclastic gravel.		RS	ND	w=PL									A		0.50				
		0.70	Silty CLAY (CI-CH) trace gravel: pale grey to orange brown mottled red brown; medium to high plasticity; (up to 7mm), ironstone gravel.		RS	VSt	w=PL									A		1.00	PP	320kPa		
	1															SPT			SPT	4,5,7 N=12		
																			PP	410kPa		
																		1.45	PP	520kPa		
		1.60	Silty CLAY (CI): pale grey to orange brown mottled red brown; medium plasticity.		RS	VSt	w=PL									SPT		2.50	PP	280kPa	Bentonite	
	4																		SPT	3,7,10 N=17		
	2																		PP	360kPa		
			2.90m: gravel seam, ironstone up to 10mm																PP	380kPa		
																		2.95				
	3																					
	2																					
																		4.00				
	4															SPT			PP	210kPa		
																			SPT	5,7,7 N=14		
																			PP	180kPa		
																			PP	150kPa		
			4.40m: with gravel in parts, ironstone, red brown oxidization, up to 2mm			St - VSt	w>PL											4.45	PP	300kPa	Gravel	50mm
	1																					

NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 305
OPERATOR: Ground Test (Simon)
LOGGED: KO
METHOD: SFA TC bit to 2.5m, rotary water to 12.23 m, NMLC to 15 m
CASING: HWT to 2.5m
REMARKS: GPS coordinates approximate

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 5.8 AHD
COORDINATE: E:511623.7, N:6647936.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 101
PROJECT No: 89890.01
DATE: 08/05/25
SHEET: 2 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK STRENGTH	ROCK RECOVERY (%)	ROCK RQD	ROCK FRACTURE SPACING (m)	ROCK DEFECTS & REMARKS	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TESTING TEST TYPE	TESTING RESULTS AND REMARKS	BACKFILL	WELL PIPE
	0	6	[CONT] Silty CLAY (CI): pale grey to orange brown mottled red brown; medium plasticity.		RS	St - VSt	w>PL									SPT	5.50–5.95	5.50	SPT PP PP	2,2,3 N=5 130kPa 135kPa		
	-1	7				St												7.00	PP	80-150kPa	Gravel	
	-2	8														SPT	7.00–7.45		SPT	1,3,4 N=7		
	-3	8.50	Gravelly SILT: orange brown to pale grey; (up to 10mm) gravel; with fabric of extremely weathered material in parts.		RS	VSt - H	w<PL									SPT	8.50–8.95	8.50	PP SPT	350kPa 11,17,23 N=40		50mm
	-4	9																8.95				

NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 305
OPERATOR: Ground Test (Simon)
LOGGED: KO
METHOD: SFA TC bit to 2.5m, rotary water to 12.23 m, NMLC to 15 m
CASING: HWT to 2.5m
REMARKS: GPS coordinates approximate

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Combined Log

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 5.8 AHD
COORDINATE: E:511623.7, N:6647936.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 101
PROJECT No: 89890.01
DATE: 08/05/25
SHEET: 3 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK STRENGTH	ROCK RECOVERY (%)	ROCK RQD	ROCK FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TESTING TEST TYPE	TESTING RESULTS AND REMARKS	BACKFILL	WELL PIPE
		0.00	[CONT] Gravelly SILT: orange brown to pale grey; (up to 10mm) gravel; with fabric of extremely weathered material in parts.		RS	VSt - H	w<PL							10.26m - 12.23m: 0% recovery		SPT		10.00	SPT	23,30/105		
		10.26																10.26				
	-5	11																11				
	-6	12																12				
		12.23	METABASALT: grey to brown; highly fractured, fragmented in parts.					MW - HW	12.23	M	100	0		12.23m: , Unless otherwise stated, all discontinuities typically JT, SH-H, PL, R, ST, FE 12.31-12.46m , CZ, ST, FE 12.70m: , DS 12.95-13.15m: , CZ, ST, FE		C		12.23	PLT PLT	PL(D)=0.26MPa PL(A)=0.41MPa		
	-7	13																12.46	PLT PLT PLT	PL(D)=0.27MPa PL(D)=0.62MPa PL(D)=0.63MPa		
		13.15	METABASALT: dark grey; slightly fractured, fragmented in parts.						13.15		100	38		13.78-14.00m: , CZ, ST, FE		C		13.15	PLT	PL(D)=2.3MPa		
	-8	14						SW		H								13.98	PLT PLT PLT PLT	PL(D)=0.97MPa PL(D)=1.1MPa PL(D)=1.6MPa PL(D)=1.7MPa		
											100	55				C			PLT PLT PLT PLT	PL(D)=1.1MPa PL(D)=2.1MPa PL(D)=1.0MPa PL(D)=0.95MPa		
	-9		Borehole discontinued at 15.00m depth. Target depth reached.																			

NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 305
OPERATOR: Ground Test (Simon)
LOGGED: KO
METHOD: SFA TC bit to 2.5m, rotary water to 12.23 m, NMLC to 15 m
CASING: HWT to 2.5m
REMARKS: GPS coordinates approximate

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Combined Log

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 5.8 AHD
COORDINATE: E:511622.9, N:6647935.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 101A
PROJECT No: 89890.01
DATE: 17/04/25
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TESTING AND REMARKS: TEST TYPE	TESTING AND REMARKS: RESULTS AND REMARKS	BACKFILL	WELL PIPE
Standing groundwater level observed in open hole 08/05/25	5	0.00	FILL / Silty CLAY: dark brown; low to medium plasticity; trace brick and rootlets.		FILL	ND	w=PL		ES		0.20	PID	3ppm	Concrete	
		0.30	Silty CLAY (CI-CH) trace gravel: orange-brown; medium to high plasticity; igneous gravel.		RS	ND	w=PL		ES		0.40 0.60	PID	<1ppm		
		0.70	Silty CLAY (CI-CH) with gravel: orange-brown; medium to high plasticity; ironstone gravel.						ES		0.80 1.00	PID	4ppm	Bentonite	50mm
	1		From 0.80m: pale grey and red-brwon		RS	ND	w=PL								
		1.60	Silty CLAY (CI): pale grey to orange brown, mottled red in parts; medium plasticity; with interbed of clayey silt in parts .						* ES		1.30 1.50	PID	<1ppm		
	4														
	2										2				
	3		2.90m: gravel seam, ironstone up to 10mm		RS	ND	w=PL				3			Gravel	50mm
	2														
	4										4				
			4.40m: with gravel in parts, ironstone, red brown oxidation, up to 2mm												
	1						w>PL								
			Borehole discontinued at 5.00m depth. Target depth reached.												

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 405
METHOD: SFA to 5m
REMARKS: *Replicate sample BD1/20250417 taken at 1.3-1.5m

OPERATOR: Ground Test (Kyle)

LOGGED: N.Woodward
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 7.1 AHD
COORDINATE: E:511635.0, N:6647927.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 102
PROJECT No: 89890.01
DATE: 16/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
16/04/25 NFGWO	7 / 0.00	FILL / Silty SAND: dark brown; fine to medium; low to medium plasticity silt; with rootlets, trace charcoal.		FILL	ND	w=PL		ES		0.20	PID	12ppm
	6 / 0.30	Silty CLAY (CI-CH) trace gravel: pale grey with orange-brown; medium to high plasticity; igneous gravel.		RS	ND	w=PL		ES		0.30	PID	8ppm
		From 0.50m: becoming orange-brown								0.50		
		0.70m-0.80m: tree root and faint organic odour						ES		0.60	PID	14ppm
	5 / 1.00	Silty CLAY (CI-CH) with gravel: red-brown, pale grey and orange-brown; medium to high plasticity; weathered ironstone gravel; silt content increasing with depth.		RS	ND	w<PL		ES		0.80		
		Borehole discontinued at 1.30m depth. Target depth reached.								1.10	PID	10ppm
	4 / 2.00									1.30		
	3 / 3.00											
	2 / 4.00											

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools
METHOD: HA to 1.3m
REMARKS: GPS coordinates approximate

OPERATOR: (N.Woodward)

LOGGED: N.Woodward
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 8.9 AHD
COORDINATE: E:511657.6, N:6647911.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 103
PROJECT No: 89890.01
DATE: 15/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
15/04/25 NFGWO	8.9 / 0.00	FILL / Silty CLAY with gravel: dark brown; low to medium plasticity; igneous gravel; trace rootlets. From 0.20m: trace pebble and asphalt		FILL	ND	w<PL		ES		0.10 0.30	PID	<1ppm
	8 / 0.30	Silty CLAY (CI-CH): orange-brown; medium to high plasticity; trace rootlets. From 0.80m: with ironstone gravel		RS	ND	w=PL		ES ES		0.40 0.60 0.80	PID PID	<1ppm <1ppm
	1	Borehole discontinued at 1.00m depth. Target depth reached.								1.00		
	7											
	2											
	6											
	3											
	5											
	4											
	4											

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools
METHOD: HA to 1.0m
REMARKS: GPS coordinates approximate

OPERATOR: (N.Woodward)

LOGGED: N.Woodward
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 10.1 AHD
COORDINATE: E:511674.4, N:6647897.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 104
PROJECT No: 89890.01
DATE: 15/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(^) / DENSITY.(^)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
15/04/25 NFGWO	10	0.30	FILL / Silty SAND: dark brown; fine to medium; low plasticity silt; trace rootlets. 0.20m-0.30m: trace metal and charcoal		FILL	ND	w=PL		ES		0.20	PID	3ppm
			Silty CLAY: red-brown; medium to high plasticity.		RS	ND	w<PL		ES		0.40	PID	2ppm
			From 0.80m: red-brown and pale red-brown						* ES		0.60 0.80	PID	3ppm
	9	1	Borehole discontinued at 1.00m depth. Target depth reached.								1.00		
	8	2											
	7	3											
	6	4											

NOTES: (#) Soil origin is "probable" unless otherwise stated. (^) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools
METHOD: HA to 1.0m
REMARKS: *Replicate sample BD1/20250415 taken at 0.8-1.0m

OPERATOR: (N.Woodward)

LOGGED: N.Woodward
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 5.4 AHD
COORDINATE: E:511613.4, N:6647926.6
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 105
PROJECT No: 89890.01
DATE: 16/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(^) / DENSITY.(^)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
16/04/25 NFGWO	5 / 0.00	FILL / Silty SAND: dark brown; fine to medium; low to medium plasticity silt; trace rootlets.		FILL	ND	M		ES		0.20	PID	<1ppm
	0.40	Silty CLAY (CL): pale grey with yellow-brown; low to medium plasticity.		RS	ND	w>PL		ES		0.40	PID	<1ppm
	0.70	Silty CLAY (CI-CH): orange-brown and pale grey; medium to high plasticity; with iron oxide staining.		RS	ND	w>PL		ES		0.60		
	1 / 1.00	From 1.10m: with ironstone gravel						ES		0.80	PID	<1ppm
	4	Borehole discontinued at 1.50m depth. Target depth reached.						* ES		1.00	PID	<1ppm
										1.30		
										1.50		

NOTES: (#) Soil origin is "probable" unless otherwise stated. (^) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools
METHOD: HA to 1.5m
REMARKS: *Replicate sample BD3/20250416 taken at 1.3-1.5m

OPERATOR: (N.Woodward)

LOGGED: N.Woodward
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 6.1 AHD
COORDINATE: E:511617.6, N:6647908.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 106
PROJECT No: 89890.01
DATE: 17/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
17/04/25 NFGWO	6	0.30	FILL / Silty SAND: dark brown; fine to medium; low to medium plasticity silt; trace rootlets, tile and brick.		FILL	ND	w=PL		ES		0.20	PID	6ppm
			Silty CLAY (CI-CH): pale grey with yellow-brown; medium to high plasticity; trace rootlets.		RS	ND	w>PL		ES		0.50 0.70	PID	4ppm
	5	0.80 1	Silty CLAY (CI-CH) trace gravel: yellow-brown; medium to high plasticity; ironstone gravel.		RS	ND	w=PL		ES		0.80 1.00	PID	4ppm
									ES		1.30 1.50	PID	<1ppm
		2							ES		1.80 2.00	PID	2ppm
	4		Borehole discontinued at 2.00m depth. Target depth reached.										
	3	3											
	2	4											

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 405
METHOD: SFA to 2.0m
REMARKS: GPS coordinates approximate

OPERATOR: Ground Test (Kyle)

LOGGED: N.Woodward
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 7.6 AHD
COORDINATE: E:511641.2, N:6647901.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 107
PROJECT No: 89890.01
DATE: 16/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[^] / DENSITY.[^]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
16/04/25 NFGWO	0.20	FILL / Silty CLAY: dark brown; low to medium plasticity; trace rootlets, concrete gravel and pebbles.		FILL	ND	w=PL		ES		0.20	PID	11ppm
	7	Silty CLAY (CI-CH) trace gravel: pale brown; medium to high plasticity; ironstone gravel.						ES		0.30	PID	12ppm
		From 0.60m: orange-brown mottled grey, with ironstone		RS	ND	w<PL				0.50		
	1							ES		0.70	PID	12ppm
	1.10									0.90		
		Silty CLAY (CI-CH) with gravel: pale grey and red-brown; medium to high plasticity; ironstone gravel.		RS	ND	w<PL		* ES		1		
	6									1.20	PID	8ppm
		Borehole discontinued at 1.40m depth. Target depth reached.								1.40		
	2											
	5											
	3											
	4											
	4											
	3											

NOTES: [#] Soil origin is "probable" unless otherwise stated. [^] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools
METHOD: HA to 1.4m
REMARKS: *Replicate sample BD1/20250416 taken at 1.2-1.4m

OPERATOR: (N.Woodward)

LOGGED: N.Woodward
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 8.0 AHD
COORDINATE: E:511643.4, N:6647886.8
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 108
PROJECT No: 89890.01
DATE: 06/05/25 - 07/05/25
SHEET: 1 of 4

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK STRENGTH	ROCK RECOVERY (%)	ROCK RQD	ROCK FRACTURE SPACING (m)	ROCK DEFECTS & REMARKS	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
		0.00	TOPSOIL / Silty CLAY (CI) trace rootlets trace sand: dark brown; medium plasticity.	TS	TOP	ND	w=PL									A		0.01			Concrete	
		0.30	Silty CLAY (CI): grey brown; medium plasticity; from 0.8m, orange brown.		RS	VSt	w=PL									A		0.50				
	7	1														SPT/U50		0.95	PP	350-400kPa		
		1.05	CLAY (CI-CH) with silt: red brown to orange brown mottled pale grey; medium to high plasticity.													A		1.00	PP	550kPa		
																SPT			SPT	3,6,8		
																			PP	N=14		
																			PP	550kPa		
																		1.45		>600kPa		
																A		1.50				
	6	2	1.45m: sand lens													A		2.00				
			From 2.50m: with grey silt lenses in parts		RS	VSt	w<PL									A		2.50	PP	450kPa	Bentonite	
																SPT			SPT	3,6,6 N=12		
																			PP	500kPa		
																			PP	440kPa		
	5	3	2.90m: trace gravel, quartz, angular, up to 5mm															2.95				
		3.80	Silty CLAY (CI) trace sand trace gravel: red brown to orange brown mottled pale grey; medium plasticity; angular (up to 5mm), quartz gravel.																			
	4	4			RS	St	w=PL											4.00				
																SPT			SPT	3,5,8 N=13		
																		4.45	PP	190kPa		
																			PP	160kPa		
																			PP	190kPa		

06/05/25 The use of water as drilling fluid during wash boring and NMLC coring obscured groundwater observation below augered depths

Generated with CORE-GS by Geroc - Combined Log

NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 305
OPERATOR: Ground Test (Kyle)
LOGGED: KO
METHOD: SFA TC bit to 2.5 m, rotary (water) to 13 m, rotary (mud) to 18.2 m, NMLC to 19.6m
CASING: HWT to 2.5m
REMARKS: GPS coordinates approximate

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 8.0 AHD
COORDINATE: E:511643.4, N:6647886.8
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 108
PROJECT No: 89890.01
DATE: 06/05/25 - 07/05/25
SHEET: 2 of 4

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK STRENGTH	ROCK RECOVERY (%)	ROCK RQD	ROCK FRACTURE SPACING (m)	ROCK DEFECTS & REMARKS	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TESTING TEST TYPE	TESTING RESULTS AND REMARKS	BACKFILL	WELL PIPE
	2	6	[CONT] Silty CLAY (CI) trace sand trace gravel: red brown to orange brown mottled pale grey; medium plasticity; angular (up to 5mm), quartz gravel.			St												5.50	PP PP PP SPT	160kPa 190kPa 200kPa 4,8,11 N=19		
	1	7			RS	St	w=PL									SPT		5.95 7.00	PP SPT PP PP	80kPa 3,4,7 N=11 90kPa 130kPa	Bentonite	50mm
	0	8	8.50m-8.95m: with gravel, with fabric of extremely weathered material in parts													SPT		7.45 8 8.50	SPT PP	5,9,2 N=11 300kPa		
	-1	9				VSt												8.95				

NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 305
OPERATOR: Ground Test (Kyle)
LOGGED: KO
METHOD: SFA TC bit to 2.5 m, rotary (water) to 13 m, rotary (mud) to 18.2 m, NMLC to 19.6m
CASING: HWT to 2.5m
REMARKS: GPS coordinates approximate

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 8.0 AHD
COORDINATE: E:511643.4, N:6647886.8
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 108
PROJECT No: 89890.01
DATE: 06/05/25 - 07/05/25
SHEET: 3 of 4

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK STRENGTH	ROCK RECOVERY (%)	ROCK RQD	ROCK FRACTURE SPACING (m)	ROCK DEFECTS & REMARKS	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TESTING TEST TYPE	TESTING RESULTS AND REMARKS	BACKFILL	WELL PIPE
	11	-3	[CONT] Silty CLAY (CI) trace sand trace gravel: red brown to orange brown mottled pale grey; medium plasticity; angular (up to 5mm), quartz gravel.		RS	VSt	w=PL									SPT	10.00–10.45	10.00	SPT	6,11,18 N=29	Bentonite	
			From 10.00m: grading into extremely weathered material															11				
	11.20		Clayey GRAVEL (GC): dark grey to brown mottled red brown.													SPT	11.50–11.63	11.50	SPT	25/125mm		
																D	11.80	11.80				
	12	-4																12				
	13	-5			XWM	VSt	w=PL									SPT	13.00–13.15	13.00	SPT	(HB) 25/150mm	Gravel	
	14	-6																14				50mm

NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 305
OPERATOR: Ground Test (Kyle)
LOGGED: KO
METHOD: SFA TC bit to 2.5 m, rotary (water) to 13 m, rotary (mud) to 18.2 m, NMLC to 19.6m
CASING: HWT to 2.5m
REMARKS: GPS coordinates approximate

Refer to explanatory notes for symbol and abbreviation definitions

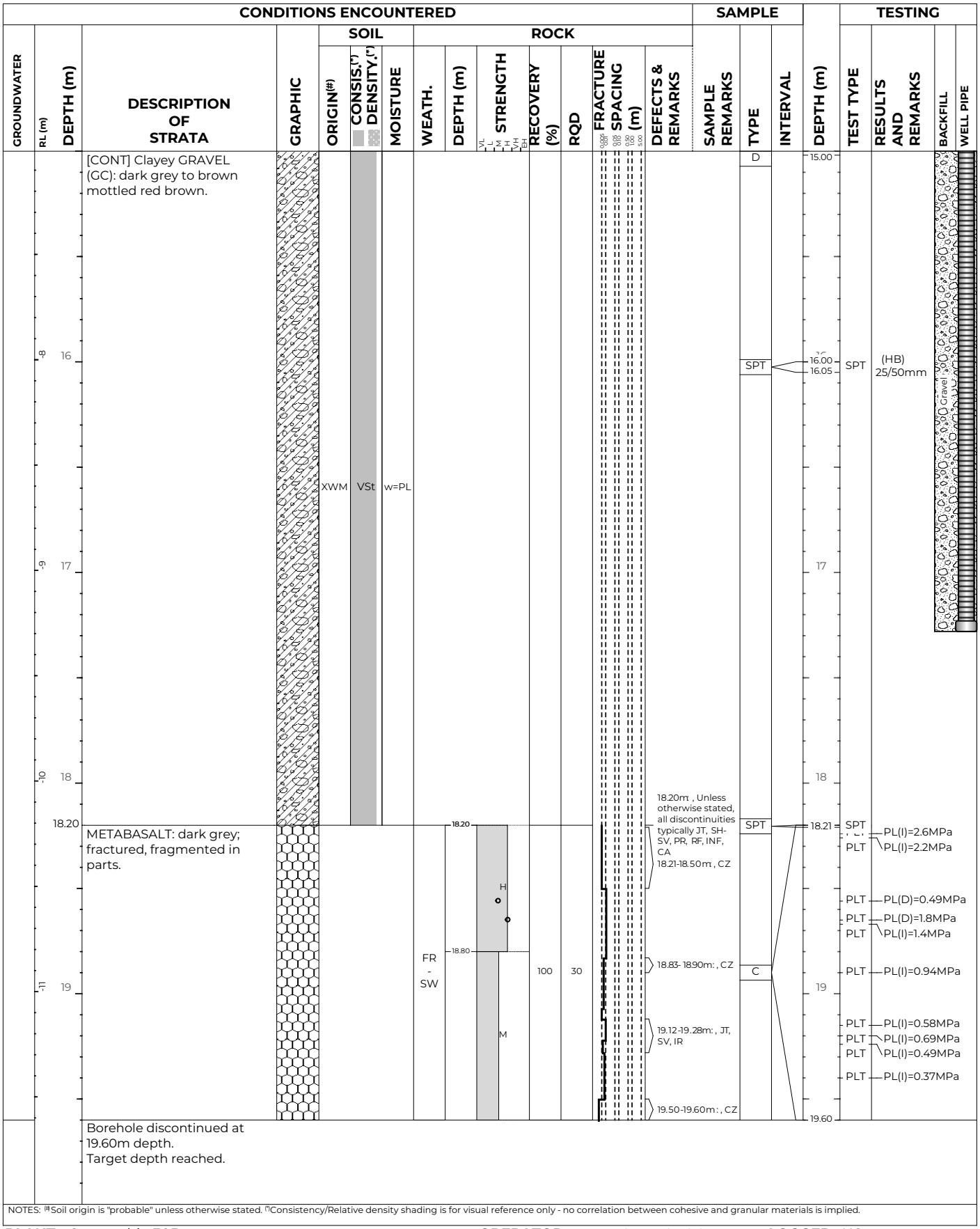
Generated with CORE-GS by Geroc - Combined Log

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 8.0 AHD
COORDINATE: E:511643.4, N:6647886.8
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 108
PROJECT No: 89890.01
DATE: 06/05/25 - 07/05/25
SHEET: 4 of 4



NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 305
OPERATOR: Ground Test (Kyle)
LOGGED: KO
METHOD: SFA TC bit to 2.5 m, rotary (water) to 13 m, rotary (mud) to 18.2 m, NMLC to 19.6m
CASING: HWT to 2.5m
REMARKS: GPS coordinates approximate

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Combined Log

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 8.0 AHD
COORDINATE: E:511642.7, N:6647886.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 108A
PROJECT No: 89890.01
DATE: 17/04/25
SHEET: 1 of 2

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(^) / DENSITY.(^)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
		0.30	FILL / Silty CLAY with sand: dark brown; low to medium plasticity; fine to medium sand; trace rootlets.		FILL	ND	w=PL		ES		0.20	PID	4ppm	Concrete	
			Silty CLAY (CI-CH) with gravel: pale brown and orange-brown; medium to high plasticity; igneous gravel; trace rootlets.		RS	ND	w<PL		ES		0.50	PID	5ppm		
		0.70	Silty CLAY (CI-CH) trace gravel: orange-brown with red-brown; medium to high plasticity; ironstone gravel; trace rootlets.		RS	ND	w=PL		ES		0.70				
	7	1							ES		0.90	PID	2ppm		
											1.10				
									* ES		1.40	PID	3ppm		
											1.60				
		1.70	Silty CLAY (CI-CH) with gravel: red-brown mottled grey; medium to high plasticity; ironstone gravel.		RS	ND	w=PL		ES		1.80	PID	3ppm		
	6	2.00	CLAY (CI-CH) with silt: red brown to orange brown, mottled pale grey in parts ; medium to high plasticity.								2.00				
	5	3	From 2.50m: with interbed of grey silt lens in parts 2.90m: trace quartz gravel, angular, up to 5mm		RS	ND	w<PL				3			Bentonite	
		3.80	Silty CLAY (CI) trace sand trace gravel: red brown to orange brown, mottled pale grey in parts ; medium plasticity; fine to coarse sand; fine, angular (up to 5mm), quartz gravel.		RS	ND	w=PL				4				
	4	4													
	3														

NOTES: (#) Soil origin is "probable" unless otherwise stated. (^)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 405
METHOD: SFA to 10m
REMARKS: *Replicate sample BD3/20250417 taken at 1.4-1.6m

OPERATOR: Ground Test (Kyle)

LOGGED: N.Woodward
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 8.0 AHD
COORDINATE: E:511642.7, N:6647886.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 108A
PROJECT No: 89890.01
DATE: 17/04/25
SHEET: 2 of 2

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	2	6	[CONT] Silty CLAY (CI) trace sand trace gravel: red brown to orange brown, mottled pale grey in parts ; medium plasticity; fine to coarse sand; fine, angular (up to 5mm), quartz gravel.								6			Bentonite	
	1	7			RS	ND	w=PL				7				
▼ 07/05/25	-0	8									8			Gravel	
			8.50m-8.95m: with gravel, with fabric of extremely weathered material in parts												
	-1	9									9				
	2		Borehole discontinued at 10.00m depth. Target depth reached.												

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 405
METHOD: SFA to 10m
REMARKS: *Replicate sample BD3/20250417 taken at 1.4-1.6m

OPERATOR: Ground Test (Kyle)

LOGGED: N.Woodward
CASING: Uncased

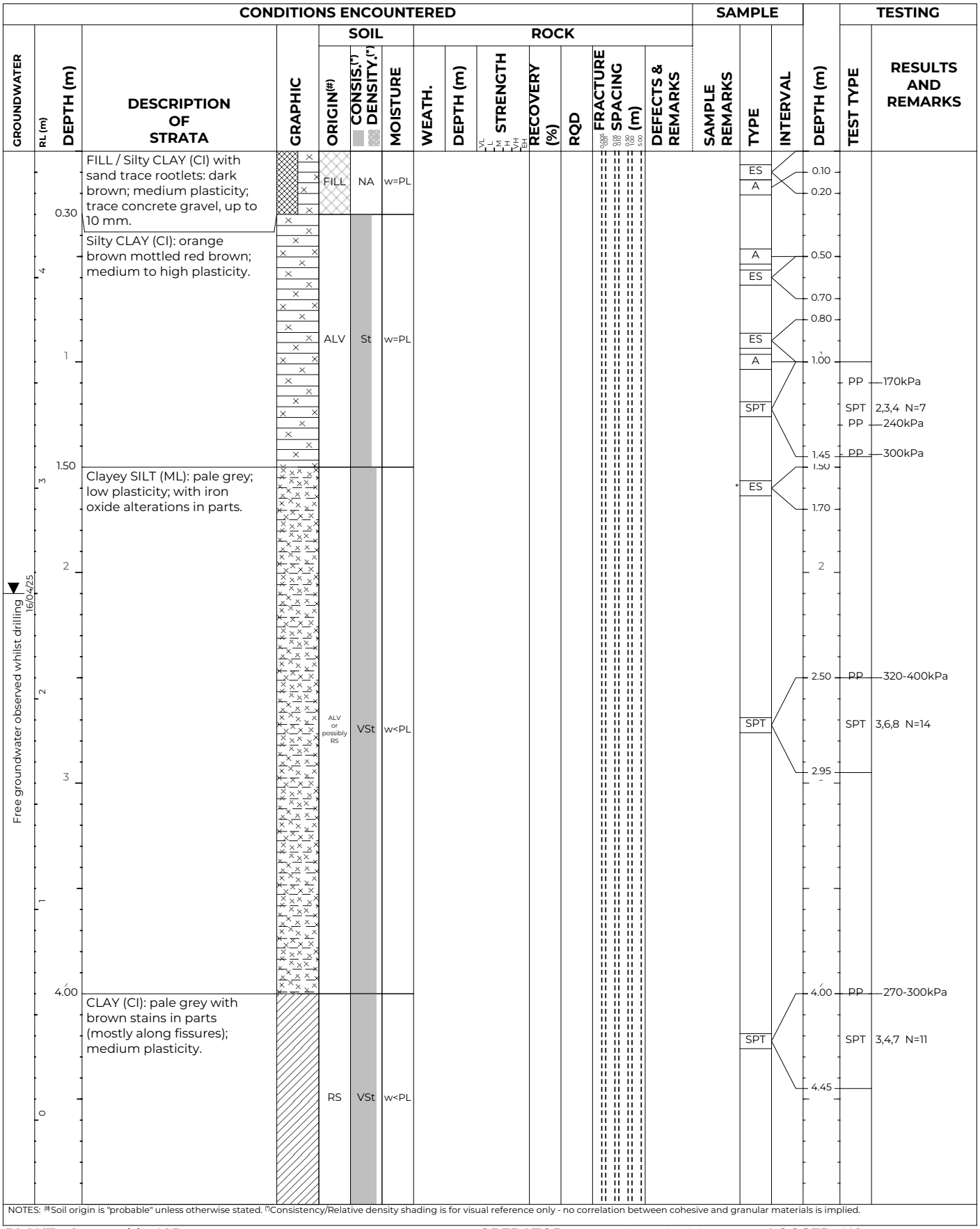
Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 4.6 AHD
COORDINATE: E:511594.2, N:6647899.8
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 109
PROJECT No: 89890.01
DATE: 15/04/25 - 16/04/25
SHEET: 1 of 4



NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 405
OPERATOR: Ground Test (Kyle)
LOGGED: KO

METHOD: SFA TC bit to 7.45 m, rotary water to 11.1 m, NMLC to 15.3 m
CASING: HWT to 11.1m

REMARKS: *Replicate sample BD2/202504015 taken at 1.5-1.7m.
GPS coordinates approximate

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 4.6 AHD
COORDINATE: E:511594.2, N:6647899.8
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 109
PROJECT No: 89890.01
DATE: 15/04/25 - 16/04/25
SHEET: 2 of 4

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK STRENGTH	ROCK RECOVERY (%)	ROCK RQD	ROCK FRACTURE SPACING (m)	ROCK DEFECTS & REMARKS	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TESTING TEST TYPE	TESTING RESULTS AND REMARKS
▼ Free groundwater observed whilst drilling 15/04/25	-1	6	[CONT] CLAY (CI): pale grey with brown stains in parts (mostly along fissures); medium plasticity.			VSt												5.50	PP	200kPa
			From 5.50m-5.95m: Trace gravel, trace sand													SPT			PP	170kPa
																			SPT	3,4,4 N=8
							w<PL												PP	300kPa
						St												5.95	PP	170kPa
	-2	7																7.00	PP	50-110kPa
					RS	F - St	w=PL									SPT			SPT	2,2,1 N=3
	-3	8	From 8.20m: Mottled brown to pale grey			S - F	w>PL									SPT		7.45		
																		8.20	PP	45kPa
	-4	9																	SPT	1,0,0 N=0
																			PP	50kPa
																		8.65	PP	35kPa
	-5		From 9.20m: With fabric of extremely weathered material in parts			VSt becoming H	w<PL											9.70		
																SPT			SPT	4,6,13 N=19

NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 405
OPERATOR: Ground Test (Kyle)
LOGGED: KO
METHOD: SFA TC bit to 7.45 m, rotary water to 11.1 m, NMLC to 15.3 m
CASING: HWT to 11.1m
REMARKS: *Replicate sample BD2/202504015 taken at 1.5-1.7m.
GPS coordinates approximate

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

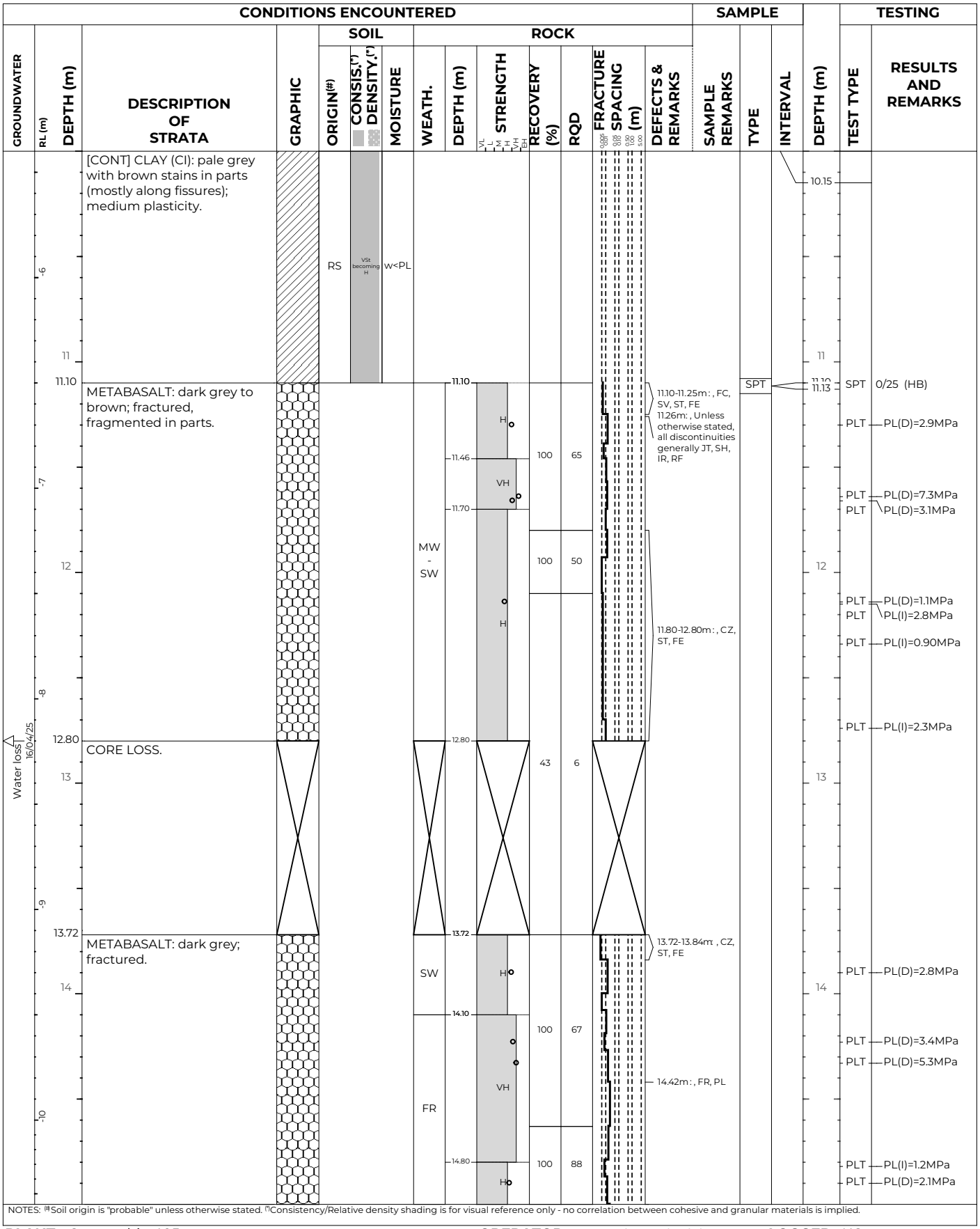
Generated with CORE-GS by Geroc - Combined Log

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 4.6 AHD
COORDINATE: E:511594.2, N:6647899.8
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 109
PROJECT No: 89890.01
DATE: 15/04/25 - 16/04/25
SHEET: 3 of 4



NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 405
OPERATOR: Ground Test (Kyle)
LOGGED: KO
METHOD: SFA TC bit to 7.45 m, rotary water to 11.1 m, NMLC to 15.3 m
CASING: HWT to 11.1m
REMARKS: *Replicate sample BD2/202504015 taken at 1.5-1.7m.
GPS coordinates approximate

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Combined Log

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 4.6 AHD
COORDINATE: E:511594.2, N:6647899.8
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 109
PROJECT No: 89890.01
DATE: 15/04/25 - 16/04/25
SHEET: 4 of 4

CONDITIONS ENCOUNTERED																			SAMPLE				TESTING	
				SOIL				ROCK																
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) DENSITY.(*)	MOISTURE	WEATH.	DEPTH (m)	STRENGTH (VL L M H VH EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (>0.06 0.06-0.2 0.2-0.6 0.6-2.0 >2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
			[CONT] METABASALT: dark grey; fractured.					FR		H	100	88		15.00-15.20m: , FR, SV, RF					PLT	PL(I)=1.5MPa
			Borehole discontinued at 15.30m depth. Target depth reached.																	
		16																		
		17																		
		18																		
		19																		

NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 405
OPERATOR: Ground Test (Kyle)
LOGGED: KO
METHOD: SFA TC bit to 7.45 m, rotary water to 11.1 m, NMLC to 15.3 m
CASING: HWT to 11.1m
REMARKS: *Replicate sample BD2/202504015 taken at 1.5-1.7m.
GPS coordinates approximate

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 4.7 AHD
COORDINATE: E:511595.4, N:6647900.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 109A
PROJECT No: 89890.01
DATE: 15/04/25 - 16/04/25
SHEET: 1 of 2

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK STRENGTH	ROCK RECOVERY (%)	ROCK RQD	ROCK FRACTURE SPACING (m)	ROCK DEFECTS & REMARKS	SAMPLE SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TESTING TEST TYPE	TESTING RESULTS AND REMARKS	BACKFILL	WELL PIPE
Standing groundwater level observed in open hole 16/04/25	4	0.30	TOPSOIL / Silty CLAY (CI) with sand trace rootlets: dark brown; medium plasticity; trace concrete.	TS TS	TOP or possibly FILL	ND	w=PL															Concrete	
	1		Silty CLAY (CI): orange brown mottled red brown; medium to high plasticity.		ALV	ND	w=PL																
	3	1.50	Clayey SILT (ML): pale grey; low plasticity; with iron oxide alterations in parts.		ALV or possibly RS	ND	w<PL															Bentonite	
	0	4.00	CLAY (CI): pale grey with brown stains in parts (mostly along fissures); medium plasticity.		RS	ND	w<PL															Gravel	

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 405
OPERATOR: Ground Test (Kyle)
LOGGED: KO
METHOD: SFA TC bit 8 m
CASING: HWT to 11.1m

REMARKS: *Replicate sample BD2/202504015 taken at 1.5-1.7m.
GPS coordinates approximate

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 4.7 AHD
COORDINATE: E:511595.4, N:6647900.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 109A
PROJECT No: 89890.01
DATE: 15/04/25 - 16/04/25
SHEET: 2 of 2

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK STRENGTH	ROCK RECOVERY (%)	ROCK RQD	ROCK FRACTURE SPACING (m)	ROCK DEFECTS & REMARKS	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TESTING TEST TYPE	TESTING RESULTS AND REMARKS	BACKFILL	WELL PIPE
	-1	6	[CONT] CLAY (CI): pale grey with brown stains in parts (mostly along fissures); medium plasticity. From 5.50m-5.95m: Trace gravel, trace sand		RS	ND St	w<PL											6			Gravel	
	-2	7				ND	w=PL											7				
	-3	8	Borehole discontinued at 8.00m depth. Target depth reached.																			
		9																				

NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 405
OPERATOR: Ground Test (Kyle)
LOGGED: KO
METHOD: SFA TC bit 8 m
CASING: HWT to 11.1m
REMARKS: *Replicate sample BD2/202504015 taken at 1.5-1.7m.
GPS coordinates approximate

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 6.4 AHD
COORDINATE: E:511619.9, N:6647895.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 110
PROJECT No: 89890.01
DATE: 17/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
17/04/25 NFGWO	6 / 0.23	FILL / Silty SAND: dark brown; fine to medium; low to medium plasticity silt; trace rootlets.		FILL	ND	w=PL		ES		0.20	PID	5ppm
		Silty CLAY (CI-CH) trace gravel: pale-dark grey with yellow-brown; medium to high plasticity; igneous gravel; trace rootlets.		RS	ND	w>PL		ES		0.40 0.60	PID	4ppm
	0.80 / 1	Silty CLAY (CI-CH) trace gravel: orange-brown with red-brown; medium to high plasticity; ironstone gravel.		RS	ND	w<PL		ES		0.80 1.00	PID	4ppm
	5 / 1.60	Silty CLAY (CI-CH) with gravel: pale grey with red-brown; medium to high plasticity; ironstone gravel.		RS	ND	w<PL		* ES		1.30 1.50	PID	4ppm
	2	Borehole discontinued at 2.00m depth. Target depth reached.						ES		1.80 2.00	PID	3ppm

NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Comacchio 405
METHOD: SFA to 2.0m
REMARKS: *Replicate sample BD2/20250417 taken at 1.3-1.5m

OPERATOR: Ground Test (Kyle)

LOGGED: N.Woodward
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 211A-215 Harbour Drive, Coffs Harbour, NSW 2450

SURFACE LEVEL: 7.4 AHD
COORDINATE: E:511630.6, N:6647868.8
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 111
PROJECT No: 89890.01
DATE: 16/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
16/04/25 NFGWO	7 / 0.30	FILL / Silty SAND trace gravel: dark brown; fine to medium; low to medium plasticity silt; igneous gravel; trace rootlets.		FILL	ND	w=PL		ES		0.20	PID	12ppm
		Silty CLAY: pale grey with yellow-brown; medium to high plasticity; trace rootlets, possibly reworked natural.		RS or possibly FILL	ND	w=PL		ES		0.40 0.60	PID	8ppm
	0.60 / 1	Silty CLAY (CI-CH): orange-brown and brown; medium to high plasticity; with iron oxide staining.		RS	ND	w=PL		* ES		0.70 0.90	PID	4ppm
		From 1.00m: with pale grey, silt content increasing with depth						ES		1 1.10 1.30	PID	10ppm
	6	Borehole discontinued at 1.40m depth. Target depth reached.										
	5 / 2											
	4 / 3											
	3 / 4											

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools
METHOD: HA to 1.4m
REMARKS: *Replicate sample BD2/20250416 taken at 0.7-0.9m

OPERATOR: (N.Woodward)

LOGGED: N.Woodward
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Photo 1: Bore 101 Location

Photo 2: Bore 101: Approximate Location (arrow)

Douglas PARTNERS	**Proposed Multi-Storey**	PROJECT:	89890.01
	Residential Development	Plate	1
	Harbour Drive, Coffs Harbour	REV:	A
	Client: Homes NSW	DATE:	29-May-25

Photo 3: Bore 101 Auger Sample 0.1 m

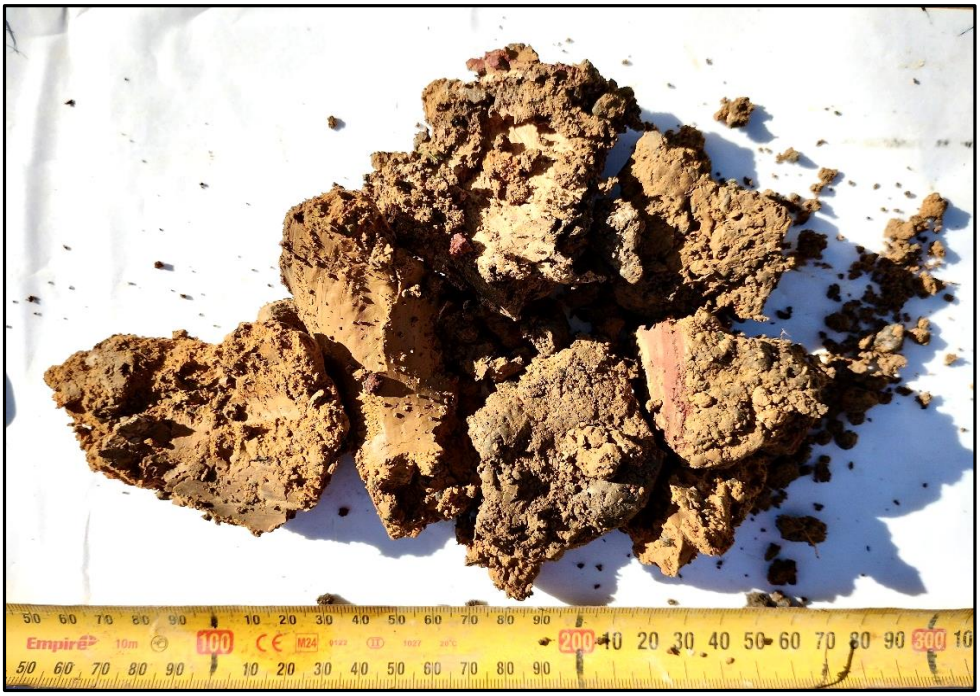


Photo 4: Bore 101 Auger Sample 0.5 m

Douglas PARTNERS	**Proposed Multi-Storey**	PROJECT:	89890.01
	Residential Development	Plate	2
	Harbour Drive, Coffs Harbour	REV:	A
	Client: Homes NSW	DATE:	29-May-25

Photo 5: Bore 101 Auger Sample 1 m

Photo 6: Bore 101 SPT Sample 1 m - 1.45 m

Douglas PARTNERS	**Proposed Multi-Storey**	PROJECT:	89890.01
	Residential Development	Plate	3
	Harbour Drive, Coffs Harbour	REV:	A
	Client: Homes NSW	DATE:	29-May-25

Photo 7: Bore 101 SPT Sample 2.5 m - 2.95 m

Photo 8: Bore 101 SPT Sample 4 m - 4.45 m

Douglas PARTNERS	**Proposed Multi-Storey**	PROJECT:	89890.01
	Residential Development	Plate	4
	Harbour Drive, Coffs Harbour	REV:	A
	Client: Homes NSW	DATE:	29-May-25

Photo 9: Bore 101 SPT Sample 5.5 m - 5.95 m

Photo 10: Bore 101 SPT Sample 7 m - 7.45 m

Douglas PARTNERS	**Proposed Multi-Storey**	PROJECT:	89890.01
	Residential Development	Plate	5
	Harbour Drive, Coffs Harbour	REV:	A
	Client: Homes NSW	DATE:	29-May-25

Photo 11: Bore 101 SPT Sample 8.5 m - 8.95 m

Douglas PARTNERS	**Proposed Multi-Storey**	PROJECT:	89890.01
	Residential Development	Plate	6
	Harbour Drive, Coffs Harbour	REV:	A
	Client: Homes NSW	DATE:	29-May-25

Photo 12: Bore 108 Location

Photo 13: Bore 108 Location

Douglas PARTNERS	**Proposed Multi-Storey**	PROJECT:	89890.01
	Residential Development	Plate	7
	Harbour Drive, Coffs Harbour	REV:	A
	Client: Homes NSW	DATE:	29-May-25

Photo 14: Bore 108 Auger Sample 0.1 m

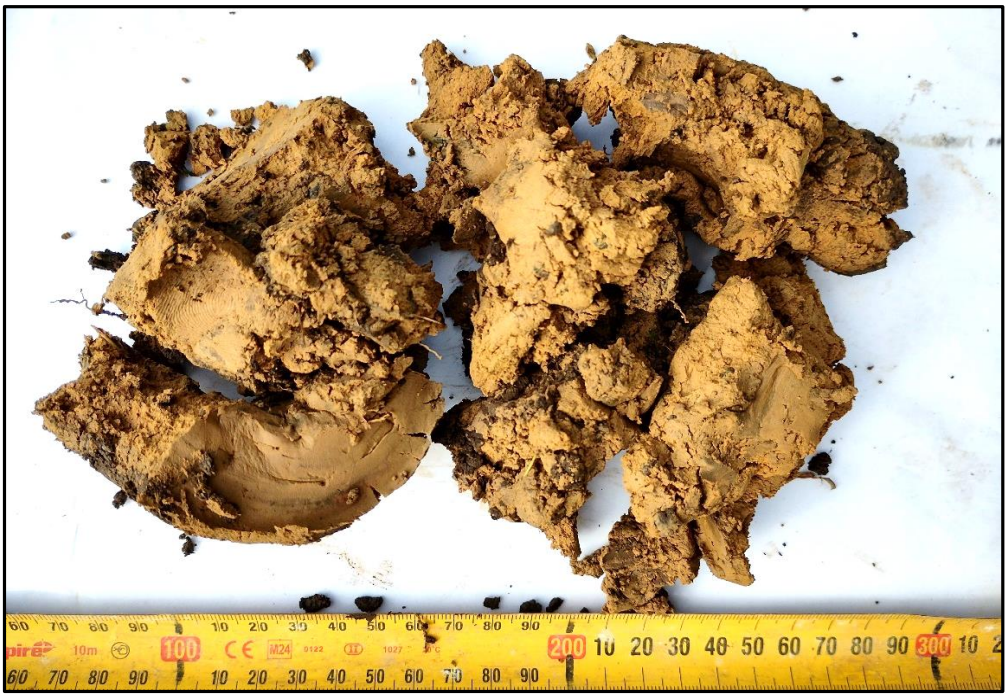


Photo 15: Bore 108 Auger Sample 0.5 m

Douglas PARTNERS	**Proposed Multi-Storey**	PROJECT:	89890.01
	Residential Development	Plate	8
	Harbour Drive, Coffs Harbour	REV:	A
	Client: Homes NSW	DATE:	29-May-25

Photo 16: Bore 108 Auger Sample 1 m

Photo 17: Bore 108 SPT Sample 1 m - 1.45 m

Douglas PARTNERS	**Proposed Multi-Storey**	PROJECT:	89890.01
	Residential Development	Plate	9
	Harbour Drive, Coffs Harbour	REV:	A
	Client: Homes NSW	DATE:	29-May-25

Photo 18: Bore 108 Auger Sample 1.5 m

Photo 19: Bore 108 Auger Sample 2 m

Douglas PARTNERS	**Proposed Multi-Storey**	PROJECT:	89890.01
	Residential Development	Plate	10
	Harbour Drive, Coffs Harbour	REV:	A
	Client: Homes NSW	DATE:	29-May-25

Photo 20: Bore 108 SPT Sample 2.5 m - 2.95 m

Photo 21: Bore 108 SPT Sample 4 m - 4.45 m

Douglas PARTNERS	**Proposed Multi-Storey**	PROJECT:	89890.01
	Residential Development	Plate	11
	Harbour Drive, Coffs Harbour	REV:	A
	Client: Homes NSW	DATE:	29-May-25

Photo 22: Bore 108 SPT Sample 5.5 m - 5.95 m

Photo 23: Bore 108 SPT Sample 7 m - 7.45 m

Douglas PARTNERS	**Proposed Multi-Storey**	PROJECT:	89890.01
	Residential Development	Plate	12
	Harbour Drive, Coffs Harbour	REV:	A
	Client: Homes NSW	DATE:	29-May-25

Photo 24: Bore 108 SPT Sample 8.5 m - 8.95 m

Photo 25: Bore 108 SPT Sample 10 m - 10.45 m

Douglas PARTNERS	**Proposed Multi-Storey**	PROJECT:	89890.01
	Residential Development	Plate	13
	Harbour Drive, Coffs Harbour	REV:	A
	Client: Homes NSW	DATE:	29-May-25

Photo 26: Bore 108 SPT Sample 11.5 m

Photo 27: Bore 108 Wash Sample 11.7 m

Douglas PARTNERS	**Proposed Multi-Storey**	PROJECT:	89890.01
	Residential Development	Plate	14
	Harbour Drive, Coffs Harbour	REV:	A
	Client: Homes NSW	DATE:	29-May-25

Photo 28: Bore 108 SPT Sample 13 m - 13.45 m

Photo 29: Bore 108 SPT Sample 16 m - 16.05 m

Douglas PARTNERS	**Proposed Multi-Storey**	PROJECT:	89890.01
	Residential Development	Plate	15
	Harbour Drive, Coffs Harbour	REV:	A
	Client: Homes NSW	DATE:	29-May-25

Photo 30: Bore 109 Location

Photo 31: Bore 109 Location

Douglas Partners	**Proposed Multi-Storey**	PROJECT:	89890.01
	Residential Development	Plate	16
	Harbour Drive, Coffs Harbour	REV:	A
	Client: Homes NSW	DATE:	29-May-25

Photo 32: Bore 109 SPT Sample 1 m - 1.45 m

Photo 33: Bore 109 SPT Sample 2.5 m - 2.95 m

Douglas PARTNERS	**Proposed Multi-Storey**	PROJECT:	89890.01
	Residential Development	Plate	17
	Harbour Drive, Coffs Harbour	REV:	A
	Client: Homes NSW	DATE:	29-May-25

Photo 34: Bore 109 SPT Sample 4 m - 4.45 m

Photo 35: Bore 109 SPT Sample 5.5 m - 5.95 m

Douglas PARTNERS	**Proposed Multi-Storey**	PROJECT:	89890.01
	Residential Development	Plate	18
	Harbour Drive, Coffs Harbour	REV:	A
	Client: Homes NSW	DATE:	29-May-25

Photo 36: Bore 109 SPT Sample 7.0 m - 7.45 m

Photo 37: Bore 109 SPT Sample 8.2 m - 8.65 m

Douglas PARTNERS	**Proposed Multi-Storey**	PROJECT:	89890.01
	Residential Development	Plate	19
	Harbour Drive, Coffs Harbour	REV:	A
	Client: Homes NSW	DATE:	29-May-25

Photo 38: Bore 109 SPT Sample 9.7 m - 10.15 m

Douglas PARTNERS	**Proposed Multi-Storey**	PROJECT:	89890.01
	Residential Development	Plate	20
	Harbour Drive, Coffs Harbour	REV:	A
	Client: Homes NSW	DATE:	29-May-25

Photo 1: Bore 101 core 12.23 m to 15.00 m

Douglas PARTNERS GROUNDED EXPERTISE	**Proposed Multi-Storey Residential Development**	PROJECT:	89890.01
	211A – 215 Harbour Drive, Coffs Harbour NSW	PLATE No:	1
		REV:	0
	CLIENT: Homes NSW	DATE:	26-May-25

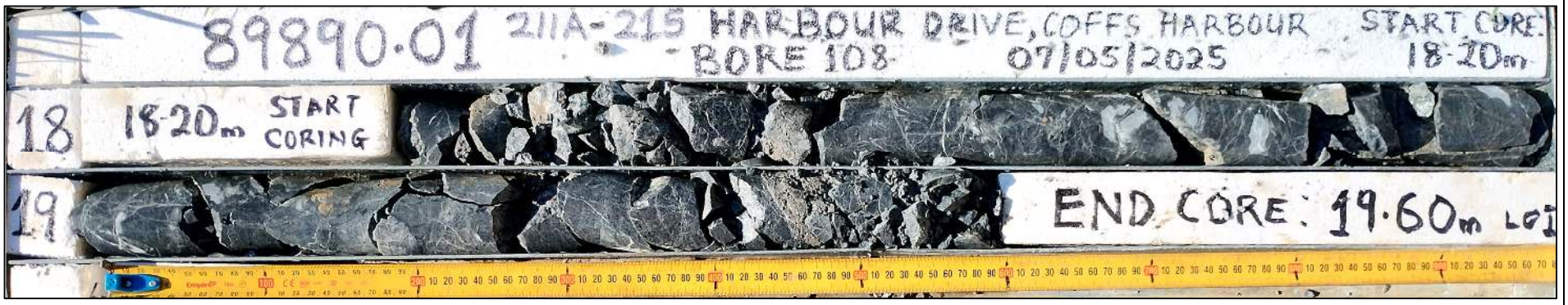


Photo 2: Bore 108 core 18.20 m to 19.60 m

Douglas PARTNERS GROUNDED EXPERTISE	**Proposed Multi-Storey Residential Development**	PROJECT:	89890.01
	211A – 215 Harbour Drive, Coffs Harbour NSW	PLATE No:	2
		REV:	0
	CLIENT: Homes NSW	DATE:	26-May-25

Photo 3: Bore 109 core 11.1m to 15.30

Douglas PARTNERS GROUNDED EXPERTISE	**Proposed Multi-Storey Residential Development**	PROJECT:	89890.01
	211A – 215 Harbour Drive, Coffs Harbour NSW	PLATE No:	3
		REV:	0
	CLIENT: Homes NSW	DATE:	26-May-25

Appendix D

Results of Laboratory Testing

Soil - Certificate of Analysis - E25-00-5656

Client:	Douglas Partners Pty Ltd	Laboratory:	Environmental Analysis Laboratory
Contact:	John Niland	Contact:	EAL Customer Service Team
Address:	PO Box 5463, PORT MACQUARIE, NSW 2444, Australia	Address:	Military Road, East Lismore NSW 2480, Australia
Telephone:	02 9809 0666	Telephone:	(02) 6620 3678
Email:	john.niland@douglaspartners.com.au	Email:	eal@scu.edu.au

Customer reference:	Project number 89890.01	Request ID:	EAL /E25-00-5656
Number of samples:	4	Report ID:	E25-00-5656_EALP1_1
Date samples received:	23 May 2025	Issue date:	28 May 2025

Authorised by:	Nick Ward
Position:	Technical Team Leader

Accreditation No. 14960

Comments: EAL is a NATA accredited laboratory (14960), accredited for compliance with ISO/IEC 17025 - Testing.

Certificate of Analysis

Request ID: EAL/E25-00-5656 Report ID: E25-00-5656_EALP1_1 Issue date: 28 May 2025

			Client Sample ID:	101A	101	108	109
			Sample Depth:	3.5-3.5	8.5-8.95	10-10.45	4-4.45
			Sample Date:	7 May 2025	8 May 2025	6 May 2025	15 April 2025
			Sampled By:	Ken Okonkwo	Ken Okonkwo	Ken Okonkwo	Ken Okonkwo
			EAL Sample ID:	E25-00-5656-0001	E25-00-5656-0002	E25-00-5656-0003	E25-00-5656-0004
Parameter	**Unit**	**Method Reference**	**LOR**	---	---	---	---
Moisture Content	%	Inhouse S2 (105°C)	<0.1	20.8	16.8	20.7	21.4
Texture (Coarse/Medium/Fine)	---	** Inhouse S90	---	Fine	Fine	Fine	Fine
pH (H2O)	units	Rayment & Lyons 2011 - 4A1	---	5.83	6.73	6.10	6.78
Electrical Conductivity	dS/m	Rayment & Lyons 2011 - 3A1	<0.005	0.041	0.023	0.028	0.065
Resistivity	ohm.mm	** Calculation	---	244000	435000	357000	154000
Resistivity	ohm.cm	** Calculation	---	24400	43500	35700	15400
Chloride	mg/kg	** Rayment & Lyons 2011 - 5A3a	<0.1	19.5	10.0	18.8	55.4
Chloride	%	** Rayment & Lyons 2011 - 5A3a	---	0.0019	0.0010	0.0019	0.0055
Sulfate	mg/kg	** APHA 3120 ICPOES	<2	33	7	16	18
Sulfate	%	** APHA 3120 ICPOES	<0.0002	0.0033	0.0007	0.0016	0.0018
Chloride:Sulfate Ratio	---	** Calculation	<0.1	0.6	1.5	1.2	3.1

Notes:

- NSCT (2009) texture: coarse and peats = sands to loamy sands; medium = clayey sand to light clays; fine = light medium to heavy clays.
- ** denotes NATA accreditation does not cover the performance of this service.
- .. denotes not requested, no data/information or no guidelines available.
- All services undertaken by EAL are covered by the EAL Laboratory Services Terms and Conditions (available on request or at scu.edu.au/eal).
- Analysis conducted between sample arrival date and reporting date.
- This report is not to be reproduced except in full.
- Results only relate to the item tested.
- Methods from Rayment and Lyons, 2011. Soil Chemical Methods - Australasia. CSIRO Publishing, Collingwood.
- All analysis is on a dry weight (DW) basis - samples were dried at 60 °C for 48 h prior to crushing and analysis.
- For conductivity 1 dS/m = 1 mS/cm = 1000 µS/cm.
- ppm = mg/kg dried sample

sPOCAS field test						
Our Reference		378799-37	378799-38	378799-39	378799-40	378799-41
Your Reference	UNITS	BH109	BH109	BH109	BH109	BH109
Depth		2.5-2.7	3.5-3.7	4.5-4.7	5.5-5.7	6.5-6.7
Date Sampled		15/04/2025	15/04/2025	15/04/2025	15/04/2025	15/04/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/04/2025	22/04/2025	22/04/2025	22/04/2025	22/04/2025
Date analysed	-	29/04/2025	29/04/2025	29/04/2025	29/04/2025	29/04/2025
pH_F (field pH test)	pH Units	6.1	6.2	6.7	5.9	6.3
pH_{FOX} (field peroxide test)	pH Units	5.1	5.2	5.1	5.1	5.2
Reaction Rate*	-	Low reaction	Low reaction	Low reaction	Low reaction	Low reaction

sPOCAS field test		
Our Reference		378799-42
Your Reference	UNITS	BH109
Depth		7.5-7.7
Date Sampled		15/04/2025
Type of sample		Soil
Date prepared	-	22/04/2025
Date analysed	-	29/04/2025
pH_F (field pH test)	pH Units	6.0
pH_{FOX} (field peroxide test)	pH Units	5.1
Reaction Rate*	-	Low reaction

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CERTIFICATE OF ANALYSIS 378799-B

Client Details

Client	Douglas Partners Pty Ltd
Attention	Lisa Teng
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**89890.01 Coffs Harbour**
Number of Samples	Additional analysis 1 sample
Date samples received	22/04/2025
Date completed instructions received	14/05/2025

Analysis Details

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

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

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

Report Details

Date results requested by	21/05/2025
Date of Issue	21/05/2025

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Results Approved By
Jenny He, Inorganic Team Leader

Authorised By
Nancy Zhang, Laboratory Manager

Acid Sulphate Soil Suite		
Our Reference		378799-B-39
Your Reference	UNITS	BH109
Depth		4.5-4.7
Date Sampled		15/04/2025
Type of sample		Soil
Date prepared	-	22/04/2025
Date analysed	-	15/05/2025
pH $_{kcl}$	pH units	6.1
s-TAA pH 6.5	%w/w S	<0.01
TAA pH 6.5	moles H^+ /t	<5
a-Chromium Reducible Sulfur	moles H^+ /t	5
Chromium Reducible Sulfur	%w/w	0.008
S_{KCl}	%w/w S	[NT]
S_{HCl}	%w/w S	[NT]
S_{NAS}	%w/w S	[NT]
ANC_{BT}	% $CaCO_3$	[NT]
s-ANC_{BT}	%w/w S	[NT]
s-Net Acidity excluding ANC	%w/w S	0.014
a-Net Acidity excluding ANC	moles H^+ /t	8.5
Liming rate excluding ANC	kg $CaCO_3$ /t	<0.75
s-Net Acidity including ANC	%w/w S	0.014
a-Net Acidity including ANC	moles H^+ /t	8.5
Liming rate including ANC	kg $CaCO_3$ /t	<0.75

Method ID	Methodology Summary
Inorg-068	Determination of Acid Sulphate Soil analysis - a sample is analysed by traditional titration method and ICP-OES analysis. Based on Acid Sulfate Soils Laboratory Methods Guidelines, latest edition. There is no documented official holding time, we have assigned an arbitrary 180 days to frozen samples. neutralising value (NV) of 100% is assumed for liming rate. Net Acidity with ANC calculation should only be used when corroborated by other data that demonstrates the soil material does not experience acidification during complete oxidation under field conditions. The recommendation that the SHCL concentration be multiplied by a factor of 2 to ensure retained acidity is not underestimated, has not been applied in the SHCL results reported.

QUALITY CONTROL: Acid Sulphate Soil Suite						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			22/04/2025	[NT]	[NT]	[NT]	[NT]	22/04/2025	[NT]
Date analysed	-			15/05/2025	[NT]	[NT]	[NT]	[NT]	15/05/2025	[NT]
pH $_{kcl}$	pH units		Inorg-068	[NT]	[NT]	[NT]	[NT]	[NT]	98.0	[NT]
s-TAA pH 6.5	%w/w S	0.01	Inorg-068	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
TAA pH 6.5	moles H^+ /t	5	Inorg-068	<5	[NT]	[NT]	[NT]	[NT]	96	[NT]
a-Chromium Reducible Sulfur	moles H^+ /t	3	Inorg-068	<3	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chromium Reducible Sulfur	%w/w	0.005	Inorg-068	<0.005	[NT]	[NT]	[NT]	[NT]	106	[NT]
S_{KCl}	%w/w S	0.005	Inorg-068	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_{HCl}	%w/w S	0.005	Inorg-068	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_{NAS}	%w/w S	0.005	Inorg-068	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
ANC_{BT}	% $CaCO_3$	0.05	Inorg-068	<0.05	[NT]	[NT]	[NT]	[NT]	90	[NT]
s-ANC_{BT}	%w/w S	0.05	Inorg-068	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-Net Acidity excluding ANC	%w/w S	0.005	Inorg-068	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-Net Acidity excluding ANC	moles H^+ /t	5	Inorg-068	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Liming rate excluding ANC	kg $CaCO_3$ /t	0.75	Inorg-068	<0.75	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-Net Acidity including ANC	%w/w S	0.005	Inorg-068	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-Net Acidity including ANC	moles H^+ /t	5	Inorg-068	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Liming rate including ANC	kg $CaCO_3$ /t	0.75	Inorg-068	<0.75	[NT]	[NT]	[NT]	[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.

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.

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.

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

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CERTIFICATE OF ANALYSIS 381997

Client Details

Client	Douglas Partners Pty Ltd
Attention	Lisa Teng
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**89890.01, Coffs Harbour**
Number of Samples	6 Water
Date samples received	29/05/2025
Date completed instructions received	29/05/2025

Analysis Details

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

Samples were analysed as received from the client. 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	06/06/2025
Date of Issue	06/06/2025

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Results Approved By
Nick Sarlamis, Assistant Operation Manager
Stuart Chen, Asbestos Approved Identifier/Report coordinator
Tabitha Roberts, Senior Chemist
Timothy Toll, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

VOCs in water					
Our Reference		381997-1	381997-2	381997-3	381997-4
Your Reference	UNITS	101A	108A	109	BD1/20250529
Date Sampled		29/05/2025	29/05/2025	29/05/2025	29/05/2025
Type of sample		Water	Water	Water	Water
Date Extracted	-	30/05/2025	30/05/2025	30/05/2025	30/05/2025
Date Analysed	-	02/06/2025	02/06/2025	02/06/2025	02/06/2025
Dichlorodifluoromethane	µg/L	<10	<10	<10	<10
Chloromethane	µg/L	<10	<10	<10	<10
Vinyl Chloride	µg/L	<10	<10	<10	<10
Bromomethane	µg/L	<10	<10	<10	<10
Chloroethane	µg/L	<10	<10	<10	<10
Trichlorofluoromethane	µg/L	<10	<10	<10	<10
1,1-Dichloroethene	µg/L	<1	<1	<1	<1
Trans-1,2-dichloroethene	µg/L	<1	<1	<1	<1
1,1-dichloroethane	µg/L	<1	<1	<1	<1
Cis-1,2-dichloroethene	µg/L	<1	<1	<1	<1
Bromochloromethane	µg/L	<1	<1	<1	<1
Chloroform	µg/L	<1	<1	<1	<1
2,2-dichloropropane	µg/L	<1	<1	<1	<1
1,2-dichloroethane	µg/L	<1	<1	<1	<1
1,1,1-trichloroethane	µg/L	<1	<1	<1	<1
1,1-dichloropropene	µg/L	<1	<1	<1	<1
Cyclohexane	µg/L	<1	<1	<1	<1
Carbon tetrachloride	µg/L	<1	<1	<1	<1
Benzene	µg/L	<1	<1	<1	<1
Dibromomethane	µg/L	<1	<1	<1	<1
1,2-dichloropropane	µg/L	<1	<1	<1	<1
Trichloroethene	µg/L	<1	<1	<1	<1
Bromodichloromethane	µg/L	<1	<1	<1	<1
trans-1,3-dichloropropene	µg/L	<1	<1	<1	<1
cis-1,3-dichloropropene	µg/L	<1	<1	<1	<1
1,1,2-trichloroethane	µg/L	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1
1,3-dichloropropane	µg/L	<1	<1	<1	<1
Dibromochloromethane	µg/L	<1	<1	<1	<1
1,2-dibromoethane	µg/L	<1	<1	<1	<1
Tetrachloroethene	µg/L	<1	<1	<1	<1
1,1,1,2-tetrachloroethane	µg/L	<1	<1	<1	<1
Chlorobenzene	µg/L	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1

VOCs in water					
Our Reference		381997-1	381997-2	381997-3	381997-4
Your Reference	UNITS	101A	108A	109	BD1/20250529
Date Sampled		29/05/2025	29/05/2025	29/05/2025	29/05/2025
Type of sample		Water	Water	Water	Water
Bromoform	µg/L	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2
Styrene	µg/L	<1	<1	<1	<1
1,1,2,2-tetrachloroethane	µg/L	<1	<1	<1	<1
o-xylene	µg/L	<1	<1	<1	<1
1,2,3-trichloropropane	µg/L	<1	<1	<1	<1
Isopropylbenzene	µg/L	<1	<1	<1	<1
Bromobenzene	µg/L	<1	<1	<1	<1
n-propyl benzene	µg/L	<1	<1	<1	<1
2-chlorotoluene	µg/L	<1	<1	<1	<1
4-chlorotoluene	µg/L	<1	<1	<1	<1
1,3,5-trimethyl benzene	µg/L	<1	<1	<1	<1
Tert-butyl benzene	µg/L	<1	<1	<1	<1
1,2,4-trimethyl benzene	µg/L	<1	<1	<1	<1
1,3-dichlorobenzene	µg/L	<1	<1	<1	<1
Sec-butyl benzene	µg/L	<1	<1	<1	<1
1,4-dichlorobenzene	µg/L	<1	<1	<1	<1
4-isopropyl toluene	µg/L	<1	<1	<1	<1
1,2-dichlorobenzene	µg/L	<1	<1	<1	<1
n-butyl benzene	µg/L	<1	<1	<1	<1
1,2-dibromo-3-chloropropane	µg/L	<1	<1	<1	<1
1,2,4-trichlorobenzene	µg/L	<1	<1	<1	<1
Hexachlorobutadiene	µg/L	<1	<1	<1	<1
1,2,3-trichlorobenzene	µg/L	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	106	105	105	106
Surrogate Toluene-d8	%	100	99	100	100
Surrogate 4-Bromofluorobenzene	%	98	98	96	98

vTRH(C6-C10)/BTEXN in Water						
Our Reference		381997-1	381997-2	381997-3	381997-4	381997-5
Your Reference	UNITS	101A	108A	109	BD1/20250529	Trip Spike
Date Sampled		29/05/2025	29/05/2025	29/05/2025	29/05/2025	29/05/2025
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	30/05/2025	30/05/2025	30/05/2025	30/05/2025	30/05/2025
Date analysed	-	02/06/2025	02/06/2025	02/06/2025	02/06/2025	02/06/2025
TRH C_6 - C_9	µg/L	<10	<10	<10	<10	[NA]
TRH C_6 - C_{10}	µg/L	<10	<10	<10	<10	[NA]
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10	<10	[NA]
Benzene	µg/L	<1	<1	<1	<1	109%
Toluene	µg/L	<1	<1	<1	<1	107%
Ethylbenzene	µg/L	<1	<1	<1	<1	107%
m+p-xylene	µg/L	<2	<2	<2	<2	105%
o-xylene	µg/L	<1	<1	<1	<1	106%
Naphthalene	µg/L	<1	<1	<1	<1	[NA]
Surrogate Dibromofluoromethane	%	106	105	105	106	104
Surrogate Toluene-d8	%	100	99	100	100	101
Surrogate 4-Bromofluorobenzene	%	98	98	96	98	101

vTRH(C6-C10)/BTEXN in Water		
Our Reference		381997-6
Your Reference	UNITS	Trip Blank
Date Sampled		29/05/2025
Type of sample		Water
Date extracted	-	30/05/2025
Date analysed	-	02/06/2025
TRH C_6 - C_9	µg/L	<10
TRH C_6 - C_{10}	µg/L	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10
Benzene	µg/L	<1
Toluene	µg/L	<1
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	<2
o-xylene	µg/L	<1
Naphthalene	µg/L	<1
Surrogate Dibromofluoromethane	%	105
Surrogate Toluene-d8	%	101
Surrogate 4-Bromofluorobenzene	%	98

svTRH (C10-C40) in Water					
Our Reference		381997-1	381997-2	381997-3	381997-4
Your Reference	UNITS	101A	108A	109	BD1/20250529
Date Sampled		29/05/2025	29/05/2025	29/05/2025	29/05/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	03/06/2025	03/06/2025	03/06/2025	03/06/2025
Date analysed	-	03/06/2025	03/06/2025	03/06/2025	04/06/2025
TRH C_{10} - C_{14}	µg/L	<50	<50	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100	<100	<100
Total +ve TRH (C10-C36)	µg/L	<50	<50	<50	<50
TRH >C_{10} - C_{16}	µg/L	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50	<50	<50
TRH >C_{16} - C_{34}	µg/L	<100	<100	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	µg/L	<50	<50	<50	<50
Surrogate o-Terphenyl	%	112	102	111	105

PAHs in Water					
Our Reference		381997-1	381997-2	381997-3	381997-4
Your Reference	UNITS	101A	108A	109	BD1/20250529
Date Sampled		29/05/2025	29/05/2025	29/05/2025	29/05/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	03/06/2025	03/06/2025	03/06/2025	03/06/2025
Date analysed	-	05/06/2025	05/06/2025	05/06/2025	05/06/2025
Naphthalene	µg/L	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	µg/L	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	<0.1	<0.1	<0.1	<0.1
Fluorene	µg/L	<0.1	<0.1	<0.1	<0.1
Phenanthrene	µg/L	<0.1	<0.1	<0.1	<0.1
Anthracene	µg/L	<0.1	<0.1	<0.1	<0.1
Fluoranthene	µg/L	<0.1	<0.1	<0.1	<0.1
Pyrene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	µg/L	<0.1	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d14	%	97	99	116	92

Organochlorine Pesticides in Water					
Our Reference	UNITS	381997-1	381997-2	381997-3	381997-4
Your Reference		101A	108A	109	BD1/20250529
Date Sampled		29/05/2025	29/05/2025	29/05/2025	29/05/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	03/06/2025	03/06/2025	03/06/2025	03/06/2025
Date analysed	-	05/06/2025	05/06/2025	05/06/2025	05/06/2025
alpha-BHC	µg/L	<0.2	<0.2	<0.2	<0.2
HCB	µg/L	<0.2	<0.2	<0.2	<0.2
beta-BHC	µg/L	<0.2	<0.2	<0.2	<0.2
gamma-BHC	µg/L	<0.2	<0.2	<0.2	<0.2
Heptachlor	µg/L	<0.2	<0.2	<0.2	<0.2
delta-BHC	µg/L	<0.2	<0.2	<0.2	<0.2
Aldrin	µg/L	<0.2	<0.2	<0.2	<0.2
Heptachlor Epoxide	µg/L	<0.2	<0.2	<0.2	<0.2
gamma-Chlordane	µg/L	<0.2	<0.2	<0.2	<0.2
alpha-Chlordane	µg/L	<0.2	<0.2	<0.2	<0.2
Endosulfan I	µg/L	<0.2	<0.2	<0.2	<0.2
pp-DDE	µg/L	<0.2	<0.2	<0.2	<0.2
Dieldrin	µg/L	<0.2	<0.2	<0.2	<0.2
Endrin	µg/L	<0.2	<0.2	<0.2	<0.2
Endosulfan II	µg/L	<0.2	<0.2	<0.2	<0.2
pp-DDD	µg/L	<0.2	<0.2	<0.2	<0.2
Endrin Aldehyde	µg/L	<0.2	<0.2	<0.2	<0.2
pp-DDT	µg/L	<0.2	<0.2	<0.2	<0.2
Endosulfan Sulphate	µg/L	<0.2	<0.2	<0.2	<0.2
Methoxychlor	µg/L	<0.2	<0.2	<0.2	<0.2
Mirex	ug/L	<0.2	<0.2	<0.2	<0.2
Surrogate 4-Chloro-3-NBTF	%	100	94	105	84

OP Pesticides in Water					
Our Reference		381997-1	381997-2	381997-3	381997-4
Your Reference	UNITS	101A	108A	109	BD1/20250529
Date Sampled		29/05/2025	29/05/2025	29/05/2025	29/05/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	03/06/2025	03/06/2025	03/06/2025	03/06/2025
Date analysed	-	05/06/2025	05/06/2025	05/06/2025	05/06/2025
Dichlorvos	µg/L	<0.2	<0.2	<0.2	<0.2
Mevinphos	µg/L	<0.2	<0.2	<0.2	<0.2
Phorate	µg/L	<0.2	<0.2	<0.2	<0.2
Dimethoate	µg/L	<0.2	<0.2	<0.2	<0.2
Diazinon	µg/L	<0.2	<0.2	<0.2	<0.2
Disulfoton	µg/L	<0.2	<0.2	<0.2	<0.2
Chlorpyriphos-methyl	µg/L	<0.2	<0.2	<0.2	<0.2
Parathion-Methyl	µg/L	<0.2	<0.2	<0.2	<0.2
Ronnel	µg/L	<0.2	<0.2	<0.2	<0.2
Fenitrothion	µg/L	<0.2	<0.2	<0.2	<0.2
Malathion	µg/L	<0.2	<0.2	<0.2	<0.2
Chlorpyriphos	µg/L	<0.2	<0.2	<0.2	<0.2
Fenthion	µg/L	<0.2	<0.2	<0.2	<0.2
Parathion	µg/L	<0.2	<0.2	<0.2	<0.2
Bromophos ethyl	µg/L	<0.2	<0.2	<0.2	<0.2
Methidathion	µg/L	<0.2	<0.2	<0.2	<0.2
Fenamiphos	µg/L	<0.2	<0.2	<0.2	<0.2
Ethion	µg/L	<0.2	<0.2	<0.2	<0.2
Phosalone	µg/L	<0.2	<0.2	<0.2	<0.2
Azinphos-methyl (Guthion)	µg/L	<0.2	<0.2	<0.2	<0.2
Coumaphos	µg/L	<0.2	<0.2	<0.2	<0.2
Surrogate 4-Chloro-3-NBTF	%	100	94	105	84

PCBs in Water					
Our Reference		381997-1	381997-2	381997-3	381997-4
Your Reference	UNITS	101A	108A	109	BD1/20250529
Date Sampled		29/05/2025	29/05/2025	29/05/2025	29/05/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	03/06/2025	03/06/2025	03/06/2025	03/06/2025
Date analysed	-	05/06/2025	05/06/2025	05/06/2025	05/06/2025
Aroclor 1016	µg/L	<2	<2	<2	<2
Aroclor 1221	µg/L	<2	<2	<2	<2
Aroclor 1232	µg/L	<2	<2	<2	<2
Aroclor 1242	µg/L	<2	<2	<2	<2
Aroclor 1248	µg/L	<2	<2	<2	<2
Aroclor 1254	µg/L	<2	<2	<2	<2
Aroclor 1260	µg/L	<2	<2	<2	<2
Surrogate 2-Fluorobiphenyl	%	94	87	101	87

Total Phenolics in Water					
Our Reference		381997-1	381997-2	381997-3	381997-4
Your Reference	UNITS	101A	108A	109	BD1/20250529
Date Sampled		29/05/2025	29/05/2025	29/05/2025	29/05/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	02/06/2025	02/06/2025	02/06/2025	02/06/2025
Date analysed	-	03/06/2025	03/06/2025	03/06/2025	03/06/2025
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05	<0.05

HM in water - dissolved					
Our Reference		381997-1	381997-2	381997-3	381997-4
Your Reference	UNITS	101A	108A	109	BD1/20250529
Date Sampled		29/05/2025	29/05/2025	29/05/2025	29/05/2025
Type of sample		Water	Water	Water	Water
Date prepared	-	02/06/2025	02/06/2025	02/06/2025	02/06/2025
Date analysed	-	02/06/2025	02/06/2025	02/06/2025	02/06/2025
Arsenic-Dissolved	µg/L	<1	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1
Copper-Dissolved	µg/L	<1	<1	1	<1
Lead-Dissolved	µg/L	<1	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	<1	<1	<1	<1
Zinc-Dissolved	µg/L	6	11	2	11

Metals in Waters - Acid extractable				
Our Reference		381997-1	381997-2	381997-3
Your Reference	UNITS	101A	108A	109
Date Sampled		29/05/2025	29/05/2025	29/05/2025
Type of sample		Water	Water	Water
Date prepared	-	03/06/2025	03/06/2025	03/06/2025
Date analysed	-	03/06/2025	03/06/2025	03/06/2025
Phosphorus - Total	mg/L	<0.05	<0.05	<0.05

Ion Balance				
Our Reference		381997-1	381997-2	381997-3
Your Reference	UNITS	101A	108A	109
Date Sampled		29/05/2025	29/05/2025	29/05/2025
Type of sample		Water	Water	Water
Date prepared	-	30/05/2025	30/05/2025	30/05/2025
Date analysed	-	30/05/2025	30/05/2025	30/05/2025
Calcium - Dissolved	mg/L	1	0.7	6.8
Potassium - Dissolved	mg/L	<0.5	1	1
Sodium - Dissolved	mg/L	27	22	42
Magnesium - Dissolved	mg/L	2	1	4
Hardness (calc) equivalent $CaCO_3$	mg/L	9.1	6.1	34
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	10	11	40
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	10	11	40
Sulphate, SO4	mg/L	13	23	6
Chloride, Cl	mg/L	32	14	57
Ionic Balance	%	0	0	0

Miscellaneous Inorganics					
Our Reference	UNITS	381997-1	381997-2	381997-3	381997-4
Your Reference		101A	108A	109	BD1/20250529
Date Sampled		29/05/2025	29/05/2025	29/05/2025	29/05/2025
Type of sample		Water	Water	Water	Water
Date prepared	-	30/05/2025	30/05/2025	30/05/2025	30/05/2025
Date analysed	-	30/05/2025	30/05/2025	30/05/2025	30/05/2025
pH	pH Units	5.6	5.6	6.2	[NA]
Electrical Conductivity	µS/cm	180	140	320	[NA]
Total Suspended Solids	mg/L	64	36	20	[NA]
Total Dissolved Solids (grav)	mg/L	110	83	170	[NA]
Total Cyanide	mg/L	<0.004	<0.004	<0.004	<0.004
Weak Acid Dissociable Cyanide	mg/L	<0.004	<0.004	<0.004	<0.004
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004	<0.004
Ammonia as N in water	mg/L	0.01	0.02	<0.005	[NA]
Nitrate as N in water	mg/L	0.006	<0.005	<0.005	[NA]
Nitrite as N in water	mg/L	0.006	0.006	0.008	[NA]
NOx as N in water	mg/L	0.01	0.009	0.009	[NA]
TKN in water	mg/L	<0.1	<0.1	<0.1	[NA]
Total Nitrogen in water	mg/L	<0.1	<0.1	<0.1	[NA]
Organic Nitrogen as N	mg/L	<0.2	<0.2	<0.2	[NA]
Phosphate as P in water	mg/L	0.02	0.009	0.02	[NA]

Microbiological Testing					
Our Reference		381997-1	381997-2	381997-3	381997-4
Your Reference	UNITS	101A	108A	109	BD1/20250529
Date Sampled		29/05/2025	29/05/2025	29/05/2025	29/05/2025
Type of sample		Water	Water	Water	Water
Date of testing	-	30/05/2025	30/05/2025	30/05/2025	30/05/2025
E. coli	cfu/100mL	<1000 NBO	<1000	<10	<1000
Faecal Coliforms	cfu/100mL	<1000 NBO	25,000	<10	<1000

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-014	Cyanide - free, total, weak acid dissociable by segmented flow analyser (in line dialysis with colourimetric finish). Solids/Filters and sorbents are extracted in a caustic media prior to analysis. Impingers are pH adjusted as required prior to analysis. Cyanides amenable to Chlorination - samples are analysed untreated and treated with hypochlorite to assess the potential for chlorination of cyanide forms. Based on APHA latest edition, 4500-CN_G,H.
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:- TDS = EC * 0.6
Inorg-019	Suspended Solids - determined gravimetricially by filtration of the sample. The samples are dried at 104+/-5°C.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
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).

Method ID	Methodology Summary
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.
Metals-020	Determination of various metals by ICP-AES. Total Phosphate determined stochiometrically 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.
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-021/022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD and/or GC-MS/GC-MSMS. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

QUALITY CONTROL: VOCs in water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date Extracted	-			30/05/2025	1	30/05/2025	02/06/2025		30/05/2025	[NT]
Date Analysed	-			02/06/2025	1	02/06/2025	03/06/2025		02/06/2025	[NT]
Dichlorodifluoromethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Chloromethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Vinyl Chloride	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Bromomethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Chloroethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Trichlorofluoromethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
1,1-Dichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Trans-1,2-dichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1-dichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	95	[NT]
Cis-1,2-dichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromochloromethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chloroform	µg/L	1	Org-023	<1	1	<1	<1	0	98	[NT]
2,2-dichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	100	[NT]
1,1,1-trichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	101	[NT]
1,1-dichloropropene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Cyclohexane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Carbon tetrachloride	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	94	[NT]
Dibromomethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Trichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	99	[NT]
Bromodichloromethane	µg/L	1	Org-023	<1	1	<1	<1	0	100	[NT]
trans-1,3-dichloropropene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
cis-1,3-dichloropropene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1,2-trichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	94	[NT]
1,3-dichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Dibromochloromethane	µg/L	1	Org-023	<1	1	<1	<1	0	98	[NT]
1,2-dibromoethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Tetrachloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	105	[NT]
1,1,1,2-tetrachloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	94	[NT]
Bromoform	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	93	[NT]
Styrene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1,2,2-tetrachloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]

QUALITY CONTROL: VOCs in water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	93	[NT]
1,2,3-trichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Isopropylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
n-propyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
2-chlorotoluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
4-chlorotoluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,3,5-trimethyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Tert-butyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,4-trimethyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,3-dichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Sec-butyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,4-dichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
4-isopropyl toluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
n-butyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dibromo-3-chloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,4-trichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Hexachlorobutadiene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,3-trichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	105	1	106	106	0	103	[NT]
Surrogate Toluene-d8	%		Org-023	99	1	100	100	0	102	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	95	1	98	97	1	104	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date extracted	-			30/05/2025	1	30/05/2025	02/06/2025		30/05/2025	[NT]
Date analysed	-			02/06/2025	1	02/06/2025	03/06/2025		02/06/2025	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	1	<10	<10	0	94	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	1	<10	<10	0	94	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	94	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	94	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	94	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	93	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	93	[NT]
Naphthalene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	105	1	106	106	0	103	[NT]
Surrogate Toluene-d8	%		Org-023	99	1	100	100	0	102	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	95	1	98	97	1	104	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			03/06/2025	1	03/06/2025	03/06/2025		03/06/2025	[NT]
Date analysed	-			03/06/2025	1	03/06/2025	03/06/2025		03/06/2025	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	1	<50	<50	0	94	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	1	<100	<100	0	96	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	1	<100	<100	0	86	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	1	<50	<50	0	94	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	1	<100	<100	0	96	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	1	<100	<100	0	86	[NT]
Surrogate o-Terphenyl	%		Org-020	103	1	112	109	3	100	[NT]

QUALITY CONTROL: PAHs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	381997-2
Date extracted	-			03/06/2025	1	03/06/2025	03/06/2025		03/06/2025	03/06/2025
Date analysed	-			05/06/2025	1	05/06/2025	05/06/2025		05/06/2025	05/06/2025
Naphthalene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	79	80
Acenaphthylene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	74	74
Fluorene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	84	84
Phenanthrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	91	88
Anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	85	85
Pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	91	90
Benzo(a)anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	81	80
Benzo(b,j+k)fluoranthene	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	82	82
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	101	1	97	100	3	107	97

QUALITY CONTROL: Organochlorine Pesticides in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	381997-2
Date extracted	-			03/06/2025	1	03/06/2025	03/06/2025		03/06/2025	03/06/2025
Date analysed	-			05/06/2025	1	05/06/2025	05/06/2025		05/06/2025	05/06/2025
alpha-BHC	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	90	91
HCB	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
beta-BHC	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	89	88
gamma-BHC	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Heptachlor	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	84	83
delta-BHC	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Aldrin	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	87	91
Heptachlor Epoxide	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	97	94
gamma-Chlordane	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
alpha-Chlordane	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Endosulfan I	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
pp-DDE	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	83	82
Dieldrin	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	90	90
Endrin	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	81	82
Endosulfan II	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
pp-DDD	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	94	93
Endrin Aldehyde	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
pp-DDT	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Endosulfan Sulphate	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	91	92
Methoxychlor	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Mirex	ug/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	91	1	100	94	6	101	102

QUALITY CONTROL: OP Pesticides in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	381997-2
Date extracted	-			03/06/2025	1	03/06/2025	03/06/2025		03/06/2025	03/06/2025
Date analysed	-			05/06/2025	1	05/06/2025	05/06/2025		05/06/2025	05/06/2025
Dichlorvos	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	98	95
Mevinphos	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Phorate	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Dimethoate	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Diazinon	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Disulfoton	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Chlorpyriphos-methyl	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Parathion-Methyl	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Ronnel	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	88	87
Fenitrothion	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	92	88
Malathion	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	97	94
Chlorpyriphos	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	96	96
Fenthion	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Parathion	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	85	82
Bromophos ethyl	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Methidathion	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Fenamiphos	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Ethion	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	97	96
Phosalone	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Azinphos-methyl (Guthion)	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Coumaphos	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	91	1	100	94	6	101	102

QUALITY CONTROL: PCBs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	381997-2
Date extracted	-			03/06/2025	1	03/06/2025	03/06/2025		03/06/2025	03/06/2025
Date analysed	-			05/06/2025	1	05/06/2025	05/06/2025		05/06/2025	05/06/2025
Aroclor 1016	µg/L	2	Org-021/022/025	<2	1	<2	<2	0	[NT]	[NT]
Aroclor 1221	µg/L	2	Org-021/022/025	<2	1	<2	<2	0	[NT]	[NT]
Aroclor 1232	µg/L	2	Org-021/022/025	<2	1	<2	<2	0	[NT]	[NT]
Aroclor 1242	µg/L	2	Org-021/022/025	<2	1	<2	<2	0	[NT]	[NT]
Aroclor 1248	µg/L	2	Org-021/022/025	<2	1	<2	<2	0	[NT]	[NT]
Aroclor 1254	µg/L	2	Org-021/022/025	<2	1	<2	<2	0	100	102
Aroclor 1260	µg/L	2	Org-021/022/025	<2	1	<2	<2	0	[NT]	[NT]
Surrogate 2-Fluorobiphenyl	%		Org-021/022/025	90	1	94	93	1	96	94

QUALITY CONTROL: Total Phenolics in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			02/06/2025	1	02/06/2025	02/06/2025		02/06/2025	[NT]
Date analysed	-			03/06/2025	1	03/06/2025	03/06/2025		03/06/2025	[NT]
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	1	<0.05	<0.05	0	101	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W6	381997-2
Date prepared	-			02/06/2025	1	02/06/2025	02/06/2025		02/06/2025	02/06/2025
Date analysed	-			02/06/2025	1	02/06/2025	02/06/2025		02/06/2025	02/06/2025
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		107	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	<0.1	[NT]		98	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		114	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		107	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		95	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0.05	0	89	94
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		108	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	6	[NT]		111	[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	-			03/06/2025	[NT]	[NT]	[NT]	[NT]	03/06/2025	[NT]
Date analysed	-			03/06/2025	[NT]	[NT]	[NT]	[NT]	03/06/2025	[NT]
Phosphorus - Total	mg/L	0.05	Metals-020	<0.05	[NT]	[NT]	[NT]	[NT]	118	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			30/05/2025	1	30/05/2025	30/05/2025		30/05/2025	[NT]
Date analysed	-			30/05/2025	1	30/05/2025	30/05/2025		30/05/2025	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	1	1	0	103	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	<0.5	<0.5	0	99	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	27	28	4	101	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	2	2	0	101	[NT]
Hardness (calc) equivalent $CaCO_3$	mg/L	3	Metals-020	[NT]	1	9.1	9.2	1	[NT]	[NT]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	1	<5	[NT]		[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	10	[NT]		[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	<5	[NT]		[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	10	[NT]		109	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	1	13	[NT]		93	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	1	32	[NT]		90	[NT]
Ionic Balance	%		Inorg-040	[NT]	1	0	NT		[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			30/05/2025	1	30/05/2025	30/05/2025		30/05/2025	[NT]
Date analysed	-			30/05/2025	1	30/05/2025	30/05/2025		30/05/2025	[NT]
pH	pH Units		Inorg-001	[NT]	1	5.6	[NT]		100	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	<1	1	180	[NT]		101	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	<5	1	64	[NT]		84	[NT]
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	<5	1	110	[NT]		101	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	<0.004	1	<0.004	<0.004	0	104	[NT]
Weak Acid Dissociable Cyanide	mg/L	0.004	Inorg-014	<0.004	1	<0.004	<0.004	0	111	[NT]
Free Cyanide in Water	mg/L	0.004	Inorg-014	<0.004	1	<0.004	<0.004	0	101	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.01	[NT]		100	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.006	[NT]		95	[NT]
Nitrite as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.006	[NT]		106	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.01	[NT]		97	[NT]
TKN in water	mg/L	0.1	Inorg-062	<0.1	1	<0.1	[NT]		[NT]	[NT]
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	<0.1	1	<0.1	[NT]		91	[NT]
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	0.02	[NT]		111	[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.

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.

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.

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. W2512172.

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

NBO: The presence of competing background organisms in the sample may have reduced the count

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

Total Metals: The preserved sample provided was not identified as either total or dissolved, therefore the analysis was conducted from the unpreserved sample.
Note: there is a possibility some elements may be underestimated