



REPORT TO
SUNDALE NORTHLAND DEVELOPMENT PTY LTD
ATF SUNDALE NORTHLAND DEVELOPMENT UNIT
TRUST

ON
REMEDIAION ACTION PLAN

FOR
PROPOSED RESIDENTIAL DEVELOPMENT

AT
12-16 BENT STREET, LINDFIELD, NSW

Date: 19 May 2025

Ref: E35535BWrpt6-RAP

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Executive Summary

Sundale Northland Development Pty Ltd ATF Sundale Northland Development Unit Trust ('the client') commissioned JK Environments (JKE) to prepare a Remediation Action Plan (RAP) for the proposed residential development at 12-16 Bent Street, Lindfield, NSW ('the site'). The site location is shown on Figure 1 and the RAP applies to the land within the site boundaries as shown on Figure 2 attached in Appendix A.

This RAP has been prepared to support the lodgement of a State Significant Development Application (SSDA) for the proposed residential development, with regards to Chapter 4 of State Environmental Planning Policy (Resilience and Hazards) 2021 (formerly known as SEPP55).

JKE have prepared a Preliminary Site Contamination Investigation (PSI), Preliminary Groundwater Quality Screening and Detailed Site Investigation (DSI) for the proposed development. The previous investigations at the site identified historically imported fill soils impacted by heavy metals and asbestos which are primarily suspected to be associated with fill/soil inclusions and from historical building demolition activities. Remediation of the site is required to mitigate potential risks associated with these contaminants.

The goal of the remediation is to reduce contamination-related risks to human health and the environment, and to render the site suitable for the proposed development from a contamination viewpoint. The primary aim of the remediation at the site is to mitigate risks from heavy metals and asbestos in fill/soil. The objectives of this RAP are to:

- Provide a rationale to support the extent of proposed remediation and the remedial/validation approach;
- Provide a methodology to remediate and validate the site;
- Provide a contingency plan for the remediation works;
- Outline site management procedures to be implemented during remediation work; and
- Provide an unexpected finds protocol to be implemented during the development works.

The proposed remediation strategy includes 'excavation and off-site disposal' of contaminated fill/soil to a suitably licensed landfill. This process aligns closely with the proposed development works which include excavation for a proposed basement. The strategy is expected to be effective to mitigate the contamination risks. The remedial strategy also avoids the need for statutory on-going management under the provisions of a long-term Environmental Management Plan (EMP).

The anticipated sequence of remediation works is outlined in Section 5.3 of this RAP. Remediation will occur prior to the commencement of the built form of the development.

We are of the opinion that the site can be made suitable for the proposed development via remediation and the implementation of this RAP. A site validation report is to be prepared on completion of remediation activities and submitted to the consent authority to demonstrate that the site is suitable for the proposed development following completion of remediation/validation.

The conclusions and recommendations should be read in conjunction with the limitations presented in the body of this report.



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Abbreviations

Asbestos Containing Material	ACM
Asbestos Fines/Fibrous Asbestos	AF/FA
Asbestos Management Plan	AMP
Area of Environmental Concern	AEC
Australian Height Datum	AHD
Acid Sulfate Soil	ASS
Below Ground Level	BGL
Benzene, Toluene, Ethylbenzene, Xylene	BTEX
Contaminated Land Management	CLM
Construction Environmental Management Plan	CEMP
Contaminant(s) of Potential Concern	CoPC
Chain of Custody	COC
Conceptual Site Model	CSM
Development Application	DA
Data Quality Indicator	DQI
Data Quality Objective	DQO
Detailed Site Investigation	DSI
Ecological Investigation Level	EIL
Ecological Screening Level	ESL
Environmental Management Plan	EMP
Environment Protection Authority	EPA
Fibre Cement Fragment(s)	FCF
General Approval of Immobilisation	GAI
Health Investigation Level	HIL
Health Screening Level	HSL
International Organisation of Standardisation	ISO
JK Environments	JKE
Lab Control Spike	LCS
National Association of Testing Authorities	NATA
National Environmental Protection Measure	NEPM
Organochlorine Pesticides	OCP
Organophosphate Pesticides	OPP
Polycyclic Aromatic Hydrocarbons	PAH
Polychlorinated Biphenyls	PCB
Photo-ionisation Detector	PID
Protection of the Environment Operations	POEO
Practical Quantitation Limit	PQL
Quality Assurance	QA
Quality Control	QC
Residential Aged Care	RAC
Remediation Action Plan	RAP
Remedial Works Plan	RWP
Relative Percentage Difference	RPD
Site Assessment Criteria	SAC
Sampling, Analysis and Quality Plan	SAQP
State Environmental Planning Policy	SEPP
Source, Pathway, Receptor	SPR
Standing Water Level	SWL
Toxicity Characteristic Leaching Procedure	TCLP
Total Recoverable Hydrocarbons	TRH
Upper Confidence Limit	UCL
United States Environmental Protection Agency	USEPA
Virgin Excavated Natural Material	VENM



Volatile Organic Compounds
Work Health and Safety

VOC
WHS

Units

Litres

L

Metres BGL

mBGL

Metres

m

Millilitres

ml or mL

Milligrams per Kilogram

mg/kg

Milligrams per Litre

mg/L

Parts Per Million

ppm

Percentage

%

Percentage weight for weight

%w/w



1 INTRODUCTION

Sundale Northland Development Pty Ltd ATF Sundale Northland Development Unit Trust ('the client') commissioned JK Environments (JKE) to prepare a Remediation Action Plan (RAP) for the proposed residential development at 12-16 Bent Street, Lindfield, NSW ('the site'). The site location is shown on Figure 1 and the RAP applies to the land within the site boundaries as shown on Figure 2 attached in Appendix A.

This RAP has been prepared to support the lodgement of a State Significant Development Application (SSDA) for the proposed residential development, with regards to Chapter 4 of State Environmental Planning Policy (Resilience and Hazards) 2021¹ (formerly known as SEPP55).

JKE have prepared a Preliminary Site Contamination Investigation (PSI), Preliminary Groundwater Quality Screening and Detailed Site Investigation (DSI) for the proposed development. The previous investigations at the site identified historically imported fill soils impacted by heavy metals and asbestos which are primarily suspected to be associated with fill/soil inclusions and from historical building demolition activities. Remediation of the site is required to mitigate potential risks associated with these contaminants. A summary of the previous investigations is provided in Section 2.

JKE were also commissioned to undertake an Acid Sulfate Soil (ASS) assessment, a Dryland Salinity Assessment and a Surface and Groundwater Impact Assessment (SGIA) for the SSDA. The results of above assessments have been presented in individual reports issued to the client. The RAP should be read in conjunction with the other reports.

The RAP includes a methodology to remediate and validate the site, to demonstrate that the site can be made suitable for the proposed development from a contamination viewpoint.

This RAP must be read and implemented in conjunction with the recommendations of the geotechnical investigation report prepared by our geotechnical division, JK Geotechnics (JKG) (Project ref: 35535YCrpt2, dated 9 January 2025)².

1.1 Proposed Development Details

A review of the supplied information indicates that the proposed development will comprise demolition of the existing residences and associated structures followed by the construction of a new 9-storey residential building over a partial basement Ground Floor (G) level and three common basement levels (B1, B2 and B3).

The proposed finished floor level (FFL) of the lowest basement level B3 is at RL 71.6m Australian Height Datum (AHD), which requires bulk excavation to a depth of approximately 15.5m below ground level (BGL) within the north-eastern high side of the site and to approximately 9mBGL within the south-western low side of the site. The basements will be set back approximately 3m from the north-western and north-eastern site boundaries and 6m from the south-western and south-eastern boundaries as indicated on Figure 2.

¹ State Environmental Planning Policy (Resilience and Hazards) 2021 (NSW) (referred to as SEPP Resilience and Hazards 2021)

² JKG, (2025). Report to Sundale Northland Development P/L on Geotechnical Investigation for Proposed Residential Development at 12-16 Bent Street, Lindfield, NSW (Referred to as JKG report)



Landscaped areas are proposed within the basement off-set areas. The client supplied proposed development plans are included in Appendix B.

1.2 Remediation Goal, Aims and Objectives

The goal of the remediation is to reduce contamination-related risks to human health and the environment, and to render the site suitable for the proposed development from a contamination viewpoint. The primary aim of the remediation at the site is to mitigate risks from heavy metals and asbestos in fill/soil. The objectives of this RAP are to:

- Provide a rationale to support the extent of proposed remediation and the remedial/validation approach;
- Provide a methodology to remediate and validate the site;
- Provide a contingency plan for the remediation works;
- Outline site management procedures to be implemented during remediation work; and
- Provide an unexpected finds protocol to be implemented during the development works.

1.3 Scope of Work

The RAP was prepared generally in accordance with a JKE proposal (Ref: EP71389BW) of 20 March 2025 and written acceptance from the client of 27 March 2025. The scope of work included review of the previous reports and preparation of a RAP.

The scope of work was undertaken with reference to the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)³, Consultants Reporting on Contaminated Land (2020)⁴ guidelines, other guidelines made under or with regards to the Contaminated Land Management Act (1997)⁵ and SEPP Resilience and Hazards 2021. A list of reference documents/guidelines is included in the appendices.

³ National Environment Protection Council (NEPC), (2013). *National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013)*. (referred to as NEPM 2013)

⁴ NSW EPA, (2020). *Consultants reporting on contaminated land, Contaminated Land Guidelines*. (referred to as Consultants Reporting Guidelines)

⁵ Contaminated Land Management Act 1997 (NSW) (referred to as CLM Act 1997)



2 SITE INFORMATION

2.1 Summary of Previous Investigations

A summary of relevant information from the previous JKE investigation is outlined in the table below:

Table 2-1: Previous Information Summary

Report	Summary of relevant information
PSI, JKE 2025a ⁶	<p>The PSI included a review of historical information, site walkover inspection and soil sampling from six boreholes (BH2, BH3, BH8A, BH9, BH101 and BH102) concurrently with the JKG geotechnical investigation. The PSI included data from 14-16 Bent Street which was obtained in 2022. The 2022 data included site history information and sub-surface soil data from boreholes BH2, BH3, BH8A and BH9. No. 12 Bent Street was incorporated into the revised PSI in 2024.</p> <p>The PSI identified that the site has historically been used for residential purposes since at least 1943. Building demolition and construction activities were identified at the site. The central portion of the site (14 Bent Street) has likely been used for hobby farm type agricultural activities. The site history and site walkover inspection identified the following areas of environmental concern (AEC): imported fill material; historical agricultural activities; use of pesticides; hazardous building materials; and up-gradient off-site dry cleaners, motor garage/service stations and general up-gradient industrial activities.</p> <p>The boreholes drilled for the PSI generally encountered fill material to depths of approximately 0.1mBGL to 1.2mBGL, underlain by residual silty clay soils and sandstone bedrock. The fill typically comprised sandy silty clay and silty sandy clay with inclusions of igneous, ironstone and sandstone gravel, clay nodules, ceramic, concrete and plastic fragments, roots and root fibres and ash.</p> <p>The PSI laboratory results identified zinc and nickel in fill above the ecological site assessment criteria (SAC). The source of the zinc was considered to be associated with imported fill soil. The elevations are shown on Figure 3.</p> <p>The PSI did not identify any contamination that would preclude the proposed development/use of the site. The following was recommended:</p> <ul style="list-style-type: none"> • Undertake a DSI to characterise the site contamination conditions and establish whether remediation is required. An SAQP is to be prepared prior to the commencement of the DSI; and • Undertake a hazardous building materials (HAZMAT) survey for the existing residences and structures prior to demolition.
Preliminary Groundwater Quality Screening, JKE 2025b ⁷	<p>The groundwater quality screening included sampling and laboratory analysis of groundwater from three existing onsite wells (MW101 to MW103 inclusive). The groundwater monitoring wells are shown on Figure 2 attached in the appendices.</p> <p>The primary objective of the screening was to provide preliminary groundwater quality data that could be used to support an application for a temporary construction dewatering license with WaterNSW.</p>

⁶ JKE, (2025a). Report to Sundale Northland Development Pty Ltd ATF Sundale Northland Development Unit Trust on Preliminary Site Contamination Investigation (PSI) for Proposed Residential Development at 12-16 Bent Street, Lindfield, NSW. (Ref: E35535BWrptRev2, dated 18 March 2025) (referred to as PSI)

⁷ JKE, (2025b). Report to Sundale Northland Development Pty Ltd ATF Sundale Northland Development Unit Trust on Preliminary Groundwater Quality Screening for Proposed Residential Development at 12-16 Bent Street, Lindfield, NSW. (Ref: E35535BWrpt2-GW, dated 16 January 2025) (referred to as Groundwater Quality Screening)

Report	Summary of relevant information
	<p>The Preliminary Groundwater Quality Screening identified the following results above the SAC:</p> <ul style="list-style-type: none"> • The copper concentrations in one well (MW101) exceeded the ecological SAC; • The aluminium concentrations in one well (MW101) exceeded the ecological SAC; • The nickel and zinc concentrations in all three wells exceeded the ecological SAC; and • The pH in all three wells was outside the range for recreational and fresh waters. <p>JKE recommended that the groundwater be treated prior to discharge and the relevant consent authorities should be contacted to clarify the requirements to obtain disposal approval to stormwater or sewer. Reference should be made to the Preliminary Groundwater Quality Screening report for details or specific recommendations.</p>
DSI, JKE 2025c ⁸	<p>The DSI included a review of existing project information, a site inspection, soil sampling from 17 in-situ locations including six test pits and 11 boreholes and four stockpile locations, and groundwater sampling from the three groundwater monitoring wells (MW101 to MW103 inclusive) installed for the groundwater quality screening.</p> <p>The boreholes generally encountered fill to depths of approximately 0.2mBGL (BH309) to 1.4mBGL (TP315 and TP316), with inclusions of igneous, sandstone ironstone and quartz gravel, sandstone boulders, sand, building rubble (concrete, asphalt and tile fragments, bricks and glass), plastic, slag, ash, roots and root fibres. FCF/ACM were encountered in TP311 (0-0.1m) and SP4 (0-0.1m) during the DSI field work.</p> <p>A selection of soil and groundwater samples were analysed for the DSI. The following exceedances were report for each media:</p> <ul style="list-style-type: none"> • In fill soil: asbestos in the form of bonded FCF/ACM was detected in surficial soil (top 100mm) within TP311 (0-0.1m) and SP4 (0-0.1m), which is considered to be an exceedance above the human health SAC; and arsenic was reported at concentrations above the ecological SAC at the stockpile location SP1 (0.4-0.5m); • In FCF: asbestos was detected in the FCF samples collected from the ground surface located in the eastern portion of the site within 16 Bent Street; and • In groundwater: Copper, nickel and zinc concentrations were encountered in the groundwater above the ecological SAC from MW101, while only nickel and zinc concentrations were encountered above the ecological SAC in MW102 and MW103. pH was also outside of the acceptable range for recreational (human health) and ecological SAC in two monitoring wells (MW101 and MW103). <p>Based on the findings of the DSI, JKE is of the opinion that the site can be made suitable for the proposed development, subject to remediation. The following was recommended:</p> <ul style="list-style-type: none"> • Undertake a hazardous materials assessment of the existing onsite buildings and structures prior to demolition; • Preparation of a construction phase Asbestos Management Plan (AMP) by a suitably qualified consultant for the remediation and development works; • Preparation of a RAP; and • Preparation of a validation assessment report for the remediation works undertaken at the site.

The laboratory results summary tables and borehole logs from the PSI and DSI are attached in Appendix C and the SAC exceedances from the PSI and DSI are shown on Figure 3 in Appendix A.

⁸ JKE, (2025c). Report to Sundale Northland Development Pty Ltd ATF Sundale Northland Development Unit Trust on Detailed Site Investigation (DSI) for Proposed Residential Development at 12-16 Bent Street, Lindfield, NSW. (Ref: E35535BWrpt5-DSI, dated 1 May 2025) (referred to as DSI)

2.2 Site Identification

Table 2-2: Site Identification

Current Site Owner at time of PSI (certificate of title):	<ul style="list-style-type: none"> 12 Bent Street: Ku-Ring-Gai Council; 14 Bent Street (as of November 2022): Mark Haddon Carter and Ruth Louise Charles; and 16 Bent Street (as of November 2022): Deirdre Elizabeth Hall.
Site Address:	12-16 Bent Street, Lindfield, NSW
Lot & Deposited Plan:	Lot 1 in DP 318518, Lot 1 in DP 935936, Lot 1 in DP 960015, Lot 1 in DP 960014 and Lot 3 in DP 1226294
Current Land Use:	Residential and vacant land
Proposed Land Use:	Multi-storey residential
Local Government Area:	Ku-ring-gai Council
Current Zoning:	R4 – High Density Residential
Site Area (m²) (approx.):	4,300
RL (AHD in m) (approx.):	79-86
Geographical Location (decimal degrees) (approx.):	Latitude: -33.775889 Longitude: 151.166764
Site Plans:	Appendix A

2.3 Summary of Site Setting and Description

The site is located in a predominantly residential area of Lindfield and is bound by Bent Street to the north. The site is located approximately 1km to the north-east of Little Blue Gum Creek.

The regional topography is characterised by a west and north-west facing hillside that extends from a ridge feature located along Pacific Highway to the east. The site is located at the mid-slope of the hillside and slopes to the west at approximately 4°-5°, generally in sympathy with the regional topography. No. 12 Bent Street slopes to the west at approximately 3°-4°. A localised valley feature was located towards the south-west of the site, where the wider regional topography generally declines to the south-west towards Little Blue Gum Creek.

A walkover inspection of the site was undertaken by JKE for the PSI, and then again between 7 and 16 April 2025 for the DSI. At the time of the inspections, the site was occupied by two adjoining residences identified as 14 and 16 Bent Street. The residence within 16 Bent Street was vacant at the time of the DSI inspection. 12 Bent Street was grass covered, vacant and unoccupied at the time of the PSI and DSI inspections. The onsite residences were of brick and sandstone construction and appeared to be in a poor condition based on an external cursory inspection. Separate external structures including a fibre cement clad veranda and dilapidated metal shed were located within 14 and 16 Bent Street respectively.

Fill was observed within areas of exposed soil, especially within the garden beds located within the rear yard area of 14 Bent Street. A vegetated mound/batter and several mounds were located within 12 and 14 Bent Street along the south-eastern site boundary. Samples were collected from the onsite mounds as SP1 to SP4 inclusive during the DSI for site characterisation purposes.

Fibre cement sheets were observed in the west section of 16 Bent Street along the site boundary as shown on Figure 2. A representative sample was obtained for laboratory testing during the DSI.

Sensitive environments such as wetlands, ponds, creeks or extensive areas of natural vegetation were not identified on site or in the immediate surrounds. The onsite vegetation included exotic grasses, shrubs and trees of up to 15m in height. The onsite vegetation appeared in good conditions with no visible dieback or phyto-toxic stress observed.

2.4 Summary of Geology and Hydrogeology

2.4.1 Regional Geology and Subsurface Conditions

Regional geological information was reviewed for the PSI and DSI. The investigations indicated that the site is underlain by Ashfield Shale of the Wianamatta Group, which typically consists of black to dark grey shale and laminite.

The boreholes drilled for the PSI and DSI generally encountered fill to a maximum depth of approximately 1.4mBGL underlain by silty clay residual natural soil and sandstone bedrock. The approximate fill depths at the borehole locations are shown on Figures 2 and 3 in Appendix A.

2.4.2 Hydrogeology and Groundwater

Hydrogeological information presented in the previous investigations indicated that the regional aquifer on-site and in the areas immediately surrounding the site includes porous, extensive aquifers of low to moderate productivity. The nearest registered bore was located approximately 560m from the site and was utilised for water supply purposes. This bore was located up-gradient of the site, along the Pacific Highway ridge feature and is not considered to be a receptor. The majority of the bores were registered for monitoring purposes. There were no down-gradient bores (i.e. within 1,000m) registered for domestic or irrigation uses.

Standing water levels (SWLs) measured in the groundwater wells during the DSI ranged from approximately 6.12mBGL to 7.01mBGL (approximately equivalent to RL 72.58mAHD to RL 79.77mAHD).

2.4.3 Water Bodies

Surface water bodies were not identified in the immediate vicinity of the site. The closest surface water body is Little Blue Gum Creek located approximately 1km to the south-west of the site. The site location and regional topography indicates that excess surface water flows have the potential to enter the stormwater system which is likely to discharge to the Little Blue Gum Creek. The creek is a tributary of the Lane Cove River which hosts a freshwater ecosystem and potentially used for recreational purposes. Little Blue Gum



Creek was included in the DSI to be a receptor. Reference should be made to the JKE SGIA report (Ref: E35535BWrpt4-SGIA) for additional information.

3 SITE CHARACTERISATION AND CONCEPTUAL SITE MODEL

NEPM 2013 defines a CSM as a representation of site related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM for the site is presented in the following sub-sections and is based on the site information and investigation data to date. Reference should also be made to the figures attached in the appendices.

3.1 Summary of Contamination (Site Characterisation)

A copy of the soil and groundwater data summary tables and borehole logs from the PSI and DSI reports is included in Appendix C. The SAC exceedances are shown on Figure 3 in Appendix A. The following exceedances were reported for each media:

- In fill soil: asbestos as bonded FCF/ACM was detected above the human health-based SAC. Arsenic, zinc and nickel were reported above the ecological-based SAC; and
- In groundwater: copper, nickel and zinc concentrations were reported above the ecological-based SAC. The pH was outside of the acceptable range generally accepted for both human health and ecological SAC in MW101 and MW103.

Based on a review of the proposed development details and future use of the site, potential risks from contaminated soil that falls within the basement/building footprint will be low as the basement construction will remove all fill, thus eliminating the risk. These locations include zinc exceedances above the ecological-bases SAC from BH2 (0-0.1m) and BH3 (0-0.1m) and nickel exceedance above the ecological-based SAC from BH101 (0-0.1m). The risks are primarily associated with soil disturbance during the proposed development works, and the contaminated soils in the setback/landscaped areas that fall outside the basement footprint.

The arsenic and asbestos in fill (soil media) are the primary risk drivers for remediation. The nickel and zinc exceedances in fill will be remediated as part of the basement excavation. The maximum reported concentrations in fill which exceeded the SAC are as follows:

- Nickel concentrations up to 82mg/kg which exceeded the ecological-bases SAC of 35mg/kg;
- Zinc concentrations of up to 410mg/kg which exceeded the ecological-based SAC of 190mg/kg;
- Arsenic concentrations of up to 340mg/kg which exceeded the ecological-bases SAC of 100mg/kg; and
- Asbestos as ACM 0.022%w/w which was encountered within the top 100mm of fill soil within unpaved areas and was considered to be an exceedance of the human health-based SAC.

The DSI concluded that the heavy metals in groundwater were due to regional conditions and did not warrant remediation. The groundwater will require treatment prior to off-site disposal associated with the construction phase dewatering as discussed in the JKE SGIA report.

3.2 CSM

The table below includes a review of the CSM which has been used to design the remediation strategy. The CSM will require further review if additional site data becomes available.

Table 3-1: CSM

Contaminant source(s) and contaminants of concern	<p>Contamination source: fill material.</p> <p>Contaminants of concern for remediation include: arsenic, nickel, zinc and asbestos.</p> <p>Potential contamination sources: fill material; historical agricultural use (from small-scale market gardens); use of pesticides and hazardous building materials in former and existing buildings.</p>
Affected media	<p>Affected medium for remediation: fill soil.</p> <p>Remediation of groundwater is not proposed as discussed above.</p>
Receptor identification	<p>Human receptors include site occupants/users (including adults and children), construction workers and intrusive maintenance workers. Off-site human receptors include adjacent land users and recreational water users within Little Blue Gum Creek. Although Little Blue Gum Creek is located approximately 1km away from the site, due to the down-gradient location and the regional valley feature located to the south-west of the site, the creek is considered to have the potential to form groundwater connectivity to the site. In addition, the historical maps reviewed for the PSI indicated that Little Blue Gum Creek could have been historically located closer to the site with potential alteration of the waterway between 1917 and 1936. To address any potential risk to the creek, groundwater treatment is required during construction stage dewatering as outlined in the JKE SGIA report.</p> <p>Ecological receptors include terrestrial organisms and plants within unpaved areas (including the proposed landscaped areas), and freshwater ecology in Little Blue Gum Creek.</p>
Exposure pathways and mechanisms	<p>Potential exposure pathways relevant to the human receptors include ingestion, dermal absorption and inhalation of dust (all contaminants) and vapours (volatile TRH, naphthalene and BTEX). The potential for exposure would typically be associated with the construction and excavation works, and future use of the site. Potential exposure pathways for ecological receptors include primary/direct contact and ingestion.</p> <p>If remediation does not occur, exposure during future site use could occur via direct contact with soil in unpaved areas such as gardens, inhalation of airborne asbestos fibres during soil disturbance, or inhalation of vapours within enclosed spaces such as buildings and basements.</p> <p>Exposure to groundwater is unlikely to occur in the Little Blue Gum Creek through direct migration, however groundwater has the potential to enter the creek via the stormwater system (which is expected to discharge into the creek) during temporary construction dewatering where groundwater is discharged into the stormwater system, or in a drained basement scenario. These risks will be managed with regards to the typical regulatory requirements during construction and this does not form part of the RAP. Reference should be made to the JKE SGIA report for additional information.</p>
Evaluation of data gaps	<p>There is not considered to be any significant data gaps remaining for the purpose of remediation.</p>



3.3 Remediation Extent

Remediation of fill will extend horizontally to the remediation Area A and Area B boundaries as shown on Figure 5 in Appendix A and vertically down to the top of the underlying natural soil. The extent of remediation will be confirmed via the validation process.

The fill depths are typically expected to be in the order of approximately 0.5m to 0.8m below the existing ground levels. However, some areas reported slightly deeper fill to a depth of 1.4mBGL in the eastern portion of the site.

The DSI encountered bonded ACM in FCF sheets at the ground surface of the site. The ACM at the ground surface was not encountered in soil and was located on top of brick pavers, thus the asbestos in this area can be removed as bonded ACM by Class B asbestos removal contractors as part of the hazardous building materials removal during demolition. As recommended in the DSI, an Asbestos Management Plan (AMP) should be prepared prior to the commencement of the remediation works.

The DSI encountered asbestos in soil two locations (TP311 and SP4). The rationale for defining the asbestos remediation area is based on the nearest non-asbestos detect sample location and the adjacent site boundary. Based on the fill depths encountered, the fill that falls within the basement footprint will be removed by default as part of the basement bulk excavation.

The fill depths at the previous investigation locations are shown on Figure 5 in Appendix A. Copies of the previous borehole logs are included in Appendix C.



4 REMEDIATION OPTIONS AND PREFERRED REMEDIATION STRATEGY

4.1 Soil Remediation

The NSW EPA follows the hierarchy set out in NEPM 2013 for the remediation of contaminated sites. The preferred order for soil remediation and management is as follows:

1. On-site treatment of soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level;
2. Off-site treatment of excavated material so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site;

Or if the above are not practicable:

3. Consolidation and isolation of the soil by on-site containment within a properly designed barrier; and
4. Removal of contaminated material to an approved site or facility, followed where necessary by replacement with clean material; or
5. Where the assessment indicates that remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy.

For simplicity herein, the above hierarchy are respectively referred to as Option 1, Option 2, Option 3 etc.

The NSW EPA Contaminated Land Management Guidelines for the NSW Site Auditor Scheme (3rd Edition) (2017)⁹ provides the following additional requirements to be taken into consideration:

- Remediation should not proceed in the event that it is likely to cause a greater adverse effect than leaving the site undisturbed; and
- Where there are large quantities of soil with low levels of contamination, alternative strategies should be considered or developed.

The following table discusses and assesses a range of soil remediation options.

4.2 Remediation Options Assessment

The table below discusses and assesses a range of remediation options:

Table 4-1: Consideration of Soil Remediation Options

Option	Discussion	Assessment/Applicability
Option 1 On-site treatment of contaminated soil	On-site treatment can provide a mechanism to reuse the processed material, and in some instances, avoid the need for large scale earthworks. Treatment options are contaminant-specific and can include bio-remediation, soil washing, air sparging and soil vapour extraction, and thermal desorption. Physical removal of fibre cement fragment containing asbestos (i.e. ACM) is also possible in some situations.	Not applicable for this site. There are no commercially available, economically viable treatment methods to remove many non-volatile contaminants such as heavy metals and asbestos in soil. The NSW EPA does not endorse removal of ACM from soil via picking (unless the ACM only occurs at the ground surface as a result of demolition activities).

⁹ NSW EPA, (2017). *Contaminated land Management, Guidelines for the NSW Site Auditor Scheme (3rd ed.)*. (referred to as Site Auditor Guidelines 2017)

Option	Discussion	Assessment/Applicability
	<p>Depending on the treatment option, licences may be necessary for specific individual waste streams due to the potential for air pollution and the formation of harmful by-products during incineration processes. Licences for re-use of treated material/waste may also be required.</p>	<p>Notwithstanding this constraint, treatment options would not likely be economically viable for the relatively small quantities of soil requiring remediation, nor would they be appropriate given the extent of the proposed basement and the surplus of materials expected to be generated during construction.</p>
<p>Option 2 Off-site treatment of contaminated soil</p>	<p>Contaminated soils are excavated, transported to an approved/licensed treatment facility, treated to remove/stabilise the contaminants then returned to the subject site, transported to an alternative site or disposed to an approved landfill facility.</p> <p>This option is also contaminant-specific. The cost per tonne for transport to and from the site and for treatment is considered to be relatively high. The material would also have to be assessed in terms of suitability for reuse as part of the proposed development works under the waste and resource recovery regulatory framework.</p>	<p>Not applicable as noted above.</p>
<p>Option 3 Consolidation and isolation of impacted soil by cap and containment</p>	<p>This would include the consolidation of contaminated soil within an appropriately designed cell, followed by the placement of an appropriate barrier over the material to reduce the potential for future disturbance (or capping in-situ beneath appropriate capping layers).</p> <p>The capping and/or containment must be appropriate for the specific contaminants of concern. An ongoing environmental management plan (EMP) would be required and this would need to be publicly notified and made to be legally enforceable (e.g. via listings in the Section 10.7 planning certificate and on the land title).</p>	<p>Not suitable considering the extent of the proposed basement/the need for bulk excavation, relatively small quantities of soil requiring remediation and considering the challenges associated with capping fill in landscaped zones when the existing site areas are not intended to be raised substantially above existing levels.</p>

Option	Discussion	Assessment/Applicability
Option 4 Removal of contaminated material (excavation and disposal) to an appropriate facility and reinstatement with clean material	Contaminated soils would be classified in accordance with NSW EPA guidelines for waste disposal, excavated and disposed of off-site to a licensed landfill. The material would have to meet the requirements for landfill disposal. Landfill gate/tipping fees would apply in addition to transport costs.	This option is the most applicable for remediation as a majority of the fill at the site will require excavation/disposal to construct the basement and that there is only a relatively small quantity of soil requiring remediation. Excavating and disposing of all contaminated fill will eliminate the need for long-term management of the site via an EMP.
Option 5 Implementation of management strategy	Contaminated soils would be managed in such a way to reduce risks to the receptors and monitor the conditions over time so that there is an on-going minimisation of risk. This may occur via the implementation of monitoring programs.	Not applicable considering the extent of the proposed development works.

4.3 Rationale for the Preferred Option for Remediation

The preferred option for remediation at the site for the asbestos and arsenic areas is Option 4 (excavation and off-site disposal). This option provides relatively short remediation program and aims to eliminate the need for long-term management of asbestos and arsenic contamination onsite via a long-term EMP.

Option 4 is considered to commensurate with the bulk excavation of the site which will result in the removal of all fill from the basement footprint and beneath the associated shoring walls. The remaining fill outside of the basement footprint is relatively shallow and removing the fill from Area B concurrently with the basement excavation will avoid the need for on-going management of the site via a long-term EMP.

Option 3, a cap and containment approach would avoid the costs associated with transport and disposal of asbestos waste to landfill. However, implementation of a cap and contain approach would potentially require additional materials handling and special procedures to reduce the potential for cross contamination. For these reasons, along with the added validation, reporting and on-going compliance under the provisions of an EMP, capping and containing the relatively small quantity of asbestos and arsenic contamination onsite is considered to be more costly in the long run in comparison with the preferred option of excavation and off-site disposal.



5 REMEDIATION DETAILS

5.1 Roles and Responsibilities

Table 5-1: Roles and Responsibilities

Role	Responsibility
Developer / client	<p>Sundale Northland Development Pty Ltd</p> <p>The client (or their nominated project manager) is required to appoint the project team for the remediation/validation and must provide all investigation reports including this RAP to the project manager, remediation contractor/principal contractor, determining authority and any other relevant parties involved in the project.</p>
Project Manager	<p>The project manager is required to review all documents prepared for the project and manage the implementation of the procedures outlined in this RAP. The project manager is to take reasonable steps so that the remediation contractor and others have understood the RAP and will implement it in its totality. The project manager will review the RAP and other associated documents and will update the parties involved of any changes to the development or remediation sequence (in consultation with the validation consultant).</p>
Principal Contractor	<p>To be confirmed</p> <p>The principal contractor is required to review all documents prepared for the project and manage the implementation of the procedures outlined in this RAP. The principal contractor is to take reasonable steps so that the remediation contractor and others have understood the RAP and will implement it in its totality.</p> <p>The principal contractor will review the RAP and other documents and will update the parties involved of any changes to the development or remediation sequence (in consultation with the validation consultant).</p>
Remediation Contractor	<p>To be confirmed</p> <p>The remediation contractor (this may be the same entity as the principal contractor) is required to review all relevant documents prepared for the project, apply for any relevant removal licences or permits and implement the remediation requirements and relevant validation requirements (that are the remediation contractor's responsibility) outlined in this RAP.</p> <p>The remediation contractor is required to collect all documentation associated with the remediation activities and forward this documentation onto the principal contractor, client and project manager as they become available.</p> <p>The remediation contractor must be (or must subcontract) a Class B licensed asbestos removalist for the remediation activities associated with removal of the asbestos in soil. An AMP should be prepared prior to the commencement of remediation works.</p>
Validation Consultant	<p>To be confirmed</p> <p>The validation consultant¹⁰ provides consulting advice and validation services in relation to the remediation. The validation consultant prepares the validation report.</p>

¹⁰ It is preferred that the validation consultant is a certified practitioner (specialising in site contamination), under one of the NSW EPA endorsed certification schemes, i.e. CEnvP SC or equivalent

Role	Responsibility
	<p>The validation consultant is required to review any deviation to this RAP or any unexpected finds if and when encountered during the site work.</p> <p>The validation consultant is required to liaise with the principal contractor, client, project manager and remediation contractor on all matters pertaining to the site contamination, remediation and validation, and carry out the required validation sampling and inspections.</p> <p>The validation consultant must have a Licensed Asbestos Assessor (LAA) on staff to carry out the required asbestos clearance(s).</p>

5.2 Pre-commencement Meeting and Arrangements

The project team is to have a pre-commencement meeting to discuss the sequence of remediation and the remediation and validation tasks. The site management plan for remediation works (see Section 8) must be reviewed by the project manager and remediation contractor, and appropriate steps are to be taken to ensure the adequate implementation of the plan.

5.3 Remediation and Associated Tasks

The following general sequence of works is anticipated:

- **Hold Point** – Prepare an AMP prior to the commencement of remediation;
- Site establishment;
- Demolition/removal of structures. A hazardous building materials assessment should be undertaken prior to the commencement of demolition works; and
- Remediation (and validation) of the site via excavation and off-site disposal of fill, and validation of this process.

Remediation will occur following demolition. Remediation will be deemed complete following the successful removal of contaminated fill, reinstatement of the remedial excavations as necessary, and validation/documentation of this process.

5.3.1 Asbestos Management Plan

Due to the presence of asbestos in fill soil, an Asbestos Management Plan (AMP) should be prepared for the remediation and construction by a suitably qualified consultant. The AMP should include the measures to be implemented during the remediation works in order to mitigate risks to human receptors. Reference should be made to Section 8.1 for more details.

5.3.2 Site Establishment

The remediation contractor is to establish on site as required to facilitate the remediation. Consideration must be given to the work sequence and extent of remediation so that the site establishment (e.g. site sheds, fencing, access points etc) does not inhibit the remediation works.



The validation consultant must be advised (by the principal/remediation contractor) if any soil, gravel or engineering materials (e.g. DGB, roadbase etc) are to be imported for the site establishment works. These materials must be validated by the validation consultant in accordance with Section 6 of this RAP to confirm they are suitable to be imported to site.

Prior to commencement of any other works onsite, the remediation areas (shown on Figure 5 in Appendix A) are to be demarcated using star pickets and barrier mesh or tape (other another suitable means) to that machinery does not track over the areas, potentially causing cross contamination.

5.3.3 Demolition of Structures

A suitably qualified consultant is to undertake a hazardous building materials survey and prepare a report for the structures at the site, prior to the commencement of any demolition activities. The demolition of buildings/structures is to occur with regards to the findings of the hazardous building materials consultant's advice/report(s) and must be undertaken in accordance with the relevant codes, standards, guidelines and regulations. All structures and materials are to be removed from the site and clearance certificates are to be provided for the removal of all hazardous materials.

All demolition waste is to be segregated in accordance with AS2601-2017 and disposed of to facilities that are licenced by the NSW EPA to accept the waste. The demolition contractor is to maintain adequate records and retain all documentation for such activities including:

- A summary register including details such as waste disposal dates, waste materials descriptions, disposal locations (i.e. facility details) and reconciliation of this information with waste disposal docket numbers;
- Waste tracking records and transport certificates (where waste is required to be tracked/transported in accordance with the regulations); and
- Disposal dockets for the waste. Legible dockets are to be provided for all waste materials so they can be reconciled with the register.

The above information is to be supplied to the validation consultant for assessment and inclusion in the site validation report.

5.3.4 Remediation Details – Impacted Fill Soil

The procedure for excavation and disposal of asbestos and arsenic contaminated fill in Areas A and B is outlined in the following table:

Table 5-2: Remediation Details – Contaminated Fill

Step	Primary Role/Responsibility	Procedure
1.	Remediation contractor	<p><u>Address Stability Issues and Underground Services:</u> Geotechnical advice must be sought regarding the stability of adjacent structures and/or adjacent areas prior to commencing remediation (as required). Stability issues are to be addressed to the satisfaction of a suitably qualified geotechnical engineer.</p> <p>All underground services are to be appropriately disconnected or rerouted to facilitate the works.</p>

Step	Primary Role/ Responsibility	Procedure
2.	Remediation contractor (or nominated Class B licensed sub-contractor)	<p><u>Establish Asbestos Related Controls and Arrange Licences and Tracking Requirements:</u> Prior to the commencement of excavation, asbestos related controls, licences and tracking requirements are to be implemented as outlined in the AMP (refer to Section 8.1 of this RAP).</p> <p>The remediation contractor is to take steps to ensure the site management plan in this RAP is implemented for the remediation works.</p>
3.	Remediation contractor (or nominated Class B licensed sub-contractor) Validation consultant/LAA (inspections)	<p><u>Excavation and Disposal of Asbestos and Arsenic Contaminated Fill:</u> Remediation will be undertaken as follows:</p> <ul style="list-style-type: none"> • Obtain an appropriate waste classification for the off-site disposal of contaminated fill from the validation consultant prior to the commencement of excavation (see Section 5.4.1). The waste classification should consider the presence of asbestos which makes the waste a special waste stream containing asbestos; • Submit an application to dispose of the contaminated fill (in accordance with an appropriate waste classification see Section 5.4.1) to a facility that is appropriately licensed by the NSW EPA to receive the waste, and obtain authorisation to dispose. Establish the required waste tracking using the NSW EPA-endorsed asbestos waste tracking system; • Contact the validation consultant to arrange for the consultant's LAA to be present to witness the remedial excavation works; • The excavation and removal of asbestos-contaminated soil must be completed in accordance with the remediation-phase AMP; • The remediation Areas A and B must be marked out using an appropriate method (i.e. star pickets or spray paint), so the extent of remediation is clear to the excavator operator and other relevant parties; • Excavate the fill from the remediation area, down to the surface of the underlying natural soil; • Load the fill directly into trucks and dispose of the soil to a facility licensed by the NSW EPA to receive the waste; and • All documents including landfill disposal dockets must be retained by the remediation contractor/asbestos removal contractor and forwarded to the client and validation consultant. This documentation forms a key part of the validation process and is to be included in the validation report.
4.	Validation consultant/LAA	<p><u>Validation of Excavation Base and Walls:</u> Once all fill is removed from Areas A and B to required levels, the base and walls of the excavation areas must be validated in accordance with the validation plan outlined in Section 6, which includes bulk field screening and completion of a surface asbestos clearance by a LAA.</p> <p>It is noted that this validation sampling must occur under asbestos-related controls with appropriate personal protective equipment (PPE) as outlined in the AMP.</p> <p>In the event of a validation failure, reference must be made to the contingency plan in Section 7.3.</p>
5.	Remediation contractor	<p><u>Make Safe following Successful Validation:</u> Considering that some of the natural soil and bedrock within remediation areas that falls within the basement footprint will be removed subsequently, the remediation areas are to be made safe via the installation of suitable fencing or an exclusion zone around the excavation, until excavation of the remaining soil/bedrock occurs. The excavation and immediate surrounds (say 1-2m beyond the excavation footprint) should be covered by plastic or geofabric until the validation is successful.</p>



Step	Primary Role/ Responsibility	Procedure
		Following successful validation of the fill removal in the remediation area, the material removed from the areas that fall outside of the basement footprint may need to be reinstated with clean material to achieve the required levels. This reinstatement is to occur using only clean site won material (e.g. VENM), or clean imported material validated in accordance with Section 7, to meet the geotechnical/structural requirements for the project.

5.4 Remediation Documentation

The remediation contractor must retain all documentation associated with the site management and remediation, including but not limited to:

- Asbestos management documentation, including all relevant notifications and clearance certificates where applicable (additional details in this regard are to be outlined in the remediation-phase AMP);
- Waste disposal docket;
- Photographs of remediation works;
- Waste tracking documentation (see below and the example waste tracking form in Appendix D); and
- Imported materials documentation (see below and the example imported material tracking form in Appendix D).

Copies of these documents must be forwarded to the project manager and the validation consultant for assessment and inclusion in the validation report.

5.4.1 Waste Register

All waste removed from the site is to be appropriately classified, tracked and managed in accordance with the relevant guidelines and regulations. The remediation contractor is to maintain adequate records and retain all documentation for waste disposal activities including:

- A summary register (in Microsoft Excel format) including details such as waste disposal dates, waste materials descriptions, disposal locations (i.e. facility details) and reconciliation of this information with the associated waste classification documentation and the waste disposal docket numbers;
- Waste tracking records and transport certificates (where waste is required to be tracked/transported in accordance with the regulations); and
- Disposal dockets for the waste (i.e. weighbridge dockets for each load).

Any soil waste classification documentation is to be prepared in accordance with the reporting requirements specified by the NSW EPA as outlined in the Consultants Reporting Guidelines and the NSW EPA Waste Classification Guidelines (2014). The documentation must be reviewed by the validation consultant (if the documentation is prepared by others) prior to the waste leaving the site.



A review of the disposal facility's Environment Protection Licence (EPL) issued under the Protection of the Environment Operations (POEO) Act (1997)¹¹ is to be undertaken to assess whether the facility is appropriately licensed to receive the waste.

The above information is to be provided to the validation consultant for inclusion in the validation report. The register must be set up at the beginning of the project and provided to the validation consultant regularly (i.e. weekly) so the details can be checked and any rectification of the record keeping process can occur in a timely manner.

5.4.2 Imported Materials Register

The remediation contractor is to maintain, for the duration of the project, an imported material register. This must include a register (in Microsoft Excel format) with details of each imported material type, supplier details, summary record of where the imported materials were placed on site, and importation docket numbers and a tally of quantities (separated for each import stream). Dockets for imported materials are to be provided electronically so these can be reconciled with the register.

Examples of imported materials for this project may include but would not be limited to site preparation materials (e.g. DGB, 40/70 etc) and potentially materials to reinstate remedial excavations (although use of clean site-won material is preferred). Landscaping materials such as topsoil garden mixes, mulches etc are not expected to be imported within the timeframe of the remediation/validation exercise, however, these materials have still been considered in the validation process for completeness.

The above information is to be provided to the validation consultant for inclusion in the validation report. The register be set up at the beginning of the project and provided to the validation consultant regularly (i.e. weekly) so the details can be checked and any rectification of the record keeping process can occur in a timely manner.

¹¹NSW Government, (1997)). *Protection of Environment Operations Act.* (referred to as POEO Act 1997)



6 VALIDATION PLAN

Validation is necessary to demonstrate that remedial measures described in the RAP have been successful and that the site is suitable for the intended land use. The sampling program for the validation is outlined in Section 6.1. This is the minimum requirement based on the remedial strategy proposed in this RAP. Additional validation sampling may be required based on the outcome of the pre-remediation investigation and/or observations made during remediation.

6.1 Validation Sampling and Documentation

The following subsections outline the validation requirements for the site:

6.1.1 Excavation/Fill Removal

Table 6-1: Validation Requirements – Area A and Area B

Aspect	Sampling	Analysis	Observations and Documentation
Validation sampling from remedial excavations Areas A and B after fill removal	<p><u>Base of excavation:</u> A minimum of two samples from the base of the excavation, as shown on Figure 5.</p> <p>All fill from the base of the excavation will be removed. Any visible FCF/ACM will be addressed by the LAA clearance.</p> <p><u>Walls of excavation:</u> The excavation is expected to expose fill along the walls. The excavation walls must be sampled every 5m lineal, with samples collected from each distinct fill profile at each location, with a minimum of one sample per distinct wall.</p> <p>The fill is expected to be shallower than 1m, however, if deeper fill is encountered, the fill on the excavation walls must have at least one sample per fill profile collected and per vertical metre on the wall (whichever is the greater). The wall sample locations are also shown on Figure 5.</p> <p>Wall sampling is to included bulk sampling (10L field screening) for asbestos in accordance with the NEPM 2013 procedures and sampling/analysis of fill soils for AF/FA (500ml samples).</p>	<p><u>Area A:</u> AF/FA by 500mL NEPM13 method; and Arsenic.</p> <p><u>Area B:</u> AF/FA by 500mL NEPM 13 method.</p> <p>Any FCF/ACM identified in the validation samples is to be analysed for asbestos (presence/absence).</p>	<p>Observations to be recorded by the validation consultant/LAA to document fill/soil lithology on the base and walls of the excavation.</p> <p>Each bulk sample is to be weighed (in kg) using an accurate scale to two decimal places.</p> <p>A sample location plan is to be prepared by the validation consultant, documenting the sample locations and final extent of the remediation area.</p> <p>Photographs are to be taken by the validation consultant/LAA.</p> <p>LAA to provide asbestos surface clearance for the base and walls of the asbestos remedial excavation.</p> <p>Disposal docket to be retained by the remediation contractor and forwarded to validation consultant for inclusion in the validation report.</p>

6.1.2 Imported Materials

The table below outlines the validation requirements for material imported onto the site, to the point in time that the validation report is issued:

Table 6-2: Validation Requirements – Imported Materials

Aspect	Sampling	Analysis	Observations and Documentation
Imported VENM backfill (if required)	Minimum of three samples per 75m ³ of source material (1 sample per 25m ³).	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), total recoverable hydrocarbons (TRHs), benzene, toluene, ethylbenzene and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine and organochlorine pesticides (OCPs), polychlorinated biphenyls (PCBs) and asbestos (500ml NEPM 2013 analysis). Additional analysis may be required depending on the site history of the source property.	Remediation contractor to supply existing VENM documentation/report (report to be prepared in accordance with the NSW EPA waste classification reporting requirements). A hold point remains until the validation consultant approves the material for importation or advises on the next steps. Material is to be inspected upon importation by the validation consultant to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation. Photographic documentation and an inspection log are to be maintained. Where check sampling occurs by the validation consultant due to deficiencies or irregularities in existing VENM documentation, the following is required: <ul style="list-style-type: none"> - Date of sampling and description of material sampled; - An estimate of the volume of material imported at the time of sampling; - Sample location plan; and - Analytical reports and tabulated results with comparison to the Validation Assessment Criteria (VAC).
Imported engineering materials such as recycled aggregate, road base etc	Minimum of three samples per 75m ³ of source material (1 sample per 25m ³).	Heavy metals (as above), TRHs, BTEX, PAHs, OCPs, PCBs and asbestos (500ml quantification).	Remediation contractor to provide product specification and documentation to confirm the material has been classified with reference to a relevant Resource Recovery Order/Exemption. A hold point remains until the validation consultant approves the material for importation or advises on the next steps.
Excavated Natural Material (ENM)	ENM testing must meet the specification within the ENM Order. If the analysis is not compliant, the validation consultant must carry out an ENM assessment and	As required in the ENM Order.	Review of the facility's EPL, where applicable. Material is to be inspected by the validation consultant upon importation to confirm it is free of visible/olfactory

Aspect	Sampling	Analysis	Observations and Documentation
	<p>prepare a report in accordance with the ENM Order/Exemption prior to material being imported.</p>		<p>indicators of contamination and is consistent with documentation.</p> <p>Where check sampling occurs by the validation consultant due to deficiencies or irregularities in existing documentation, the following is required:</p> <ul style="list-style-type: none"> - Date of sampling and description of material sampled; - An estimate of the volume of material imported at the time of sampling; - Sample location plan; and - Analytical reports and tabulated results with comparison to the VAC.
<p>Imported engineering materials comprising only natural quarried products.</p>	<p>At the validation consultant's discretion based on robustness of supplier documentation.</p> <p>Or: Minimum of three samples per 75m³ of source material (1 sample per 25m³).</p>	<p>At the validation consultant's discretion based on robustness of supplier documentation.</p>	<p>Remediation contractor to provide documentation from the supplier confirming the material is a product comprising only natural quarried material. A hold point remains until the validation consultant approves the material for importation or advises on the next steps.</p> <p>Review of the quarry's EPL.</p> <p>Material is to be inspected by the validation consultant upon importation to confirm it is free of anthropogenic materials, visible and olfactory indicators of contamination, and is consistent with documentation.</p> <p>Where check sampling occurs by the validation consultant due to deficiencies or irregularities in existing documentation, the following is required:</p> <ul style="list-style-type: none"> - Date of sampling and description of material sampled; - An estimate of the volume of material imported at the time of sampling; - Sample location plan; and - Analytical reports and tabulated results with comparison to the VAC.
<p>Imported garden mix/turf underlay/topsoil</p>	<p>Minimum of three samples per 75m³ of source material (1 sample per 25m³).</p>	<p>Heavy metals (as above), TRHs, BTEX, PAHs, OCPs, PCBs and asbestos (500ml).</p>	<p>Remediation contractor to provide documentation from the supplier confirming the product specification. This must include a description of the Australian Standard or other relevant product specification under which the material is produced, and the components. A hold point remains until the validation consultant approves the material for importation or advises on the next steps.</p>



Aspect	Sampling	Analysis	Observations and Documentation
			<p>Material is to be inspected by the validation consultant upon importation to confirm it is free of anthropogenic materials, visible and olfactory indicators of contamination, and is consistent with documentation. The validation consultant is to review any existing/available analysis results for the materials. A minimum of one batch for each imported material type (from each individual supplier) must be inspected by the validation consultant. This inspection must be repeated for each material type from each supplier, a minimum of once per month thereafter.</p> <p>Where check sampling occurs by the validation consultant due to deficiencies or irregularities in existing documentation, the following is required:</p> <ul style="list-style-type: none"> - Date of sampling and description of material sampled; - An estimate of the volume of material imported at the time of sampling; - Sample location plan; and - Analytical reports and tabulated results with comparison to the VAC.
Mulch	Minimum of three samples per 75m ³ of source material (1 sample per 25m ³).	Analysis of mulch can be limited to asbestos (500ml) and visual observations to confirm there are no anthropogenic materials.	As above.

6.2 Validation Assessment Criteria and Data Assessment

The Validation Assessment Criteria (VAC) to be adopted for the validation assessment are outlined in the table below:

Table 6-3: VAC

Validation Aspect	VAC
Remediation areas – following excavation and disposal of fill	<p>The qualitative VAC for soil validation of the asbestos remediation area are as follows:</p> <ul style="list-style-type: none"> • Visual confirmation of complete fill removal so that no fill remains at the base of the remedial excavation; and • Visual confirmation of no visible FCF/ACM at the base and walls of the excavation, by the LAA. <p>The quantitative VAC for soil/bedrock sample analysis are as follows:</p> <ul style="list-style-type: none"> • Analytical results for bonded asbestos as ACM/FCF <0.4%w/w, based on the land use Type B Tier 1 criterion presented in Schedule B1 (Table 1A[1]) of NEPM 2013; and • Analytical results for friable asbestos (ACM or AF/FA) in laboratory analysis samples <0.001%w/w, based on Schedule B1 (Table 1A[1]) of NEPM 2013 for all land uses.
Imported materials	<p>All results for imported materials are to be compared to the HIL/HSL-B criteria in Schedule B1 of NEPM 2013 to confirm they do not pose a risk to human health even in a sensitive land use scenario. Landscaping materials must also be assessed against the urban residential and public open space ecological criteria to check they do not pose a risk to ecological receptors. Discretion can be used in assessing TRH data in landscaping materials as such materials often include high organic content which can interfere with the TRH analysis.</p> <p>The land use Type B health-based criteria have been proposed along with the urban residential ecological criteria for imported landscaping materials as they are commensurate with the proposed land use scenario.</p> <p>Results for VENM and other imported materials will need to be consistent with expectations for those materials. VENM must meet the definition presented in the waste classification guidelines and the POEO Act 1997.</p> <p>Recycled materials are to meet the criteria of the relevant exemption/order under which they are produced.</p> <p>Aesthetics: soils to be free of staining and odours.</p>

6.3 Validation Sampling, Analysis and Quality Plan (SAQP)

Data Quality Objectives (DQOs) and Data Quality Indicators (DQIs) should be clearly outlined and assessed as part of the validation process. A framework for the DQO and DQI process is outlined below and are to be reflected in the validation report.

DQOs have been broadly established for the validation with regards to the seven-step process outlined NEPM (2013). The seven steps include the following which are detailed further in the following subsections:

- State the problem;
- Identify the decisions/goal of the study;
- Identify information inputs;

- Define the study boundary;
- Develop the analytical approach/decision rule;
- Specify the performance/acceptance criteria; and
- Optimise the design for obtaining the data.

DQIs are to be assessed based on field and laboratory considerations for precision, accuracy, representativeness, completeness and comparability.

6.3.1 Step 1 - State the Problem

Validation data is required to demonstrate that the remediation is successful and that the site is suitable for the proposed land use/development described in Section 1.1.

6.3.2 Step 2 - Identify the Decisions of the Study

The remediation goal, aims and objectives are defined in Section 1.2. The decisions to be made reflect these objectives and are as follows:

- Was the remediation undertaken in accordance with the RAP?
- If there were any deviations, what were these and how do they impact the outcome of the validation?
- Are any of the validation results above the VAC?
- Was the remediation successful and is the site suitable for the proposed development from a contamination viewpoint?

6.3.3 Step 3 - Identify Information Inputs

The primary information inputs required to address the decisions outlined in Step 2 include the following:

- Existing relevant data from previous reports;
- Site information, including site observations, inspections, asbestos clearance certificates, waste and imported materials registers;
- Validation sampling and analysis;
- Field and laboratory QA/QC data; and
- Records relating to unexpected finds (where applicable).

6.3.4 Step 4 - Define the Study Boundary

The remediation and validation will be confined to the land within the site boundaries, as indicated in the figures in Appendix A. The vertical study boundary is expected to be limited to the depth of fill/surface of the underlying natural soil (approximately 0.5-0.8m below existing levels), however, this will be confirmed via the validation process.

6.3.5 Step 5 - Develop an Analytical Approach (or Decision Rule)

6.3.5.1 VAC

The validation data will be assessed in accordance with the requirements outlined in Section 6.1. The data will initially be assessed as above or below the VAC. For this investigation, the following decision rules will apply:

- If all contaminant concentrations are below the VAC, then the data will be compared directly to the VAC without statistical analysis; and
- If any individual contaminant (with the exception of asbestos) concentration is above the VAC, then statistical analysis may be undertaken. This is to include calculation of the 95% UCL value for the data set, with regards to the NEPM (2013) framework and other relevant guidelines made under the CLM Act 1997. The UCL will be considered acceptable where the UCL is below the VAC, the standard deviation of the data is less than 50% of the VAC and none of the individual concentrations are more than 250% of the VAC.

The validation results from the remedial excavation must also be considered in the context of the waste classification process for the bulk excavation of natural soil/bedrock being removed from the site to construct the basement. This waste classification requirement does not form part of the remediation requirements for the site.

6.3.5.2 Field and Laboratory QA/QC

Field QA/QC is to include analysis of inter-laboratory duplicates (5% frequency), intra-laboratory duplicates (5% frequency), trip blank (one per daily sampling event) and rinsate samples (one per sampling event, only where re-usable equipment is utilised). Field QA/QC samples are to be analysed for the contaminants of concern, except asbestos. Trip spikes are not proposed as the contaminants of concern are not volatile.

DQIs for field and laboratory QA/QC samples are defined below:

Field Duplicates

Acceptable targets for precision of field duplicates will be 30% or less, consistent with NEPM (2013). RPD failures will be considered qualitatively on a case-by-case basis taking into account factors such as the concentrations used to calculate the RPD (i.e. RPD exceedance where concentrations are close to the PQL), sample type, collection methods and the specific analyte where the RPD exceedance was reported.

Trip Blanks and Rinsates

Acceptable targets for trip blank and rinsate samples will be less than the PQL for organic analytes. Metals will be considered on a case-by-case basis with regards to the reference material used as the blank medium.

Laboratory QA/QC

The suitability of the laboratory data will be assessed against the laboratory QA/QC criteria. These criteria are developed and implemented in accordance with the laboratory's NATA accreditation and align with the acceptable limits for QA/QC samples as outlined in NEPM (2013) and other relevant guidelines.

A summary of the typical limits is provided below:

RPDs

- Results that are <5 times the PQL, any RPD is acceptable; and
- Results >5 times the PQL, RPDs between 0-50% are acceptable.

Laboratory Control Samples (LCS) and Matrix Spikes

- 70-130% recovery acceptable for metals and inorganics; and
- 60-140% recovery acceptable for organics.

Surrogate Spikes

- 60-140% recovery acceptable for general organics.

Method Blanks

- All results less than PQL.

In the event that acceptable limits are not met by the laboratory analysis, other lines of evidence will be reviewed (e.g. field observations of samples, preservation, handling etc) and, where required, consultation with the laboratory is to be undertaken in an effort to establish the cause of the non-conformance. Where uncertainty exists, the validation consultant is to adopt the most conservative concentration reported.

6.3.5.3 Appropriateness of PQLs

The PQLs of the analytical methods are to be considered in relation to the VAC to confirm that the PQLs are less than the VAC. In cases where the PQLs are greater than the VAC, a discussion of this is to be provided.

6.3.6 Step 6 – Specify Limits on Decision Errors

To limit the potential for decision errors, a range of quality assurance processes are adopted. A quantitative assessment of the potential for false positives and false negatives in the analytical results is to be undertaken with reference to Schedule B(3) of NEPM (2013) using the data quality assurance information collected.

Decision errors can be controlled through the use of hypothesis testing. The test can be used to show either that the baseline condition is false or that there is insufficient evidence to indicate that the baseline condition is false. The null hypothesis is an assumption that is assumed to be true in the absence of contrary evidence. For the application of statistical analysis to data sets, the null hypothesis (H_0) is that the 95% UCL for the contaminant of concern is greater than the VAC. The alternative hypothesis (H_A) is that the 95% UCL for the contaminant of concern is less than the VAC. Potential outcomes include Type I and Type II errors as follows:

- Type I error of determining that the soil is acceptable for the proposed land use when it is not (wrongly rejects true H_0), includes an alpha (α) risk of 0.05; and
- Type II error of determining that the soil is unacceptable for the proposed land use when it is (wrongly accepts false H_0), includes beta (β) risk of 0.2.

UCLs will be considered acceptable where the UCL is below the VAC, the standard deviation of the data is less than 50% of the VAC and none of the individual concentrations are more than 250% of the VAC. However, where statistical analysis is applied in accordance with Step 5 via the calculation of UCL values, the potential



for decision errors to occur will also be evaluated using the Combined Risk Value (CRV) method as outlined in Appendix E of the NSW EPA Sampling Design Part 1 – Application (2022)¹² contaminated land guidelines. The CRV method will be used retrospectively to establish whether there is sufficient statistical power in the UCL.

6.3.7 Step 7 - Optimise the Design for Obtaining Data

The design is to be optimised via the collection of validation data to demonstrate the success of the key aspects of the remediation.

6.3.8 Sampling Plan

The proposed sampling plan is described in Section 6.1.

6.4 Validation Report

As part of the site validation process, a site validation report will be prepared by the validation consultant. The report will present the results of the validation assessment and will be prepared in accordance with the Consultants Reporting Guidelines. The report must clearly state whether or not the site has been adequately remediated and validated, and whether or not the site is suitable for the proposed development from a contamination viewpoint.

Validation of imported materials must occur until the point that the remediation is complete and the validation report is issued. However, it is recommended that the framework for validating imported materials occurs throughout the remainder of the construction works.

¹² NSW EPA, (2022). *Sampling design part 1 - application*. (referred to as EPA Sampling Design Guidelines 2022)



7 CONTINGENCY PLAN

A review of the proposed remediation works has indicated that the greatest risks that may affect the success of the remediation include unexpected finds or validation failure. A contingency plan for the remediation is provided below:

7.1 Unexpected Finds

Residual hazards that may exist at the site would generally be expected to be detectable through visual or olfactory means. At this site, these types of hazards may include odorous or stained hydrocarbon impacted soils, underground infrastructure such as tanks or separator pits, additional asbestos or suspected asbestos/FCF etc beyond the currently nominated asbestos remediation area. The procedure to be followed in the event of an unexpected find is presented below:

- In the event of an unexpected find, all work in the immediate vicinity must cease (provided it is safe to do so) and the remediation contractor must contact the validation consultant and the client/project manager;
- Temporary barricades should be erected to isolate the area from access to workers;
- The validation consultant is to attend the site, adequately characterise the contamination and provide advice in relation to site management and remediation. In the event that remediation differs from that outlined in this RAP, a Remediation Work Plan (RWP) or addendum RAP must be prepared in consultation with the project stakeholders and the client's expert planner is to advise whether the document is to be submitted to the consent authority to facilitate any modification to the consent; and
- Contamination must be remediated and validated in accordance with the advice provided (subject to any additional approval/s), and the results must be included in the validation report.

7.2 Importation Failure for VENM or other Imported Materials

Where material to be imported onto the site does not meet the importation VAC, the material should not be imported. Alternative material must be sourced that meets the importation requirements.

7.3 Validation Failure

In the event that a validation sample from the base of the remedial excavation exceeds the VAC and is assessed to pose an unacceptable risk, additional material is to be 'chased out' and disposed off-site, then the area re-validated. However, prior to the chase out of additional material, the remediation contractor/principal contractor must advise the project manager and client, and seek approval.

7.4 Remediation Strategy Changes

It should be noted that any material changes to the remediation or validation strategy will require an updated or addendum RAP. Where this occurs, the client's expert planner must provide advice in relation to submitting such documentation to the determining authority, or seeking any modifications to the consent etc.

8 SITE MANAGEMENT PLAN FOR REMEDIATION WORKS

The information outlined in this section of the RAP is for the remediation work only. The client should make reference to the development consent for specific site management requirements for the overall development of the site.

8.1 Asbestos Management Plan (AMP)

A remediation-phase AMP must be prepared for the site by a suitably qualified consultant, and implemented for the site remediation works. The AMP must include the minimum personal protective equipment (PPE), work health and safety (WHS) and other requirements outlined in the documents published by Safe Work Australia, WorkCover Authority of NSW, National Occupational Health and Safety Commission, and other relevant authorities as applicable. An asbestos removal control plan (ARCP) must be prepared by the remediation contractor and issued to SafeWork, and notification of asbestos removal is to be provided to SafeWork at least five days prior to commencement of works. Based on the current data, the asbestos is bonded/non-friable.

Although the asbestos is bonded/non-friable ACM, we recommend that air monitoring be included in the AMP due to the close proximity of adjoining residential properties. Air monitoring must only be carried out by personnel registered and accredited by NATA (National Association of Testing Authorities). Filter analysis must only be carried out within a NATA certified laboratory. The monitoring results must conform to the requirements of the NOHSC Guidance note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition [NOHSC:3003 (2005)].

A monitoring program will be used to assess whether the control procedures being applied are satisfactory and that criteria for airborne asbestos fibre levels are not being exceeded. The following levels will be used as action criteria during the air monitoring:

- <0.01 Fibres/ml: Work procedures deemed to be successful;
- 0.01 to 0.02 Fibres/ml: Inspection of the site and review of procedures; and
- >0.02 Fibres/ml: Stop work, inspection of the site, review of procedures, clean-up, rectification works where required and notify the relevant regulator.

It is noted that the DSI also recommended the preparation of an AMP.

8.2 Project Contacts

Emergency procedures and contact telephone numbers should be displayed in a prominent position at the site entrance gate and within the main site working areas. The available contact details are summarised in the following table:

Table 8-1: Project Contacts

Role	Company	Contact Details
Developer/Project Manager	Sundale Northland Development Pty Ltd	Phil Choy E: phil@sundaleddevelopments.com.au P: 0411 338 829 George Stojanovski E: george@sundaleddevelopments.com.au
Remediation Contractor	To be appointed	-
Validation Consultant	To be appointed	-
Certifier	To be appointed	-
NSW EPA	Pollution Line	131 555
Emergency Services	Ambulance, Police, Fire	000

8.3 Security

Appropriate fencing should be installed as required to secure the site. Warning signs should be erected, which outline the personal PPE required for remediation work.

8.4 Timing and Sequencing of Remediation Works

The anticipated sequence of remediation works is outlined in Section 5.3 of this RAP. Remediation will occur prior to other earthworks or any works associated with the built form of the development.

The validation report is expected to be prepared following commencement of construction, but prior to the issue of any occupation certificate or use of the site for the intended purpose.

8.5 Site Soil and Water Management Plan

The remediation contractor must prepare a detailed soil and water management plan prior to the commencement of site works and this should consider the requirements of the AMP, as applicable. Silt fences must be used to control the surface water runoff at all appropriate locations of the site and appropriate measures are to be implemented to manage soil/water disturbance to the satisfaction of the regulator/consent authority. Reference should be made to the consent conditions for further details.

All stockpiled materials must be placed within an erosion containment boundary with silt fences and sandbags employed to limit sediment movement. The containment area should be located away from drainage lines/low-points, gutters, stormwater pits and inlets and the site boundary. No liquid waste or runoff can be discharged to the stormwater or sewerage system without the approval of the appropriate authorities.

8.6 Noise and Vibration Control Plan

The guidelines for minimisation of noise on construction sites outlined in AS-2460 (2002)¹³ should be adopted. Other measures specified in the consent conditions should also be complied with. Noise producing machinery and equipment should only be operated between the hours approved by the consent authority (refer to consent documents).

All practicable measures should be taken to reduce the generation of noise and vibration to within acceptable limits. In the event that short-term noisy operations are necessary, and where these are likely to affect residences, notifications should be provided to the relevant authorities and the residents by the project manager, specifying the expected duration of the noisy works.

8.7 Dust Control Plan

All practicable measures must be taken to reduce dust emanating from the site. Factors that contribute to dust production are:

- Wind over a cleared surface;
- Wind over stockpiled material; and
- Movement of machinery in unpaved areas.

Visible dust should not be present at the site boundary. Measures to minimise the potential for dust generation include:

- Use of water sprays on unsealed or exposed soil surfaces;
- Covering of stockpiled materials and excavation faces (particularly during periods of site inactivity and/or during windy conditions) or alternatively the erection of hessian fences around stockpiled soil or large exposed areas of soil;
- Establishment of dust screens consisting of a 2m high shade cloth or similar material secured to a chain wire fence;
- Maintenance of dust control measures to keep the facilities in good operating condition;
- Stopping work during strong winds;
- Loading or unloading of dry soil as close as possible to stockpiles to prevent spreading of loose material around the development area; and
- Geofabric/geotextile could be placed over exposed soils in the event that excavation is staged.

If stockpiles are to remain on-site or soil remains exposed for a period of longer than several days, dust monitoring should be undertaken at the site. If excessive dust is generated all site activities should cease

¹³ Australian Standard, (2002). AS2460: *Acoustics - Measurement of the Reverberation Time in Rooms*.



until either wind conditions are more acceptable or a revised method of excavation/remediation is developed.

Dust is also produced during the transfer of material to and from the site. All material must be covered during transport and should be properly disposed of on delivery. No material is to be left in an exposed, un-monitored condition.

All equipment and machinery must be brushed or washed down before leaving the site to limit dust and sediment movement off-site. In the event of prolonged rain and lack of paved areas all vehicles should be washed down prior to exit from the site, and any soil or dirt on the wheels of the vehicles removed. Water used to clean the vehicles should be collected and tested prior to appropriate disposal under the relevant waste classification guidelines.

Reference is also to be made to the AMP in this regard.

8.8 Dewatering

Standard regulatory requirements would apply to any discharge of groundwater during the proposed construction works (e.g. construction dewatering). This does not fall under the purview of the RAP at this stage. Reference should be made to the JKE SGIA (Ref: E358535BWrpt4-SGIA) and the JKG geotechnical reports (Ref: 35535YCrpt2 and 35535YCrpt3) for further details.

8.9 Odour Control Plan

All activities undertaken at the site should be completed in a manner that minimises emissions of smoke, fumes and vapour into the atmosphere and any odours arising from the works or stockpiled material should be controlled. Control measures may include:

- Maintenance of construction equipment so that exhaust emissions comply with the Clean Air Regulations issued under the Protection of the Environment Operations Act (1997) (POEO);
- Demolition materials and other combustible waste should not be burnt on site;
- The spraying of a suitable proprietary product to suppress any odours that may be generated by excavated materials; and
- Use of protective covers (e.g. builder's plastic).

All practicable measures must be taken to reduce fugitive emissions emanating from the site so that associated odours do not constitute a nuisance and that the ambient air quality is not adversely impacted.

The following odour management plan should be implemented to limit the exposure of site personnel and surrounding neighbours to unpleasant odours:

- Excavation and stockpiling of odorous material must be scheduled during periods with low winds if possible;
- Where necessary, a suitable proprietary product could be sprayed on material during excavation and following stockpiling to reduce odours (subject to an appropriate assessment of the product by the validation consultant);

- All complaints from workers and neighbours should be logged and a response provided. Work should be rescheduled as necessary to minimise odour problems;
- The site foreman should consider the following odour control measures:
 - reduce the exposed surface of the odorous materials;
 - time excavation activities to reduce off-site nuisance (particularly during strong winds); and
 - cover exposed excavation faces overnight or during periods of low excavation activity.
- If continued complaints are received, alternative odour management strategies should be considered and implemented.

8.10 Work Health and Safety (WHS) Plan

A site specific WHS plan must be prepared by the remediation contractor for all work to be undertaken at the site. The WHS plan must meet all the requirements outlined in SafeWork NSW WHS regulations.

As a minimum requirement, personnel must wear appropriate protective clothing, including long sleeve shirts, long trousers, steel cap boots and hard hats. Additional asbestos-related PPE will be required for the remedial works involving asbestos (Reference is also to be made to the remediation-phase AMP in this regard). Washroom and lunchroom facilities must also be provided to allow workers to remove potential contamination from their hands and clothing prior to eating or drinking.

8.11 Waste Management

Prior to commencement of remedial works and excavation for the proposed development, the remediation contractor should develop a waste management or recycling plan to minimise the amount of waste produced by the site. Consideration should be given to re-use material wherever possible.

8.12 Incident Management Contingency

The validation consultant must be contacted if any unexpected conditions are encountered at the site. This should enable the scope of remedial/validation works to be adjusted as required. Similarly, if any incident occurs at the site, the validation consultant must be advised to assess potential impacts on contamination conditions and the remediation/validation timetable.

8.13 Hours of Operation

Hours of operation should be between those approved by the consent authority under the development approval process.

8.14 Community Consultation and Complaints

The remediation contractor should provide details for managing community consultation and complaints within their Construction Environmental Management Plan (CEMP).



9 CONCLUSIONS

Previous investigations at the site identified historically imported fill soils impacted by heavy metals which are primarily suspected to be associated with ash and slag within the fill/soil matrix. Bonded asbestos in the form of ACM/FCF was also identified in soil at two locations (TP311 and SP4), and at the ground surface within the western portion of the site. Remediation of the site is required to mitigate potential risks associated with these contaminants.

The proposed remediation strategy includes ‘excavation and off-site disposal’ of contaminated fill/soil to a suitably licensed landfill. This process aligns closely with the proposed development works which include excavation for a proposed basement. The strategy is expected to be effective to mitigate the contamination risks. The remedial strategy also avoids the need for statutory on-going management under the provisions of a long-term EMP.

The anticipated sequence of remediation works is outlined in Section 5.3 of this RAP. Remediation will occur prior to the commencement of the built form of the development.

We are of the opinion that the site can be made suitable for the proposed development via remediation and the implementation of this RAP. A site validation report is to be prepared on completion of remediation activities and submitted to the consent authority to demonstrate that the site is suitable for the proposed development following completion of remediation/validation.

JKE is of the opinion that the RAP has met the objectives outlined in Section 1.2.

The regulatory requirements applicable for the site are outlined in Section 9.1.

9.1 Regulatory Requirements

The regulatory requirements applicable for the remediation are discussed in the following table:

Table 9-1: Regulatory Requirement

Guideline / Legislation / Policy	Applicability
SEPP Resilience and Hazards 2021	<p>Based on the available information, the remediation falls under Category 2 with regards to SEPP Resilience and Hazards 2021. Prior notice of Category 2 remediation work is required with regards to Clauses 4.13 at least 30 days before the commencement of work. We recommend the project planner to assess this requirement with the consent authority prior to the commencement of remediation works.</p> <p>A notice of completion of remediation work is to be given to the local council within 30 days of completion of the work, in accordance with Clauses 4.14 and 4.15 of SEPP Resilience and Hazards 2021.</p> <p>A notice of completion of remediation work is to be provided in accordance with Clauses 14.14 and 14.15 of SEPP Resilience and Hazards 2021.</p>
POEO Act 1997 (and associated regulations)	Section 143 of the POEO Act 1997 states that if waste is transported to a place that cannot lawfully be used as a waste facility for that waste, then the transporter and owner of the

Guideline / Legislation / Policy	Applicability
	<p>waste are each guilty of an offence. The transporter and owner of the waste have a duty to ensure that the waste is disposed of in an appropriate manner.</p> <p>Appropriate waste tracking must occur for all waste that is disposed off-site, where required.</p> <p>Activities must be carried out in a manner which does not result in the pollution of waters.</p>
<p>POEO (Waste) Regulation 2014</p>	<p>Part 7 of the POEO Waste Regulation 2014 set outs the requirements for the transportation and management of asbestos waste and Clause 79 of the POEO Waste Regulation requires waste transporters to provide information to the NSW EPA regarding the movement of any load in NSW of more than 10 square meters of asbestos sheeting, or 100 kilograms of asbestos waste. To fulfil these legal obligations, asbestos waste transporters must use the NSW EPA-endorsed asbestos waste tracking system.</p> <p>Appropriate waste tracking is required for all waste that is disposed off-site, in accordance with the regulations.</p>
<p>Work Health and Safety Regulation (2017)</p> <p>SafeWork NSW Code of Practice: How to manage and control asbestos in the workplace (2022)</p>	<p>Sites with asbestos become a ‘workplace’ when work is carried out there and require a register and AMP. Appropriate SafeWork NSW notification will be required for licensed asbestos removal works or handling. These requirements must be evaluated following the hazardous building materials survey and on completion of the additional soil sampling associated with the pre-remediation investigation.</p>
<p>NSW EPA Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997</p>	<p>The requirement to notify the NSW EPA should be assessed as part of the site validation process. The need to notify will be largely dependent on the asbestos air monitoring results during the remediation. In our opinion the results obtained by JKE to date do not trigger a need to notify the EPA.</p>



10 LIMITATIONS

The report limitations are outlined below:

- JKE accepts no responsibility for any unidentified contamination issues at the site. Any unexpected problems/subsurface features that may be encountered during development works should be inspected by an environmental consultant as soon as possible;
- Previous use of this site may have involved excavation for the foundations of buildings, services, and similar facilities. In addition, unrecorded excavation and burial of material may have occurred on the site. Backfilling of excavations could have been undertaken with potentially contaminated material that may be discovered in discrete, isolated locations across the site during construction work;
- This report has been prepared based on site conditions which existed at the time of the investigation; scope of work and limitation outlined in the JKE proposal; and terms of contract between JKE and the client (as applicable);
- The conclusions presented in this report are based on investigation of conditions at specific locations, chosen to be as representative as possible under the given circumstances, visual observations of the site and immediate surrounds and documents reviewed as described in the report;
- Subsurface soil and rock conditions encountered between investigation locations may be found to be different from those expected. Groundwater conditions may also vary, especially after climatic changes;
- The investigation and preparation of this report have been undertaken in accordance with accepted practice for environmental consultants, with reference to applicable environmental regulatory authority and industry standards, guidelines and the assessment criteria outlined in the report;
- Where information has been provided by third parties, JKE has not undertaken any verification process, except where specifically stated in the report;
- JKE has not undertaken any assessment of off-site areas that may be potential contamination sources or may have been impacted by site contamination, except where specifically stated in the report;
- JKE accept no responsibility for potentially asbestos containing materials that may exist at the site. These materials may be associated with demolition of pre-1990 constructed buildings or fill material at the site;
- JKE have not and will not make any determination regarding finances associated with the site;
- Additional investigation work may be required in the event of changes to the proposed development or landuse. JKE should be contacted immediately in such circumstances;
- Material considered to be suitable from a geotechnical point of view may be unsatisfactory from a soil contamination viewpoint, and vice versa; and
- This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose.



Important Information About This Report

These notes have been prepared by JKE to assist with the assessment and interpretation of this report.

The Report is based on a Unique Set of Project Specific Factors

This report has been prepared in response to specific project requirements as stated in the JKE proposal document which may have been limited by instructions from the client. This report should be reviewed, and if necessary, revised if any of the following occur:

- The proposed land use is altered;
- The defined subject site is increased or sub-divided;
- The proposed development details including size, configuration, location, orientation of the structures or landscaped areas are modified;
- The proposed development levels are altered, eg addition of basement levels; or
- Ownership of the site changes.

JKE will not accept any responsibility whatsoever for situations where one or more of the above factors have changed since completion of the investigation. If the subject site is sold, ownership of the investigation report should be transferred by JKE to the new site owners who will be informed of the conditions and limitations under which the investigation was undertaken. No person should apply an investigation for any purpose other than that originally intended without first conferring with the consultant.

Changes in Subsurface Conditions

Subsurface conditions are influenced by natural geological and hydrogeological process and human activities. Groundwater conditions are likely to vary over time with changes in climatic conditions and human activities within the catchment (e.g. water extraction for irrigation or industrial uses, subsurface waste water disposal, construction related dewatering). Soil and groundwater contaminant concentrations may also vary over time through contaminant migration, natural attenuation of organic contaminants, ongoing contaminating activities and placement or removal of fill material. The conclusions of an investigation report may have been affected by the above factors if a significant period of time has elapsed prior to commencement of the proposed development.

This Report is based on Professional Interpretations of Factual Data

Site investigations identify actual subsurface conditions at the actual sampling locations at the time of the investigation. Data obtained from the sampling and subsequent laboratory analyses, available site history information and published regional information is interpreted by geologists, engineers or environmental scientists and opinions are drawn about the overall subsurface conditions, the nature and extent of contamination, the likely impact on the proposed development and appropriate remediation measures.

Actual conditions may differ from those inferred, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an investigation indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, but steps can be taken to help minimise the impact. For this reason, site owners should retain the services of their consultants throughout the development stage of the project, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

Investigation Limitations

Although information provided by a site investigation can reduce exposure to the risk of the presence of contamination, no environmental site investigation can eliminate the risk. Even a rigorous professional investigation may not detect all contamination on a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant which may occur; only the most likely contaminants are screened.



Misinterpretation of Site Investigations by Design Professionals

Costly problems can occur when other design professionals develop plans based on misinterpretation of an investigation report. To minimise problems associated with misinterpretations, the environmental consultant should be retained to work with appropriate professionals to explain relevant findings and to review the adequacy of plans and specifications relevant to contamination issues.

Logs Should not be Separated from the Investigation Report

Borehole and test pit logs are prepared by environmental scientists, engineers or geologists based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these should not be re-drawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problem, however contractors can still misinterpret the logs during bid preparation if separated from the text of the investigation. If this occurs, delays, disputes and unanticipated costs may result. In all cases it is necessary to refer to the rest of the report to obtain a proper understanding of the investigation. Please note that logs with the 'Environmental Log' header are not suitable for geotechnical purposes as they have not been peer reviewed by a Senior Geotechnical Engineer.

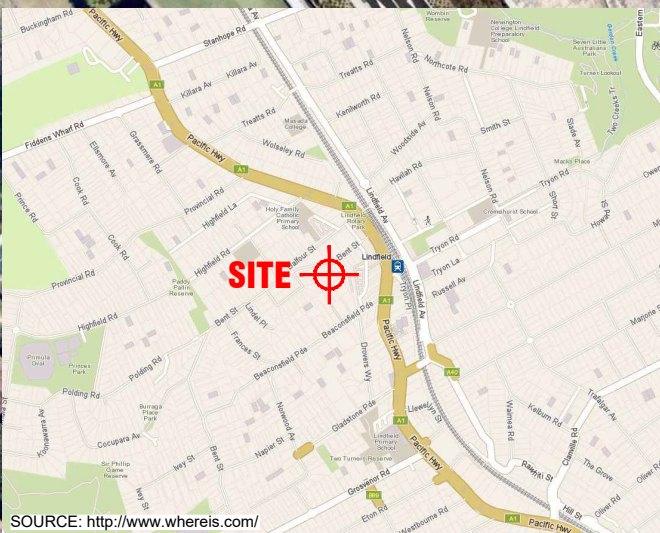
To reduce the likelihood of borehole and test pit log misinterpretation, the complete investigation should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of subsurface information does not insulate an owner from the attendant liability. It is critical that the site owner provides all available site information to persons and organisations such as contractors.

Read Responsibility Clauses Closely

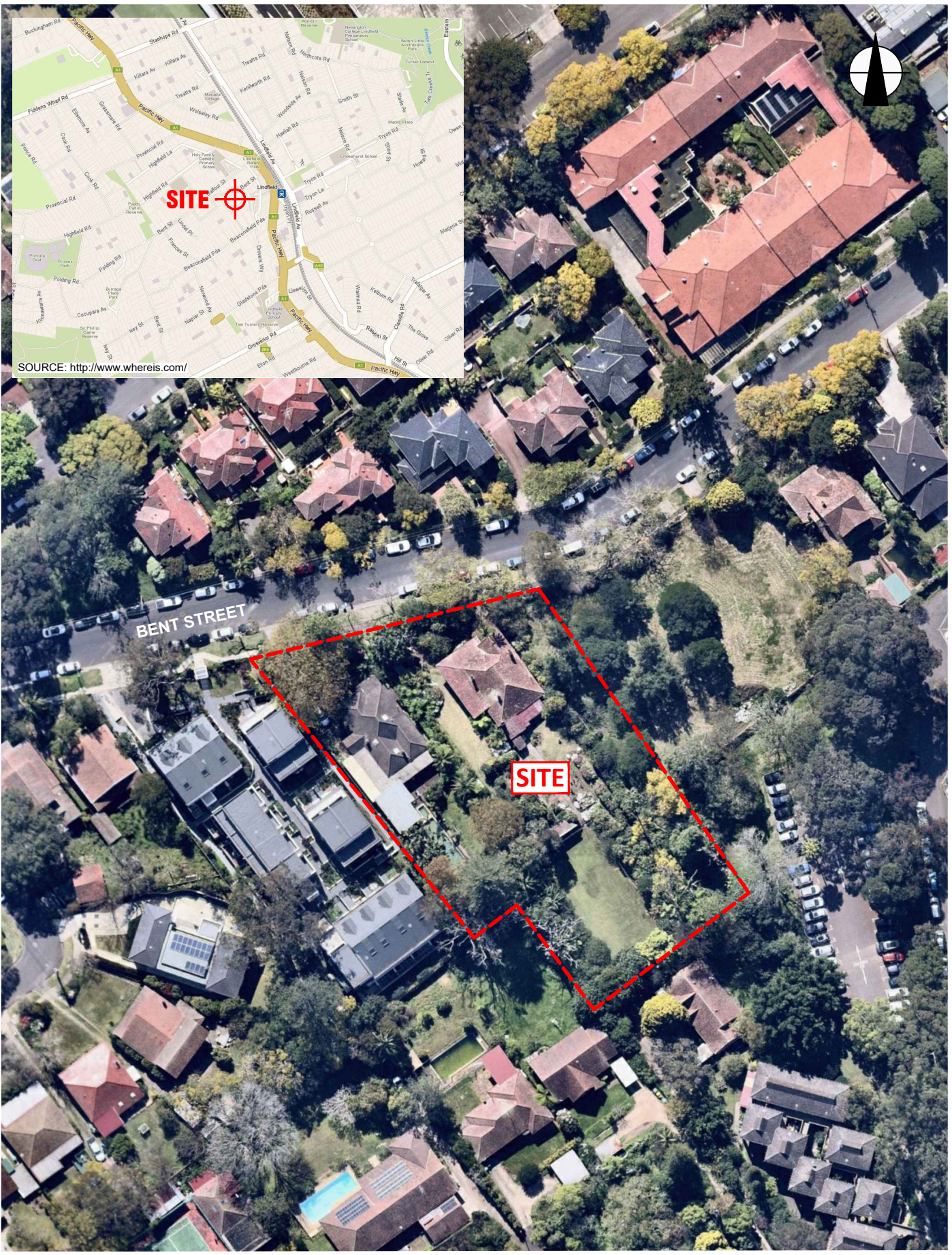
Because an environmental site investigation is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in written transmittals. These are definitive clauses designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the environmental site investigation, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to any questions.



Appendix A: Report Figures



SOURCE: <http://www.wheris.com/>



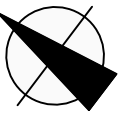
AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

Title:		SITE LOCATION PLAN	
Location:		12-16 BENT STREET, LINDFIELD, NSW	
Project No:	E35535BW	Figure No:	1
JKEnvironments			

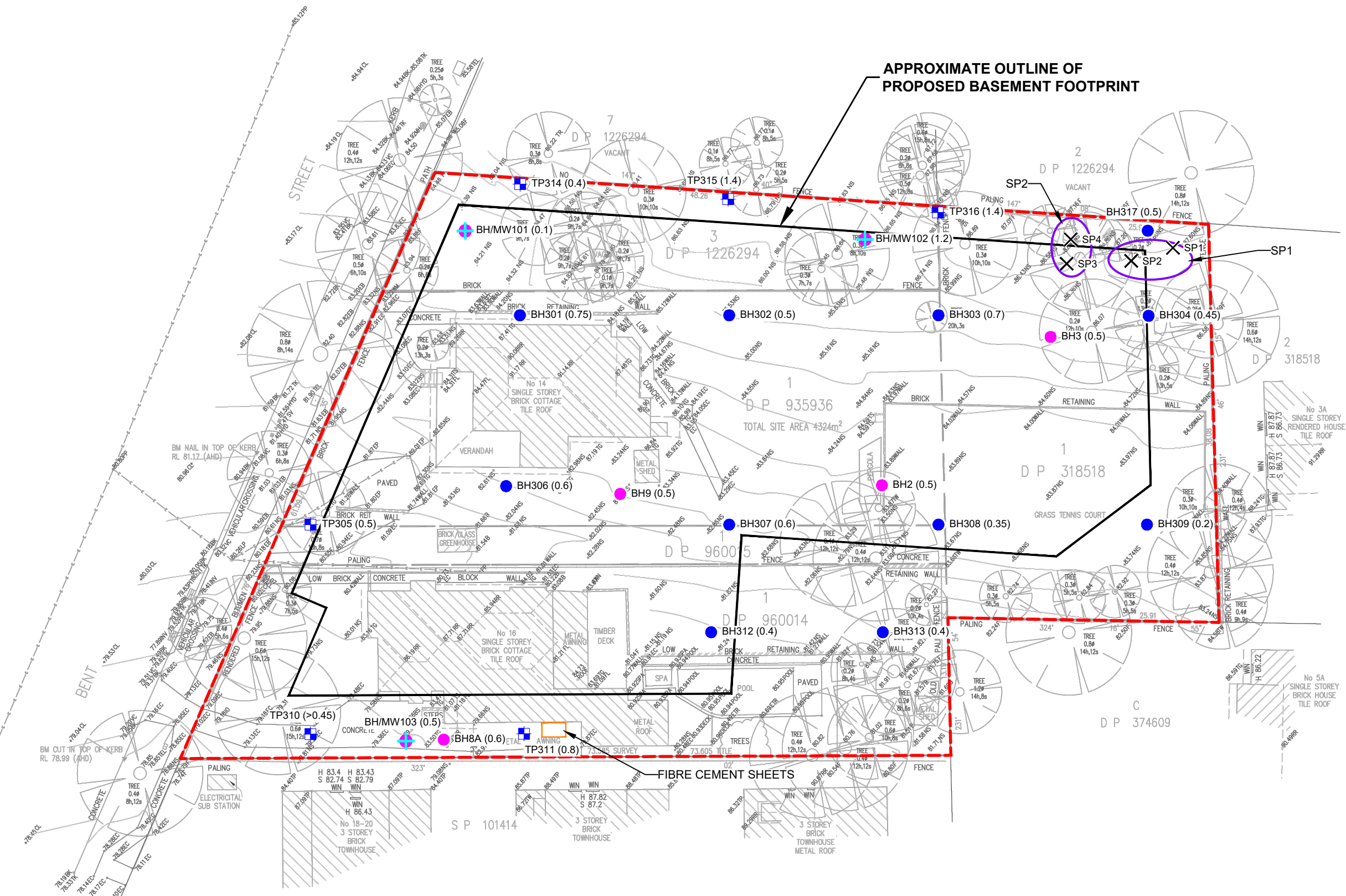


This plan should be read in conjunction with the Environmental report.

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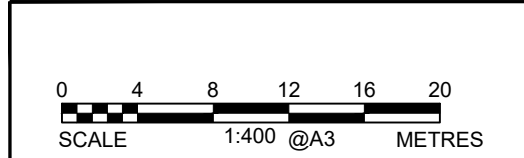


APPROXIMATE OUTLINE OF PROPOSED BASEMENT FOOTPRINT



LEGEND

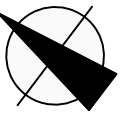
- APPROXIMATE SITE BOUNDARY
- BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
- BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
- BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
- TEST PIT LOCATION, NUMBER AND DEPTH OF FILL (m)
- STOCKPILE LOCATION
- STOCKPILE SAMPLE LOCATION AND NUMBER



This plan should be read in conjunction with the Environmental report.

Title: SAMPLE LOCATION PLAN	
Location: 12-16 BENT STREET, LINDFIELD, NSW	
Project No: E35535BW	Figure No: 2





APPROXIMATE OUTLINE OF PROPOSED BASEMENT FOOTPRINT

BH101	0-0.1m	Lab Replicate
Nickel	82mg/kg	82mg/kg
MW101		WDUP101
pH	4.6	N/A
Copper	4µg/L	4µg/L
Nickel	12µg/L	12µg/L
Zinc	69µg/L	70µg/L

MW102	LAB replicate	WDUP102
Nickel	19µg/L	18µg/L
Zinc	27µg/L	32µg/L

BH3	0-0.1m	SDUP1
Zinc	330mg/kg	350mg/kg

SP4	0-0.1m
ACM	Detected
SP4	0.4-0.5m
TRH F3	350mg/kg
TRH F3 Sillia gel clean-up	<100mg/kg

SP1	0.4-0.5m
Arsenic	340mg/kg

SP3	0.4-0.5m
TRH F2	150mg/kg
TRH F2	150mg/kg
TRH F3 Sillia gel clean-up	<50mg/kg
TRH F3	330mg/kg
TRH F3 Sillia gel clean-up	<100mg/kg

BH2	0-0.1m	Lab Duplicate	SDUP2
Zinc	370mg/kg	400mg/kg	410mg/kg

MW103	
pH	6
Nickel	36µg/L
Zinc	160µg/L

TP311	0-0.1m
ACM	Detected

LEGEND

- APPROXIMATE SITE BOUNDARY
- BH(Fill Depth) BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
- BH/MW(Fill Depth) BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
- BH301 BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
- TP305 TEST PIT LOCATION, NUMBER AND DEPTH OF FILL (m)
- STOCKPILE LOCATION
- ✕ SP1 STOCKPILE SAMPLE LOCATION AND NUMBER

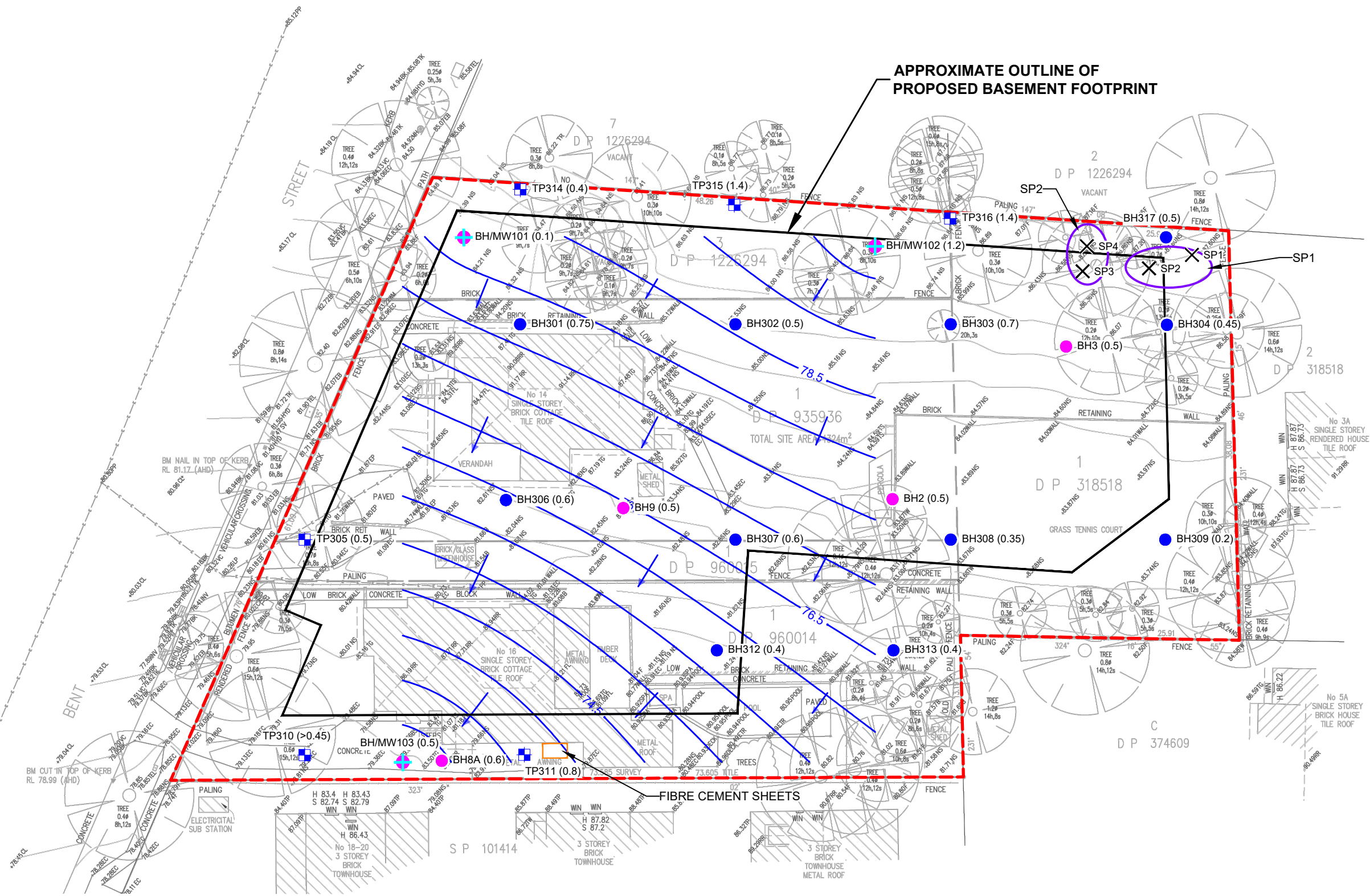
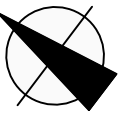
SAMPLE ID	DEPTH (metres)	SOIL/SURFACE SAMPLE EXCEEDANCE
CHEMICAL	CONCENTRATION	

SAMPLE ID	CONCENTRATION (µg/L)	GROUNDWATER SAMPLE EXCEEDANCE
CHEMICAL		

- SOIL/SURFACE CONTAMINATION ABOVE SAC FOR HUMAN HEALTH RISK
- SOIL/SURFACE CONTAMINATION ABOVE SAC FOR ECOLOGICAL RISK
- GROUNDWATER CONTAMINATION ABOVE SAC
- ASBESTOS DETECTED

		Title: SAC EXCEEDANCE PLAN	
Location: 12-16 BENT STREET, LINDFIELD, NSW		Project No: E35535BW Figure No: 3	
This plan should be read in conjunction with the Environmental report.			

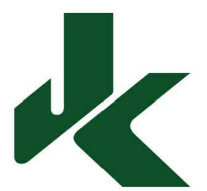
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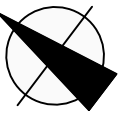
LEGEND

	APPROXIMATE SITE BOUNDARY
	BH(Fill Depth) BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
	BH/MW(Fill Depth) BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
	BH301 BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
	TP305 TEST PIT LOCATION, NUMBER AND DEPTH OF FILL (m)
	STOCKPILE LOCATION
	SP1 STOCKPILE SAMPLE LOCATION AND NUMBER
	74.5 GROUNDWATER CONTOUR INTERVALS (m)
	INFERRED GROUNDWATER FLOW DIRECTION

<p>This plan should be read in conjunction with the Environmental report.</p>	Title: GROUNDWATER CONTOUR PLOT	
	Location: 12-16 BENT STREET, LINDFIELD, NSW	
	Project No: E35535BW	Figure No: 4



PLOT DATE: 28/04/2025 1:47:10 PM DWG FILE: K:\SC EIS JOBS\35000\E35535BW\LINDFIELD\CAD\E35535BW.DWG



APPROXIMATE OUTLINE OF PROPOSED BASEMENT FOOTPRINT

BH101	0-0.1m	Lab Replicate
Nickel	82mg/kg	82mg/kg
MW101		WDUP101
pH	4.6	N/A
Copper	4µg/L	4µg/L
Nickel	12µg/L	12µg/L
Zinc	69µg/L	70µg/L

MW102	LAB replicate	WDUP102
Nickel	19µg/L	18µg/L
Zinc	27µg/L	32µg/L

BH3	0-0.1m	SDUP1
Zinc	330mg/kg	350mg/kg

SP4	0-0.1m
ACM	Detected
SP4	0.4-0.5m
TRH F3	350mg/kg
TRH F3 Sillia gel clean-up	<100mg/kg

SP1	0.4-0.5m
Arsenic	340mg/kg

SP3	0.4-0.5m
TRH F2	150mg/kg
TRH F2	150mg/kg
TRH F3 Sillia gel clean-up	<50mg/kg
TRH F3	330mg/kg
TRH F3 Sillia gel clean-up	<100mg/kg

BH2	0-0.1m	Lab Duplicate	SDUP2
Zinc	370mg/kg	400mg/kg	410mg/kg

MW103	
pH	6
Nickel	36µg/L
Zinc	160µg/L

FCF-AREA	Surface
Asbestos	Detected

TP311	0-0.1m
ACM	Detected

LEGEND

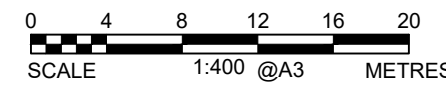
- APPROXIMATE SITE BOUNDARY
- BH(Fill Depth) BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
- BH/MW(Fill Depth) BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
- BH301 BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
- TP305 TEST PIT LOCATION, NUMBER AND DEPTH OF FILL (m)
- STOCKPILE LOCATION
- ✕ SP1 STOCKPILE SAMPLE LOCATION AND NUMBER

SAMPLE ID	DEPTH (metres)
CHEMICAL	CONCENTRATION

SAMPLE ID	-
CHEMICAL	CONCENTRATION (µg/L)

- SOIL/SURFACE CONTAMINATION ABOVE SAC FOR HUMAN HEALTH RISK
- SOIL/SURFACE CONTAMINATION ABOVE SAC FOR ECOLOGICAL RISK
- GROUNDWATER CONTAMINATION ABOVE SAC
- ASBESTOS DETECTED
- REMEDIATION AREA
- PROPOSED VALIDATION SAMPLE LOCATION

GROUNDWATER SAMPLE EXCEEDANCE



This plan should be read in conjunction with the Environmental report.

Title: REMEDATION AND VALIDATION SAMPLE LOCATION PLAN	
Location: 12-16 BENT STREET, LINDFIELD, NSW	
Project No: E35535BW	Figure No: 5
JKEnvironments	





Appendix B: Proposed Development Plans

	PERMISSIBLE	ACHIEVED
FSR	3.25	3.25
HEIGHT	28.6m	29.2m

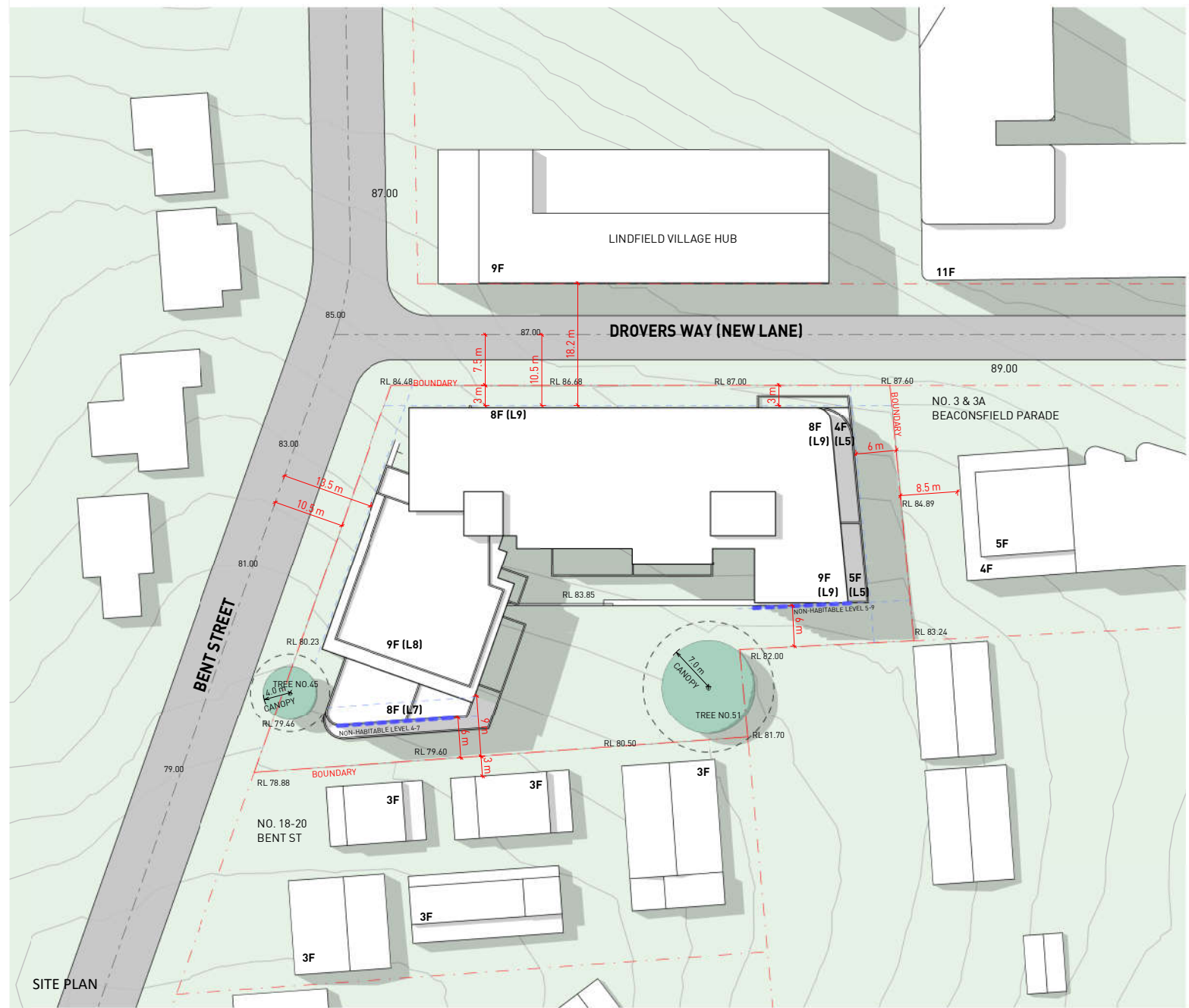
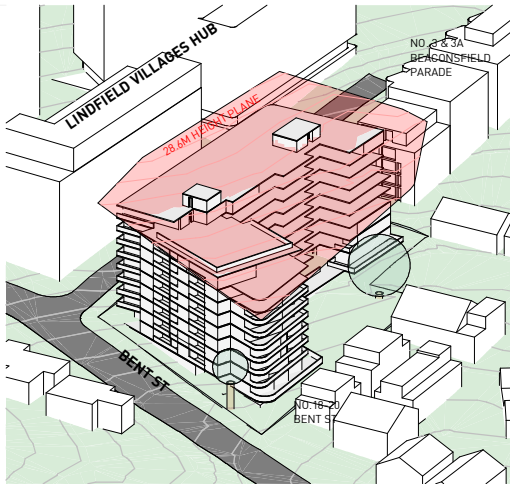
YIELD AND UNIT MIX

LEVEL	1B	2B	3B	4B	COUNT
L9	0	2	3	2	7
L8	0	3	6	2	11
L7	1	4	7	1	13
L6	1	4	7	1	13
L5	5	5	5	1	16
L4	5	5	5	1	16
L3	5	7	5	0	17
L2	4	5	6	0	15
L1	1	2	2	4	9
L0	0	0	0	0	0
	22	37	46	12	117

AFFORDABLE

LEVEL	AREA	UNIT COUNT
L5	417 m ²	6
L4	513 m ²	7
L3	572 m ²	8
L2	418 m ²	6
L1	151 m ²	2
TOTAL	2071 m ²	29

AFFORDABLE GFA REQUIRED
 4324 X 3.25 X 17%= 2389m²
 (including circulation)



SITE PLAN

Key Plan:
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PTW 0 1 2 5 10 15m

Project PA030530
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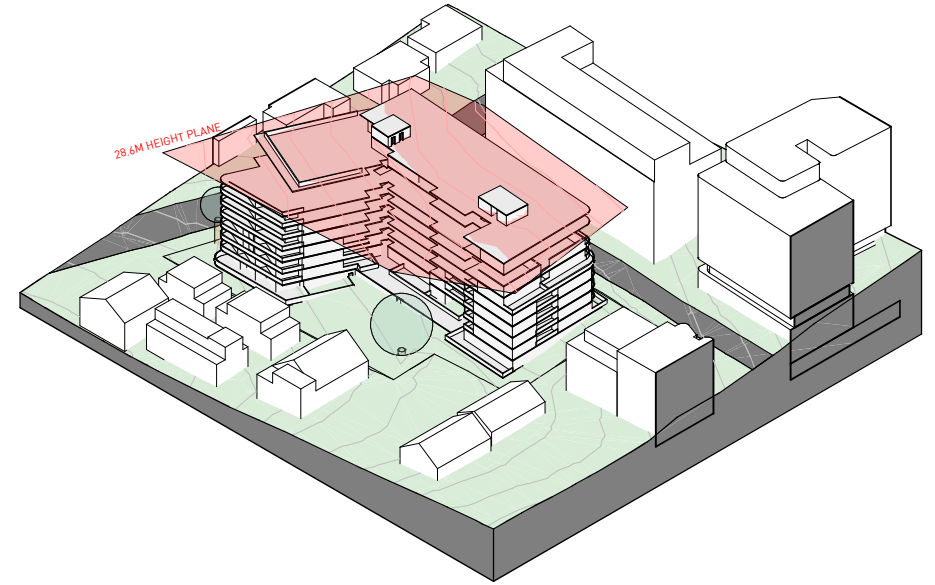
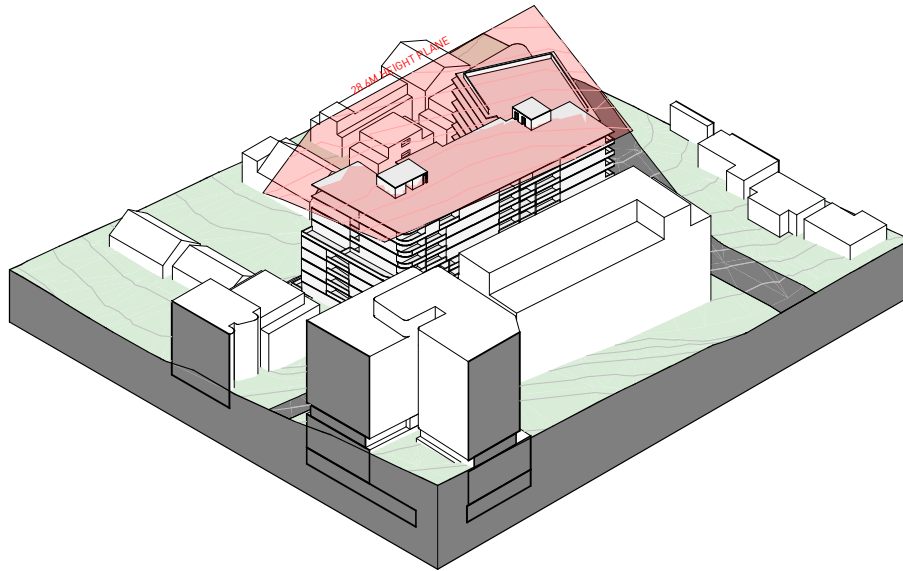
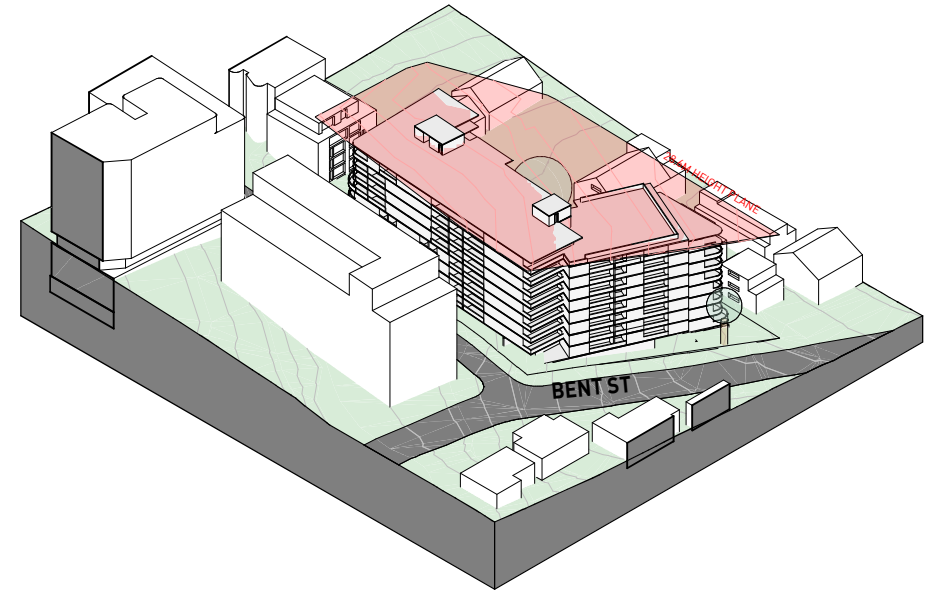
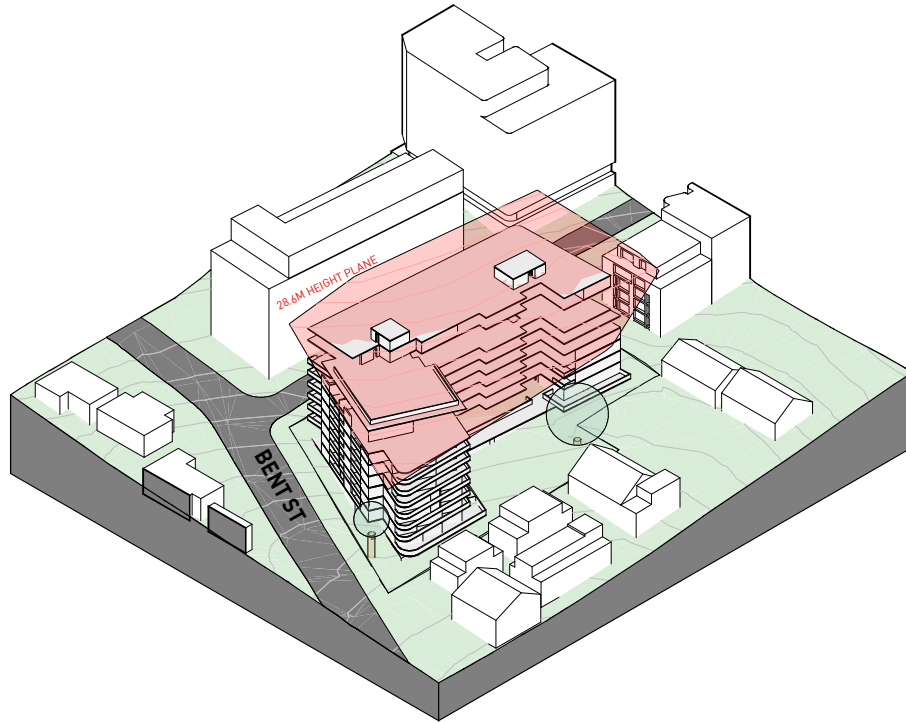
BentStreetLindfield
 12-16 BENT STREET, LINDFIELD, NSW
 2070

Status
 SKETCH

Title
 A1-GENERAL INFORMATION
 SITE PLAN

Drawing Number
 AR-A10010

Revision



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PTW

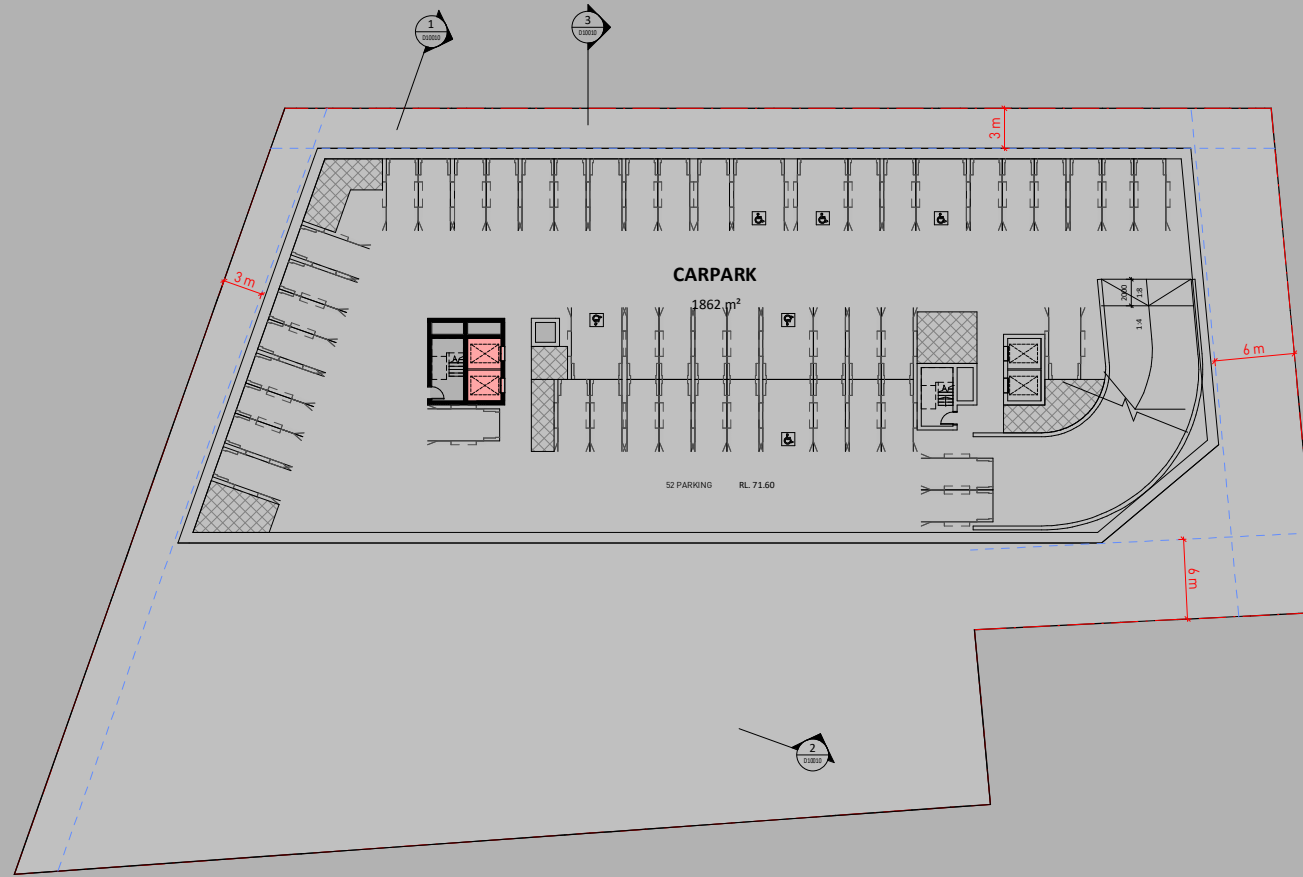
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Project PA030530
BentStreetLindfield
12-16 BENT STREET, LINDFIELD, NSW
2070

Status
SKETCH

A1-GENERAL INFORMATION	
ISOMETRIC VIEWS	
Drawing Number	Revision
AR-A10020	



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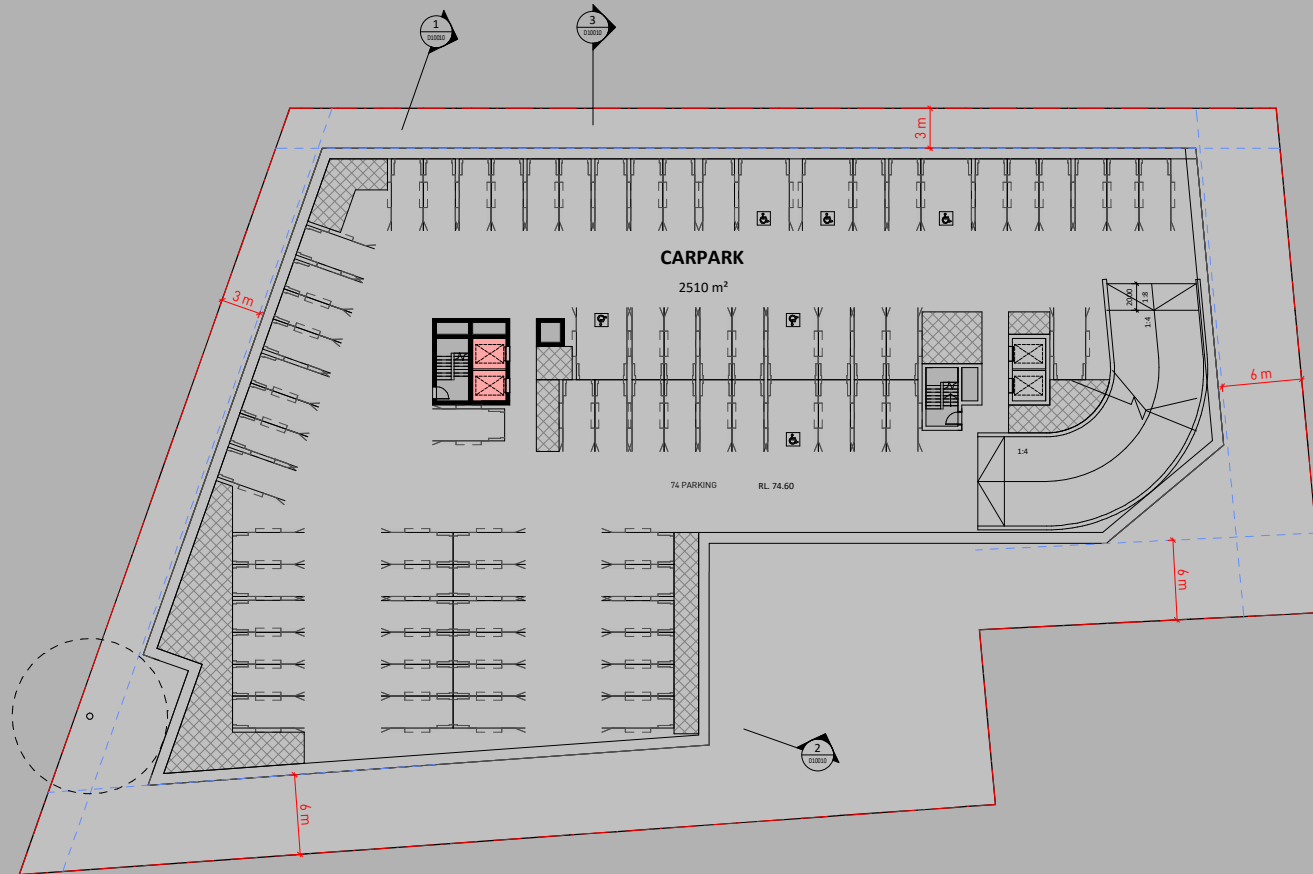
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N Mapotonic Architect No.11274

SUNDALE

PTW

0	1	2	5	10	15m
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Project PA030530					
BentStreetLindfield					
12-16 BENT STREET, LINDFIELD, NSW					
Status 2070					
SKETCH					
Title B1-PLAN					Revision
Drawing Number AR-B10000					



Key Plan:

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Rev	Amendment	By	Chk*	Date

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N Macgregor Architect No.11274

Project PA030530
BentStreetLindfield
12-16 BENT STREET, LINDFIELD, NSW
2070
Status SKETCH

PTW

0 1 2 5 10 15m
1:200 @ A1

Title B1-PLAN
BASEMENT LEVEL 2 FLOOR PLAN

Drawing Number AR-B10010
Revision



Key Plan:

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10 Jones Archibald No.4778
N Mapotepic Archibald No.11274

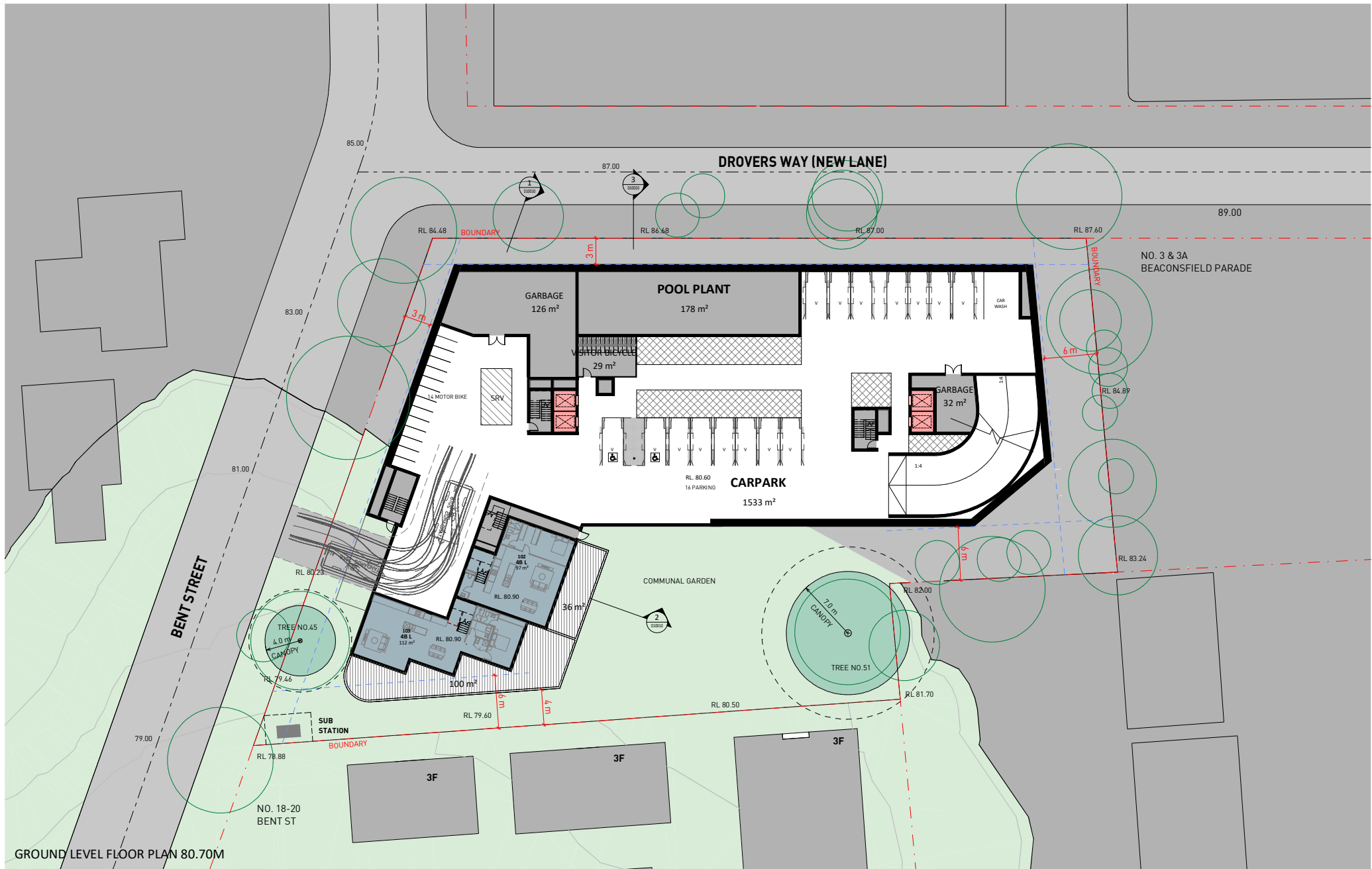
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Project PA030530
BentStreetLindfield
12-16 BENT STREET, LINDFIELD, NSW
2070

Status
SKETCH

Title	
B1-PLAN	BASEMENT LEVEL 1 FLOOR PLAN
Drawing Number	
AR-B10020	
Revision	



Key Plan:

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Rev	Amendment	By	Chk*	Date
1	BLOCK PLAN	MS	MS	2024/07/24

Registered Architect

01 Megumi Sakaguchi NSW Arch No.9391

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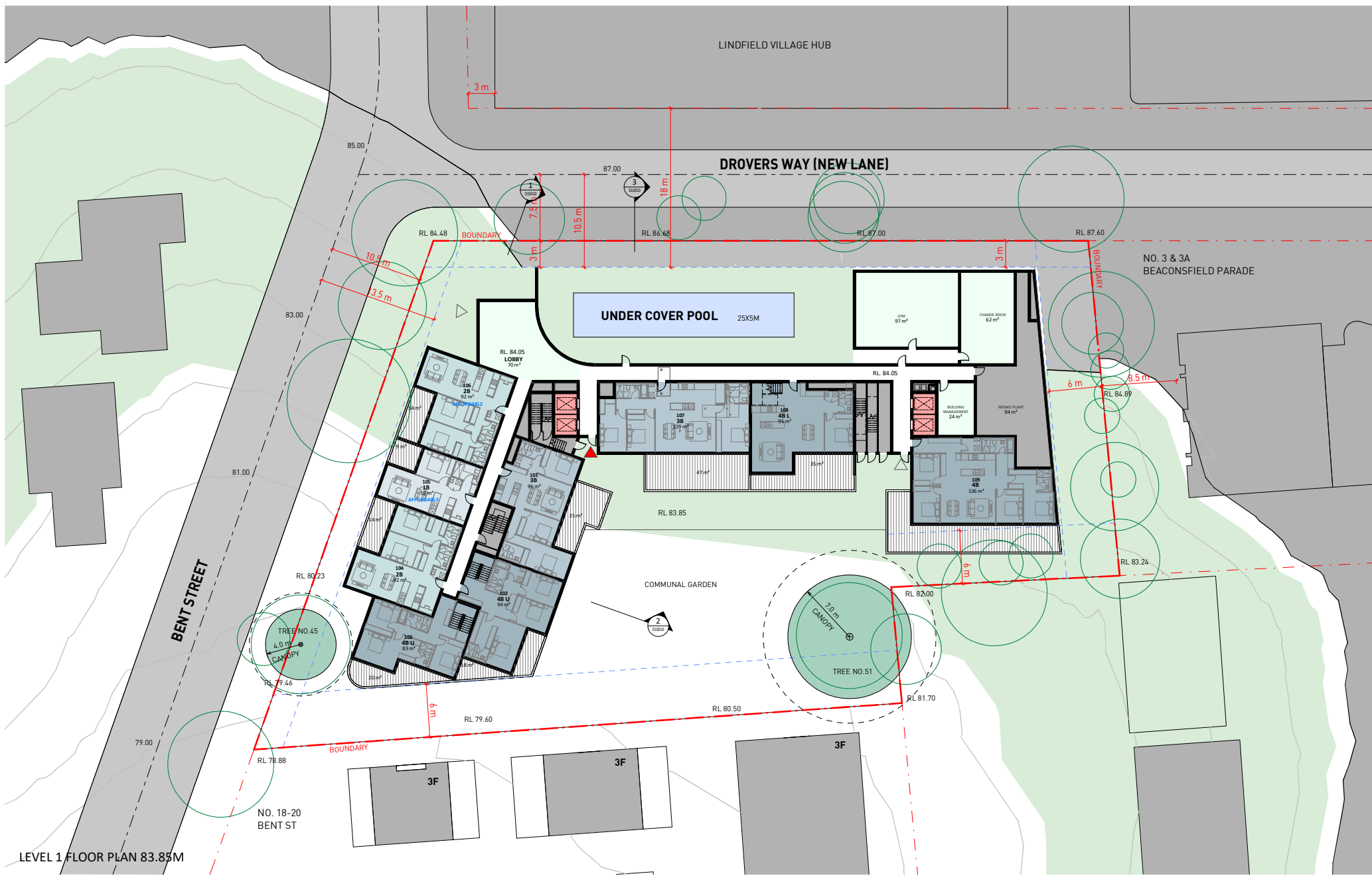
Project PA030530
BentStreetLindfield
12-16 BENT STREET, LINDFIELD, NSW
2070

Status
SKETCH

Revision	Description
1	B1-PLAN
2	
3	
4	
5	

GROUND LEVEL FLOOR PLAN

Drawing Number: AR-B10030



LEVEL 1 FLOOR PLAN 83.85M

Key Plan:

Drawing Disclaimer:
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Rev	Amendment	By	Chk*	Date
1	BLOCK PLAN	MS	MS	2024/07/24

***Registered Architect**
01 Megumi Sakaguchi NSW Arch No.9391

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Project PA030530
BentStreetLindfield
12-16 BENT STREET, LINDFIELD, NSW
2070

Status
SKETCH

Title
B1-PLAN
LEVEL 1 FLOOR PLAN

Drawing Number
AR-B10040

Revision
1



LEVEL 2 FLOOR PLAN 87.00M

Key Plan:

Drawing Disclaimer:
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Rev	Amendment	By	Chk*	Date
1	BLOCK PLAN	MS	MS	2024/07/24

*Registered Architect	Consultants
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N Mergeski Architect No.11274

PTW

1:200 @ A1

Title: B1-PLAN
LEVEL 2 FLOOR PLAN

Project: PA030530
BentStreetLindfield
12-16 BENT STREET, LINDFIELD, NSW 2070

Drawing Number: AR-B10050
Revision: 1

Status: SKETCH

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PTW-48022-AWA-1000.rvt

LEVEL 3 FLOOR PLAN



Rev	Amendment	By	Chk*	Date
1	BLOCK PLAN	MS	MS	2024/07/24

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 ABR 23 000 454 624
 trading as PTW Architects

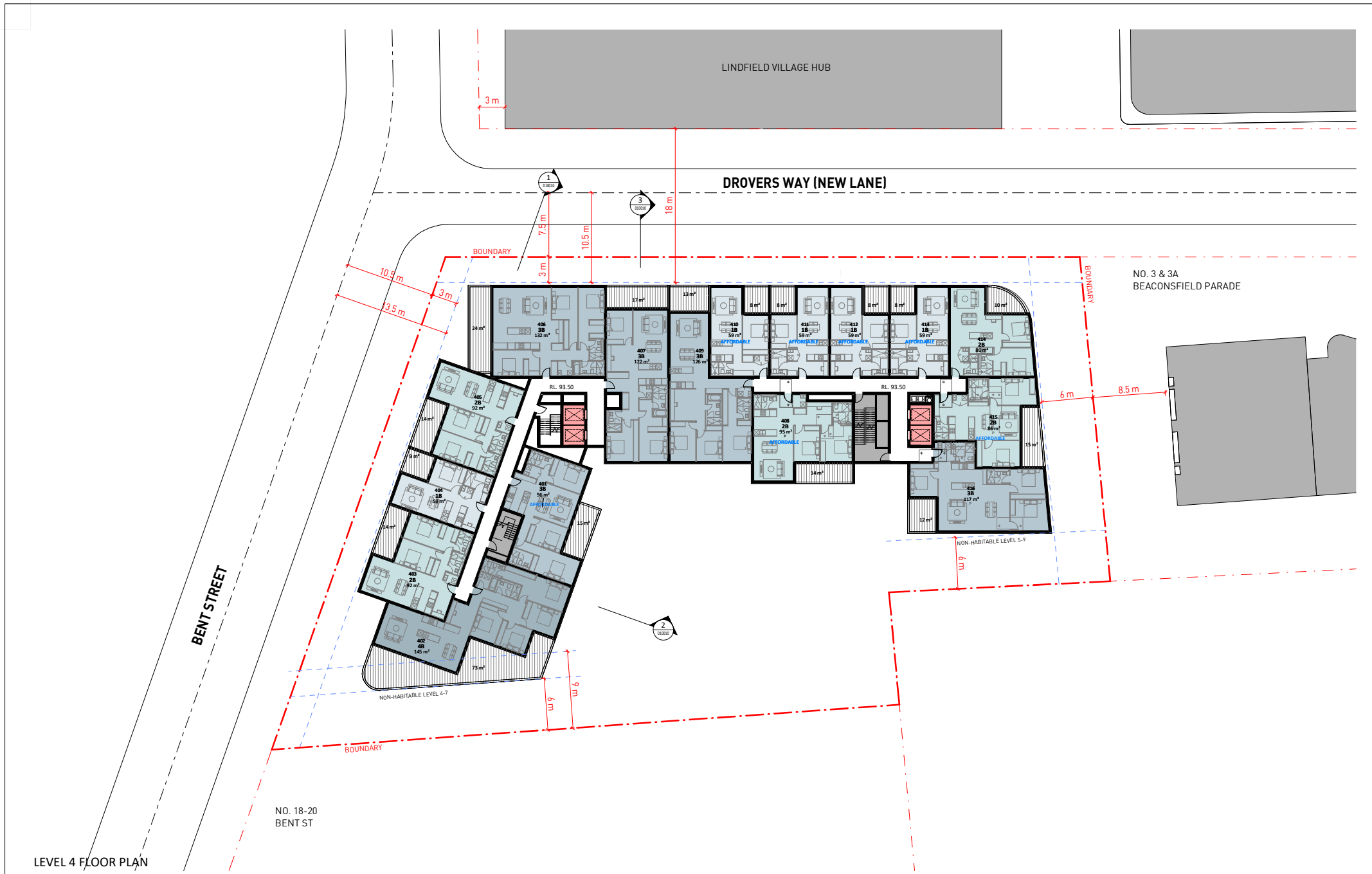
5 Parsons Architect No.6298
 D Drive Architect No.4778
 N Merrigee Architect No.11274

PTW

Project PA030530
 12-16 BENT STREET, LINDFIELD, NSW
 2070

Status: SKETCH

Revision	Drawing Number	Title
1	AR-B10060	B1-PLAN LEVEL 3 FLOOR PLAN



LEVEL 4 FLOOR PLAN

Key Plan:

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Rev	Amendment	By	Chk*	Date
1	BLOCK PLAN	MS	MS	2024/07/24

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Project PA030530
BentStreetLindfield
12-16 BENT STREET, LINDFIELD, NSW
2070

Status
SKETCH

Title
B1-PLAN
LEVEL 4 FLOOR PLAN

Drawing Number
AR-B10070

Revision
1

LEVEL 5 FLOOR PLAN

BENT STREET

LINDFIELD VILLAGE HUB

DROVERS WAY (NEW LANE)

NO. 3 & 3A
BEACONSFIELD PARADE

NO. 18-20
BENT ST



Key Plan:

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Rev	Amendment	By	Chk.*	Date
1	BLOCK PLAN	MS	MS	2024/07/24

*Registered Architect
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Project PA030530
BentStreetLindfield
12-16 BENT STREET, LINDFIELD, NSW
2070

Status
SKETCH

Title	Drawing Number	Revision
B1-PLAN	AR-B10080	1
LEVEL 5 FLOOR PLAN		

LEVEL 6 FLOOR PLAN

BENT STREET

LINDFIELD VILLAGE HUB

DRIVERS WAY (NEW LANE)

NO. 3 & 3A
BEACONSFIELD PARADE

NO. 18-20
BENT ST

NON-HABITABLE LEVEL 4-7

NON-HABITABLE LEVEL 5-9

Rev	Amendment	By	Chk*	Date	*Registered Architect
1	BLOCK PLAN	MS	MS	2024/07/24	01 Megumi Sakaguchi NSW Arch No.9391

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Project
PA030530 BentStreetLindfield 12-16 BENT STREET, LINDFIELD, NSW 2070

Scale
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Title	Drawing Number	Revision
B1-PLAN LEVEL 6 FLOOR PLAN	AR-B10090	1



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LEVEL 7 FLOOR PLAN

BENT STREET

LINDFIELD VILLAGE HUB

DROVERS WAY (NEW LANE)

NO. 3 & 3A
BEACONSFIELD PARADE

NO. 18-20
BENT ST



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Rev	Amendment	By	Chk.*	Date
1	BLOCK PLAN	MS	MS	2024/07/24

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Project PA030530
BentStreetLindfield
12-16 BENT STREET, LINDFIELD, NSW
2070
Status
SKETCH

Title	Drawing Number	Revision
B1-PLAN	AR-B10100	1

LEVEL 8 FLOOR PLAN

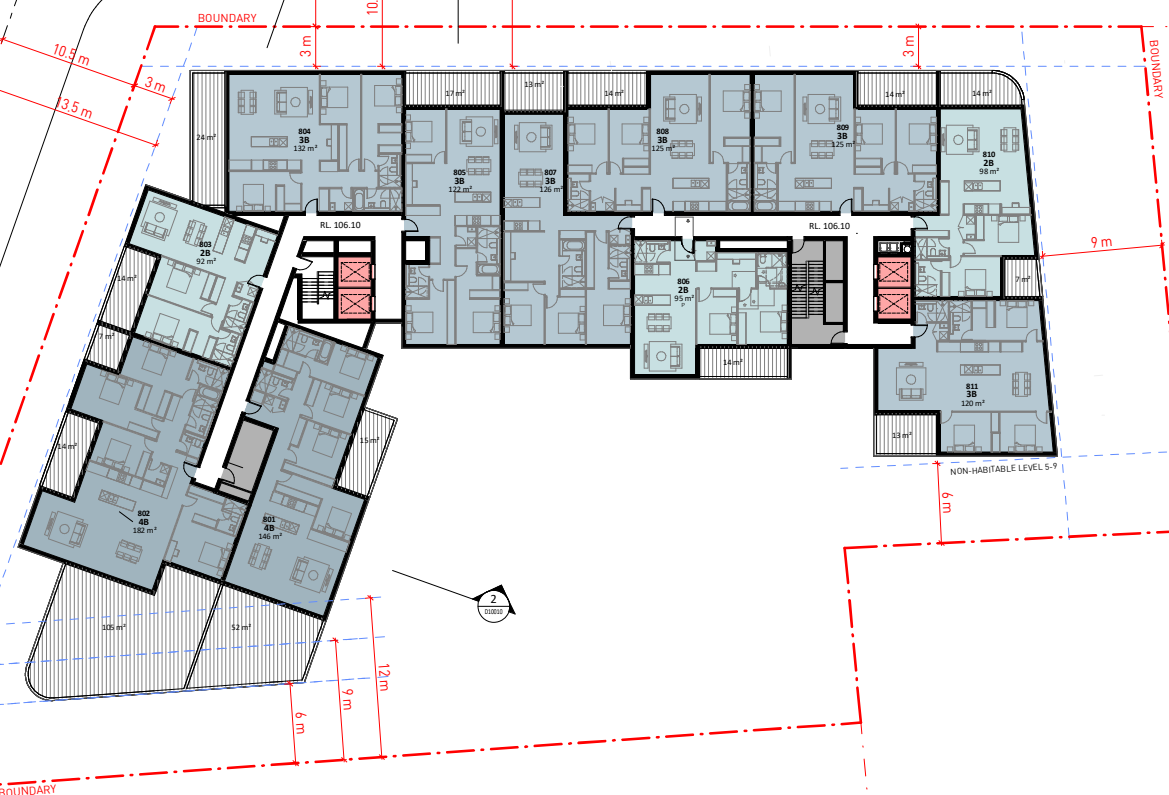
BENT STREET

LINDFIELD VILLAGE HUB

DRIVERS WAY (NEW LANE)

NO. 3 & 3A
BEACONSFIELD PARADE

NO. 18-20
BENT ST



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Rev	Amendment	By	Chk*	Date
1	BLOCK PLAN	MS	MS	20240724

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D Drive Architekt No.4778
N MergelArchitekt No.11274

PTW

Project PA030530
@ AI

BentStreetLindfield
12-16 BENT STREET, LINDFIELD, NSW
2070

Status
SKETCH

Title	Drawing Number	Revision
B1-PLAN	AR-B10110	1

LEVEL 9 FLOOR PLAN

BENT STREET

LINDFIELD VILLAGE HUB

DRIVERS WAY (NEW LANE)

NO. 3 & 3A
BEACONSFIELD PARADE

COMMUNAL SPACE
445 SQM

NO. 18-20
BENT ST

NON-HABITABLE LEVEL 5-9

Rev	Amendment	By	Chk*	Date	*Registered Architect
1	BLOCK PLAN	MS	MS	2024/07/24	01 Megumi Sakaguchi NSW Arch No.9391

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Project PA030530
BentStreetLindfield
12-16 BENT STREET, LINDFIELD, NSW
2070

Status
SKETCH

Title	Drawing Number	Revision
B1-PLAN	AR-B10120	1



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87.00

LINDFIELD VILLAGE HUB

9F

11F

DROVERS WAY (NEW LANE)

89.00

RL 84.48

BOUNDARY

RL 86.68

RL 87.00

RL 87.60

BOUNDARY

NO. 3 & 3A
BEACONSFIELD PARADE

RL 84.89

5F

4F

2

RL 83.24

RL 82.00

RL 81.70

RL 80.50

RL 79.60

RL 80.23

RL 79.46

RL 78.88

NO. 18-20
BENT ST

3F

3F

3F

BENT STREET

ROOF PLAN

Key Plan:



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Rev	Amendment	By	Chk*	Date
1	BLOCK PLAN	MS	MS	2024/07/24

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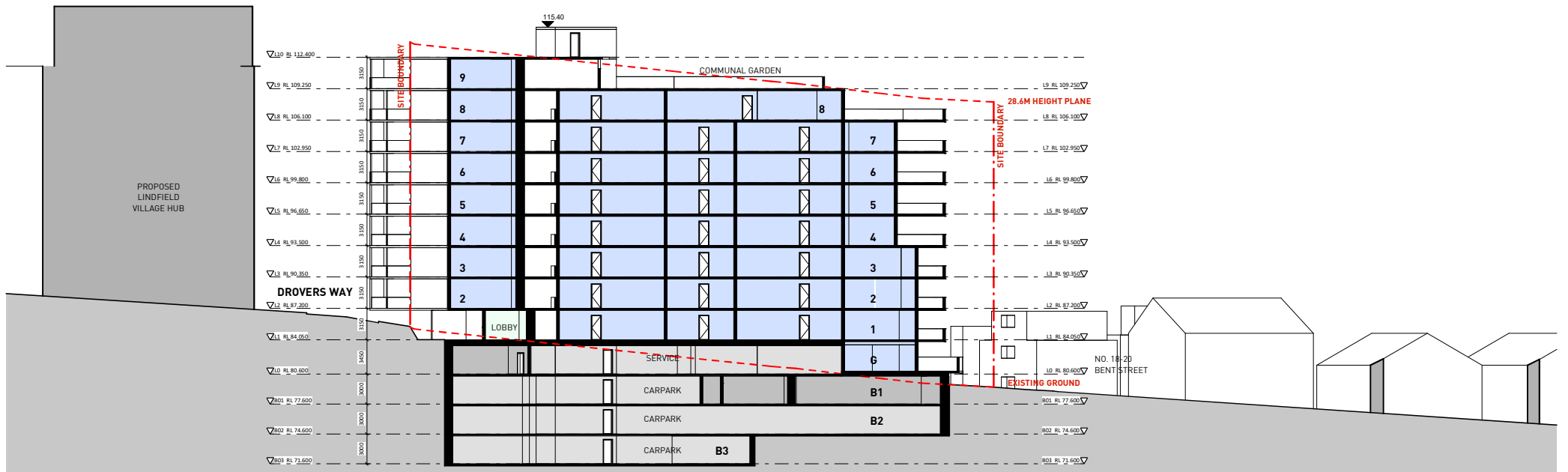
Project PA030530
12-16 BENT STREET, LINDFIELD, NSW
2070
Status
SKETCH

Title
B1-PLAN
ROOF PLAN

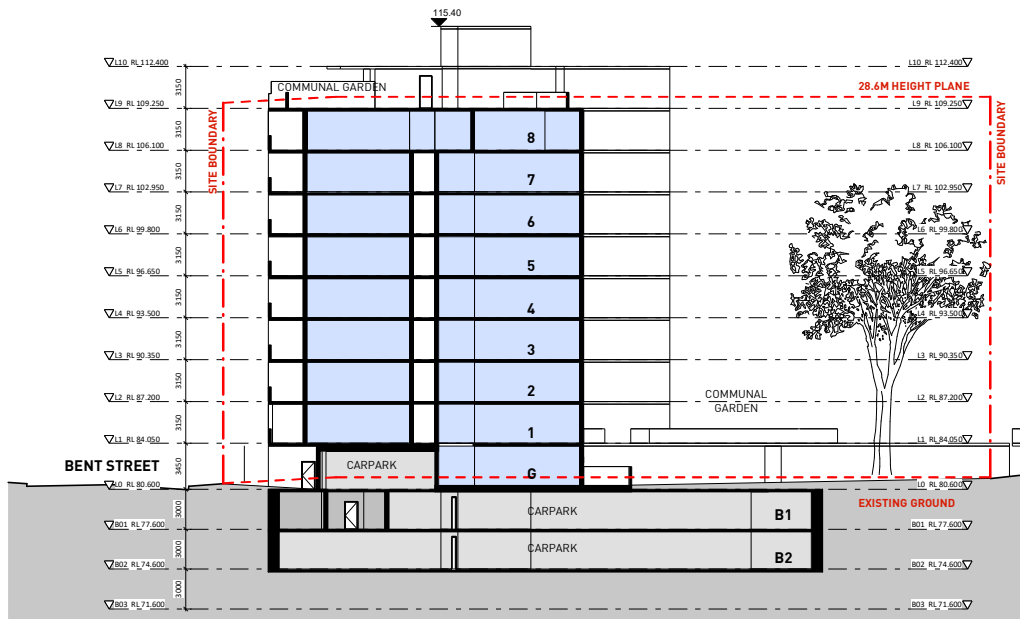
Drawing Number
AR-B10130

Revision
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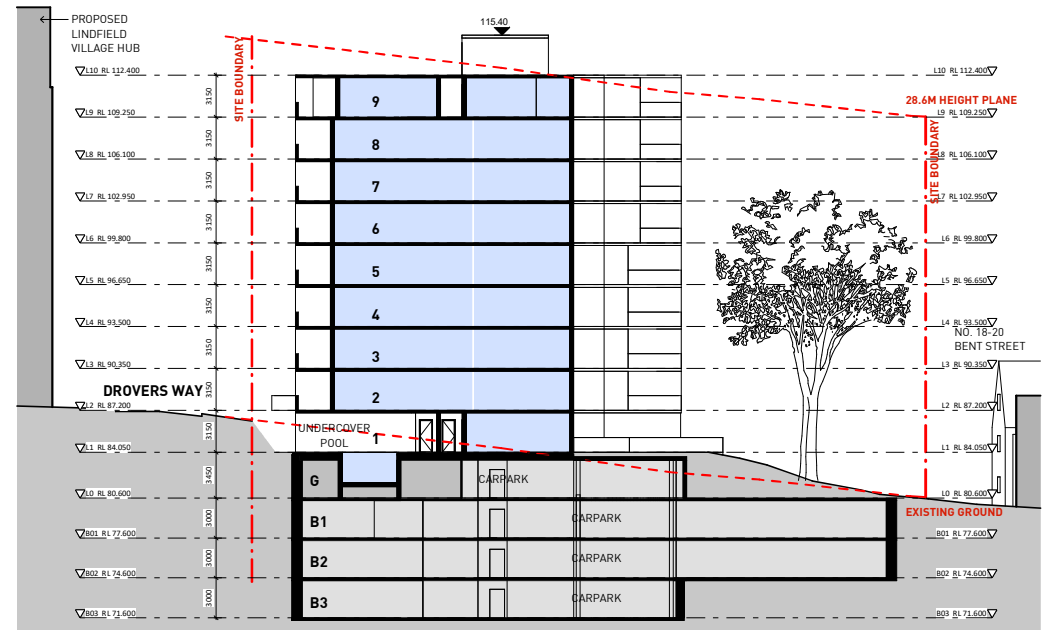
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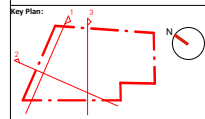
Section 1



Section 2



Section 3



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Rev	Amendment	By	Chk*	Date
1	BLOCK PLAN	MS	MS	20240724

*Registered Architect	Consultants
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Project
PA030530

Title
D1-SECTIONS SECTIONS

Drawing Number	Revision
AR-D10010	1



Appendix C: Previous Investigation Borehole Logs and Data Summary Tables

BOREHOLE LOG

Client: SUNDALE NORTHLAND DEVELOPMENT P/L
ATF SUNDALE NORTHLAND DEVELOPMENT UNIT TRUST

Project: PROPOSED RESIDENTIAL DEVELOPMENT

Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: 35535YC **Method:** HAND AUGER **R.L. Surface:** ~83.9 m

Date: 4/11/22 **Datum:** AHD

Plant Type: - **Logged/Checked By:** B.S./J.M.

Groundwater Record	SAMPLES				Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
	ES	U50	DB	DS										
DRY ON COMPLETION					REFER TO DCP TEST RESULTS SHEET			[Cross-hatched pattern]	CH	FILL: Sandy silty clay, low plasticity, dark brown, fine to medium grained sand, trace of fine to medium grained ironstone gravel, high plasticity, clay nodules, ash, and plastic fragments. Silty CLAY: high plasticity, orange brown, trace of fine to medium grained ironstone gravel, and ash. END OF BOREHOLE AT 0.70 m	w<PL			SCREEN: 11.21kg 0-0.1m, NO FCF APPEARS POORLY COMPACTED SCREEN: 10.88kg 0.1-0.5m, NO FCF RESIDUAL HP READING ON CUTTINGS RECOVERED FROM HAND AUGER HAND AUGER REFUSAL ON INFERRED IRONSTONE GRAVEL
						83	1				w-PL	VSt	310 310 270	
						82	2							
						81	3							
						80	4							
						79	5							
						78	6							
						77								

JK 9.02.4 LIB.GLB Log_JK AUGERHOLE - MASTER_35535YC LINDFIELD.GPJ <DrawingFiles> 20/12/2024 10:49 10.01.00.01 DcglgLab and In Situ Test - DCD [Lib_JK 9.02.4 20/09/2021 Pj1_JK 9.01.0 20/09/2020]



Borehole No.
3
1 / 1

BOREHOLE LOG

Client: SUNDALE NORTHLAND DEVELOPMENT P/L
ATF SUNDALE NORTHLAND DEVELOPMENT UNIT TRUST
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: 35535YC **Method:** HAND AUGER **R.L. Surface:** ~85.8 m
Date: 4/11/22 **Datum:** AHD
Plant Type: - **Logged/Checked By:** B.S./J.M.

Groundwater Record	SAMPLES				Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
	ES	U50	DB	DS										
DRY ON COMPLETION					REFER TO DCP TEST RESULTS SHEET					FILL: Sandy silty clay, low plasticity, dark brown, fine to medium grained sand, trace of fine grained ironstone gravel, ceramic fragments and roots.	w<PL			APPEARS POORLY COMPACTED
						85	1		CI-CH	Silty CLAY: medium to high plasticity, brown and orange brown, trace of fine to medium grained ironstone gravel, and ash. END OF BOREHOLE AT 0.70 m	w<PL	VSt	250 250 310	SCREEN: 12.55kg 0-0.1m, NO FCF SCREEN: 10.14kg 0.1-0.5m, NO FCF RESIDUAL HP READING ON CUTTINGS RECOVERED FROM HAND AUGER HAND AUGER REFUSAL ON INFERRED IRONSTONE GRAVEL
						84	2							
						83	3							
						82	4							
						81	5							
						80	6							
						79								

JK 9.02.4 LIB.GLB Log_JK AUGERHOLE - MASTER_35535YC LINDFIELD.GPJ -<DrawingFiles> 20/12/2024 10:49 10.01.00.01 Dcgtel Lab and In Situ Test - DCD [Lib:JK 9.02.4 20/04/05/31 Pj:JK 9.01.0 20/05/03/20]

JKEnvironments

ENVIRONMENTAL LOG



Log No.
BH8A
1/1

Environmental logs are not to be used for geotechnical purposes

Client: SUNDALE NORTHLAND DEVELOPMENT P/L ATF SUNDALE NORTHLAND DEVELOPMENT TRUST
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 14-216 BENT STREET, LINDFIELD, NSW

Job No.: E35355B **Method:** HAND AUGER **R.L. Surface:** N/A
Date: 4/11/22 **Datum:** -
Plant Type: - **Logged/Checked by:** A.D./V.B.

Groundwater Record	SAMPLES					Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL	DB									
DRY ON COMPLETION							0			FILL: Sandy silty clay, low plasticity, dark brown, fine to medium grained sand, trace of ironstone gravel, ash and root fibres.	w<PL			GRASS COVER SCREEN: 10.18kg 0-0.1m NO FCF SCREEN: 10.20kg 0.1-0.6m NO FCF
							0.5		CH	Silty CLAY: high plasticity, orange brown, trace of ironstone gravel and ash.	w<PL			RESIDUAL
							1			END OF BOREHOLE AT 1.1m				
							1.5							
							2							
							2.5							
							3							
							3.5							

BOREHOLE LOG

Client: SUNDALE NORTHLAND DEVELOPMENT P/L
ATF SUNDALE NORTHLAND DEVELOPMENT UNIT TRUST

Project: PROPOSED RESIDENTIAL DEVELOPMENT

Location: 14-16 BENT STREET, LINDFIELD, NSW

Job No.: 35535SJ

Method: SPIRAL AUGER

R.L. Surface: ~83.1 m

Date: 10/11/22

Datum: AHD

Plant Type: JK308

Logged/Checked By: J.F./J.M.

Groundwater Record	SAMPLES				Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
	ES	U50	DB	DS										
ON COMPLETION OF CORING						83				FILL: Silty sandy clay, low plasticity, dark brown, fine to medium grained sand, trace of root fibres.	w<PL			GRASS COVER
					N = 13 2,4,9	82	1		CH	Silty CLAY: high plasticity, red brown and orange brown, trace of fine to medium grained ironstone gravel, and root fibres.	w>PL	Hd		RESIDUAL
					N > 20 8,8,12/ 100mm REFUSAL	81	2		CI-CH	Silty CLAY: medium to high plasticity, light grey and red brown, trace of fine to medium grained sand, and fine to medium grained ironstone gravel, with extremely weathered fabric.	w<PL			
						80	3		-	SANDSTONE: fine to medium grained, red brown and light grey, with high strength iron indurated bands and extremely weathered bands.	DW	L - M		HAWKESBURY SANDSTONE MODERATE 'TC' BIT RESISTANCE WITH LOW BANDS
						79	4			REFER TO CORED BOREHOLE LOG		H		HIGH RESISTANCE 'TC' BIT REFUSAL GROUNDWATER MONITORING WELL INSTALLED TO 11.2m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 5.2m TO 11.2m. CASING 5.2m TO 0.1m. 2mm SAND FILTER PACK 4.0m TO 11.2m. BENTONITE SEAL 0.1m TO 4.0m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
						78	5							
						77	6							

JK 9.02.4.LB.GLB_Log_JK_AUGERHOLE - MASTER 35535SJ LINDFIELD.GPJ ->DrawingFile>> 2811/2022 10:22 10.01.00.01 D:\git\Le and In Situ\Tool - DGD\ Lib - JK 9.02.4.2019-05-31 Proj - JK 9.01.2018-03-20

CORED BOREHOLE LOG

Client: SUNDALE NORTHLAND DEVELOPMENT P/L
ATF SUNDALE NORTHLAND DEVELOPMENT UNIT TRUST

Project: PROPOSED RESIDENTIAL DEVELOPMENT

Location: 14-16 BENT STREET, LINDFIELD, NSW

Job No.: 35535SJ **Core Size:** NMLC **R.L. Surface:** ~83.1 m

Date: 10/11/22 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK308 **Bearing:** N/A **Logged/Checked By:** J.F./J.M.

Water Loss/Level Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_p(50)$	SPACING (mm)	DEFECT DETAILS		Formation	
									Specific	General		
	80			START CORING AT 3.21m								
ON 11/11/22 14% LOSS AFTER COMPLETION AT 8AM AND ON 11/11/22		79		SANDSTONE: fine to medium grained, light grey and red brown, indistinct rock fabric.	HW	L - H	1.2 1.5			(3.55m) Be, 10°, Un, R, Clay Vn (3.69m) Be, 10°, P, R, Fe Vn (3.72m) Be, 0°, P, R, Fe Vn (3.77m) Be, 5°, P, R, Clay Ct (3.82m) CS, 0°, 100 mm.t (3.87m) Be, 5°, P, R, Clay Ct (3.95m) J, 85°, Clay Ct, & XWS, 85°, 4mm.t (4.05m) XWS, 0°, 20 mm.t (4.12m) Be, 5°, P, R, Fe Vn (4.19m) J, 90°, C, R, Clay Vn (4.24m) Be, 5°, P, R, Fe Vn (4.28m) Be, 5°, Un, R, Fe Vn (4.32m) CS, 0°, 40 mm.t (4.46m) CS, 0°, 20 mm.t (4.54m) Be, 0°, P, R, Fe Vn (4.68m) J, 75°, Ir, R, Fe Vn (4.76m) J, 85°, P, R, Clay Ct (4.83m) CS, 0°, 60 mm.t (4.98m) CS, 0°, 50 mm.t (5.09m) CS, 0°, 70 mm.t		
		78		LAMINITE: Sandstone, fine to medium grained, grey, and Siltstone, dark grey, distinctly bedded at 0-5°.	HW	L	0.20 0.20			(5.35m) Cr, 0°, 60 mm.t (5.55m) Be, 5°, P, S, Fe Vn (5.66m) Be, 5°, P, S, Fe Vn (5.80m) Be, 0°, P, S, Fe Vn (5.82m) Be, 0°, P, S, Fe Ct		
65% RETURN		77			MW	M - H	1.0 1.3			(6.23m) Cr, 0°, 10 mm.t (6.49m) J, 85°, P, S, Cn (6.53m) Be, 0°, P, S, Clay Vn (6.62m) Be, 5°, P, S, Clay Vn (6.75m) Cr, 0°, 50 mm.t		Hawkesbury Sandstone
		76		NO CORE 0.10m SANDSTONE: fine to medium grained, red brown, indistinct rock fabric.	MW	L - M	0.30			(7.28m) CS, 10°, 5 mm.t		
				as above, but light grey, with grey laminae, distinctly bedded at 0-10°.	FR	M - H	0.80 1.2			(8.47m) CS, 0°, 5 mm.t (8.52m) Be, 5°, P, R, Fe Vn		
		75			SW		0.60			(8.85m) Be, 0°, P, R, Clay Ct		
					H		1.2			(9.19m) Be, 15°, P, R, Cn		
		74		SANDSTONE: fine to medium grained, dark grey brown, trace of quartz gravel, indistinct rock fabric.	MW		1.7					
					M - H		1.4					

JK 9.02.4.LB.GLB_Log_JK_CORED_BOREHOLE_MASTER_35535SJ.LINDFIELD.GPJ <<DrawingFile>> 28/11/2022 10:28 10.01.00.01 D:\gpl\Lab and in Situ\Tech\DCD\Lib\JK 9.02.4.2019-05-31 Proj_JK 9.01.10.2019-03-20

BOREHOLE LOG

Client: SUNDALE NORTHLAND DEVELOPMENT P/L
ATF SUNDALE NORTHLAND DEVELOPMENT UNIT TRUST

Project: PROPOSED RESIDENTIAL DEVELOPMENT

Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: 35535YC

Method: SPIRAL AUGER

R.L. Surface: ~84.2 m

Date: 14/10/24 TO 15/10/24

Datum: AHD

Plant Type: JK330

Logged/Checked By: S.W./T.C.

Groundwater Record	SAMPLES				Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks	
	ES	U50	DB	DS											
DRY ON COMPLETION OF AUGERING						84			CI-CH	FILL: Silty gravelly sand, fine to medium grained, dark grey, fine to medium grained, angular igneous gravel. Silty CLAY: medium to high plasticity, orange brown, trace of fine grained ironstone gravel.	M w-PL	VSt	350 360 350	GRASS COVER SCREEN: 12.81kg 0-0.1m, NO FCF RESIDUAL	
					N = 18 4,8,10							350 300 320	ASHFIELD SHALE		
							83				XW	Hd	400 420 510	VERY LOW 'TC' BIT RESISTANCE	
					N = 22 5,8,14								500 550 >600		
							82					HW	VL		VERY LOW RESISTANCE WITH LOW TO MEDIUM BANDS
						81									
						80									
						79					DW	L - M		LOW TO MODERATE RESISTANCE GROUNDWATER MONITORING WELL INSTALLED TO 17.92m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 5.92m TO	
						78				REFER TO CORED BOREHOLE LOG				17.92m. CASING 0.07m TO 5.92m. 2mm SAND FILTER PACK 4.84m TO 17.92m. BENTONITE SEAL 1.9m TO 4.84m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.	

JK 9.02.4 LIB.GLB Log JK AUGERHOLE - MASTER 35535YC LINDFIELD.GPJ <-DrawingFiles> 18/12/2024 10:05 10.01.00.01 Dwgpl Lab and In Situ Tool - DGD Lib JK 9.02.4 2019-05-31 Proj JK 9.01.0 2018-03-20

CORED BOREHOLE LOG

Client: SUNDALE NORTHLAND DEVELOPMENT P/L
ATF SUNDALE NORTHLAND DEVELOPMENT UNIT TRUST

Project: PROPOSED RESIDENTIAL DEVELOPMENT

Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: 35535YC **Core Size:** HQ **R.L. Surface:** ~84.2 m

Date: 14/10/24 TO 15/10/24 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK330 **Bearing:** N/A **Logged/Checked By:** S.W./T.C.

Water Loss/Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX I _s (50)	DEFECT DETAILS			Formation	
									DESCRIPTION Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness				
								SPACING (mm)					
								600	200	60	20	Specific	General
		79			START CORING AT 5.84m								
		78	6		SANDSTONE: fine to medium grained, light grey, bedded at 0-5°.	SW	L - M	+0.30				(5.87m) Be, 0°, P, R, Fe Sn (5.93m) Be, 0°, P, R, Cn	Ashfield Shale
		78	7		LAMINITE: Sandstone, fine grained, light grey, and Siltstone, dark grey, bedded at 0-20°.		M - H	+0.20			(6.14m) XWS, 0°, 50 mm.t (6.23m) J, 90°, Ir, R, Fe Sn (6.27m) Cr, 5°, 15 mm.t (6.41m) Be, 0°, Ir, R, Cn (6.54m) XWS, 0°, 45 mm.t (6.65m) XWS, 0°, 14 mm.t (6.80m) XWS, 0°, 5 mm.t		
		77	7					+0.80					Ashfield Shale
		77	8					+1.6					
		76	8		SANDSTONE: fine to medium grained, light grey, with occasional grey laminae, bedded at 0-10°.	FR		+0.90				(8.12m) J, 90°, Ir, R, Cn (8.22m) Be, 0°, P, Clay FILLED, 15 mm.t (8.41m) J, 20°, P, R, Cn (8.71m) Be, 5°, C, R, Cn	Hawkesbury Sandstone
		75	9					+1.5					
		75	10		as above, but bedded at 10-20°.			+0.90				(9.36m) Be, 0°, P, R, Cn	
		74	10					+1.3					Hawkesbury Sandstone
		74	11					+1.1					
		74	11					+1.4					
		73	11					+1.2					Hawkesbury Sandstone
		73	11					+2.0				(11.09m) Be, 0°, P, R, Cn (11.52m) Be, 5°, P, R, Clay FILLED, 8 mm.t	
		73	11					+1.5					

JK 9.02.4 LIB.GLB Log JK CORED BOREHOLE - MASTER 35535YC LINDFIELD.GPJ <Drawing> 18/12/2024 10:04 10:01:00.01 D:\git\Lab and in Situ Tools - DCD\Lib JK 9.02.4 2019-05-31 Pj JK 001.02019-05-20

CORED BOREHOLE LOG

Client: SUNDALE NORTHLAND DEVELOPMENT P/L
ATF SUNDALE NORTHLAND DEVELOPMENT UNIT TRUST

Project: PROPOSED RESIDENTIAL DEVELOPMENT

Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: 35535YC **Core Size:** HQ **R.L. Surface:** ~84.2 m

Date: 14/10/24 TO 15/10/24 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK330 **Bearing:** N/A **Logged/Checked By:** S.W./T.C.

Water Loss/Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_p(50)$	DEFECT DETAILS		Formation			
									SPACING (mm)	DESCRIPTION Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness				
								600	200	60	20	Specific	General	
		72			SANDSTONE: fine to medium grained, light grey, with occasional grey laminae, bedded at 10-20°.	FR	H	1.7				— (12.43m) Be, 0°, Un, R, Cn		Hawkesbury Sandstone
			13					1.4			— (12.70m) J, 30°, P, R, Cn			
		71						1.5			— (13.38m) Be, 0°, P, R, Cn			
			14					1.8						
		70						1.7						
			15					1.0						
		69						1.7			— (14.89m) Be, 5°, P, R, Cn			
			16					1.6						
		68						1.7						
			17					1.7			— (16.69m) XWS, 0°, 13 mm.t			
		67			1.5			— (17.29m) Be, 15°, P, R, Cn						
					1.7			— (17.46m) Be, 18°, P, R, Cb Ct						
		18			2.0									
		66			END OF BOREHOLE AT 17.92 m									

JK 9.02.4 LIB.GLB Log JK CORED BOREHOLE - MASTER 35535YC LINDFIELD.GPJ <<DrawingFile>> 18/12/2024 10:04 10.01.00.01 Dajjal Lab and in Situ Tool - DCD Lib JK 9.02.4 2019.05.31 Pj JK 0.01.02019.02.20

BOREHOLE LOG

Client: SUNDALE NORTHLAND DEVELOPMENT P/L
ATF SUNDALE NORTHLAND DEVELOPMENT UNIT TRUST

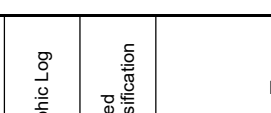
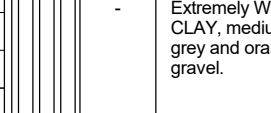
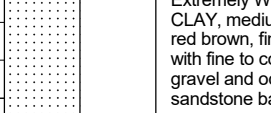
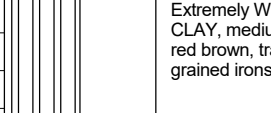

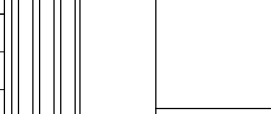
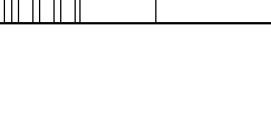
Project: PROPOSED RESIDENTIAL DEVELOPMENT

Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: 35535YC **Method:** SPIRAL AUGER **R.L. Surface:** ~86.6 m

Date: 14/10/24 TO 16/10/24 **Datum:** AHD

Plant Type: JK330 **Logged/Checked By:** S.W./T.C.

Groundwater Record	SAMPLES				Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
	ES	U50	DB	DS										
					N = 15 5,7,8	86	1		CI-CH	FILL: Silty sand, fine to medium grained, brown and light brown, trace of ceramic and concrete fragments, clay nodules and root fibres. FILL: Silty clay, medium to high plasticity, brown, red brown and grey, trace of fine to coarse grained ironstone gravel, and root fibres.	M w-PL			GRASS COVER SCREEN: 10.37kg 0-0.1m, NO FCF APPEARS MODERATELY TO WELL COMPACTED SCREEN: 3.86kg (<10L) 0.1-1.0m, NO FCF RESIDUAL
					N = 23 5,8,15	85	2		-	Extremely Weathered siltstone: silty CLAY, medium to high plasticity, light grey and orange brown, with ironstone gravel.	XW	Hd	>600 >600 >600	ASHFIELD SHALE
					N > 3 18,3/ 50mm REFUSAL	84	3			Extremely Weathered sandstone: sandy CLAY, medium plasticity, light grey and red brown, fine to medium grained sand, with fine to coarse grained ironstone gravel and occasional very low strength sandstone bands.				VERY LOW 'TC' BIT RESISTANCE WITH LOW BANDS TOO SANDY FOR HP TESTING
						83	4			Extremely Weathered siltstone: silty CLAY, medium plasticity, orange and red brown, trace of fine to coarse grained ironstone gravel.				
						82	5							
						81	6							
						80				SILTSTONE: grey and brown, with extremely weathered bands and iron indurated bands.	DW	VL		

JK 9.02.4 LIB.GLB Log_JK AUGERHOLE - MASTER 35535YC LINDFIELD.GPJ <<DrawingFile>> 18/12/2024 10:05 10.01.00.01 D:\proj Lab and In Situ Tool - DGD Lib JK 9.02.4 2019-05-31 Proj JK 9.01.0 2018-03-20



Borehole No.
102
2 / 5

BOREHOLE LOG

Client: SUNDALE NORTHLAND DEVELOPMENT P/L
ATF SUNDALE NORTHLAND DEVELOPMENT UNIT TRUST

Project: PROPOSED RESIDENTIAL DEVELOPMENT

Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: 35535YC **Method:** SPIRAL AUGER **R.L. Surface:** ~86.6 m

Date: 14/10/24 TO 16/10/24 **Datum:** AHD

Plant Type: JK330 **Logged/Checked By:** S.W./T.C.

Groundwater Record	SAMPLES				Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
	ES	U50	DB	DS										
								-	SANDSTONE: fine to medium grained, light grey.	DW	L		LOW RESISTANCE	
						79	8			REFER TO CORED BOREHOLE LOG				GROUNDWATER MONITORING WELL INSTALLED TO 21.26m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 9.26m TO 21.26m. CASING 0.11m TO 9.26m. 2mm SAND FILTER PACK 7.8m TO 21.26m. BENTONITE SEAL 1.0m TO 7.8m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
						78								
						77								
						76								
						75								
						74								
						73								

JK 9.02.4 LIB.GLB Log JK AUGERHOLE - MASTER 35535YC LINDFIELD.CPJ <-DrawingFile> 18/12/2024 10:05 10.01.00.01 D:\proj Lab and In Situ Tool - DGD \Lib JK 9.02.4 2019-05-31 Proj JK 9.01.0 2018-03-20

CORED BOREHOLE LOG

Client: SUNDALE NORTHLAND DEVELOPMENT P/L
ATF SUNDALE NORTHLAND DEVELOPMENT UNIT TRUST

Project: PROPOSED RESIDENTIAL DEVELOPMENT

Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: 35535YC **Core Size:** HQ **R.L. Surface:** ~86.6 m

Date: 14/10/24 TO 16/10/24 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK330 **Bearing:** N/A **Logged/Checked By:** S.W./T.C.

Water Loss/Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX I _s (50)		DEFECT DETAILS		Formation
								SPACING (mm)	DESCRIPTION Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness	Specific	General	
					START CORING AT 7.30m							
			79		SANDSTONE: fine to medium grained, light grey, with occasional grey laminae, bedded at 0-10°.	SW	M - H					
			8									
			78									
			9		LAMINITE: Sandstone, fine grained, light grey, and Siltstone, dark grey, bedded at 0-5°.							
			77									
			10									
			76		SANDSTONE: fine to medium grained, light grey, with occasional grey laminae, bedded at 10-20°.							
			11			FR						
			75									
			12									
			74									
			13									
			73									

JK 9.02.4 LIB.GLB Log_JK_CORED BOREHOLE - MASTER_35535YC LINDFIELD.GPJ -<DrawingFile>> 18/12/2024 10:04 10.01.00.01 D:\geol Lab and in Situ Tool - DCD\Lib_JK_9.02.4_2019.05.31 Proj_JK 0.01.0.2019.05.20

CORED BOREHOLE LOG

Client: SUNDALE NORTHLAND DEVELOPMENT P/L
ATF SUNDALE NORTHLAND DEVELOPMENT UNIT TRUST

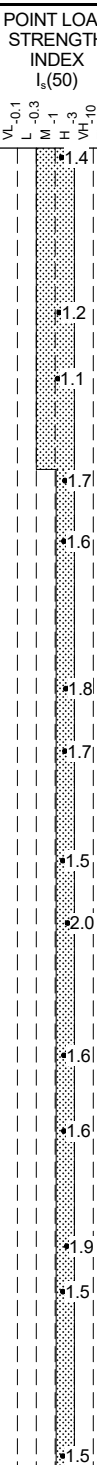
Project: PROPOSED RESIDENTIAL DEVELOPMENT

Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: 35535YC **Core Size:** HQ **R.L. Surface:** ~86.6 m

Date: 14/10/24 TO 16/10/24 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK330 **Bearing:** N/A **Logged/Checked By:** S.W./T.C.

Water Loss/Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_p(50)$	DEFECT DETAILS		Formation				
									SPACING (mm)	DESCRIPTION Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness					
					SANDSTONE: fine to medium grained, light grey, with occasional grey laminae, bedded at 10-20°. <i>(continued)</i>	FR	M - H		600	Specific General	Hawkesbury Sandstone				
		72													
		15													
		71													(15.16m) Be, 20°, P, R, Cn
		16													(16.23m) Be, 10°, P, R, Cn
		70													
		17													
		69													
		18													(18.31m) XWS, 0°, 12 mm.t
		68													
		19													
		67							(19.71m) Be, 10°, C, R, Cn						
		20													
		66							(20.84m) J, 50°, P, R, Cn						

JK 9.02.4 LIB.GLB Log JK CORED BOREHOLE - MASTER 35535YC LINDFIELD.GPJ <<DrawingFile>> 18/12/2024 10:04 10.01.00.01 Dajjal Lab and in Situ Tool - DCD Lib JK 9.02.4 2019.05.31 Pj JK 0.01.02019.05.20

CORED BOREHOLE LOG

Client: SUNDALE NORTHLAND DEVELOPMENT P/L
ATF SUNDALE NORTHLAND DEVELOPMENT UNIT TRUST


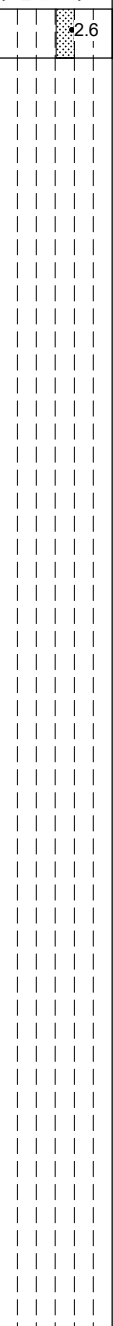
Project: PROPOSED RESIDENTIAL DEVELOPMENT

Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: 35535YC **Core Size:** HQ **R.L. Surface:** ~86.6 m

Date: 14/10/24 TO 16/10/24 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK330 **Bearing:** N/A **Logged/Checked By:** S.W./T.C.

Water Loss/Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_p(50)$	DEFECT DETAILS			Formation		
									SPACING (mm)		DESCRIPTION Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness			
								600	200	60	20	Specific	General	
					SANDSTONE: fine to medium grained, light grey, with occasional grey laminae, bedded at 10-20°. END OF BOREHOLE AT 21.26 m	FR	H	2.6						
			65											
			22											
			64											
			23											
			63											
			24											
			62											
			25											
			61											
			26											
			60											
			27											
			59											

JK 9.02.4 LIB.GLB Log JK CORED BOREHOLE - MASTER - 35535YC LINDFIELD.GPJ -<DrawingFile>> 18/12/2024 10:04 10.01.00.01 Dajjal Lab and in Situ Tool - DCD Lib JK 9.02.4 2019.05.31 Pj JK 0.01.0.2019.05.20

BOREHOLE LOG

Client: SUNDALE NORTHLAND DEVELOPMENT P/L
ATF SUNDALE NORTHLAND DEVELOPMENT UNIT TRUST

Project: PROPOSED RESIDENTIAL DEVELOPMENT

Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: 35535YC

Method: SPIRAL AUGER

R.L. Surface: ~79.6 m

Date: 17/10/24 TO 18/10/24

Datum: AHD

Plant Type: JK330

Logged/Checked By: S.W./T.C.

Groundwater Record	SAMPLES				Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
	ES	U50	DB	DS										
DRY ON COMPLETION OF AUGERING										CONCRETE: 110mm.t				NO REINFORCEMENT OBSERVED
					N = 5 3,2,3	79		CI-CH	FILL: Silty sandy clay, low plasticity, dark grey brown, fine to medium grained sand, trace of fine to medium grained sandstone gravel. Silty CLAY: medium to high plasticity, light brown and red brown.	w>PL	VSt	250 290 240	RESIDUAL	
					N = 8 5,4,4	78			Silty CLAY: medium to high plasticity, light grey and red brown, trace of fine to coarse grained ironstone gravel.	w>PL		330 330 290		
					N = 21 5,9,12	77			Extremely Weathered sandstone: silty CLAY, medium plasticity, light grey, with iron indurated bands.	XW	Hd	>600 >600 >600	HAWKESBURY SANDSTONE	
					76									
						75				SANDSTONE: fine to medium grained, light grey and red brown, with iron indurated bands. REFER TO CORED BOREHOLE LOG	DW	M		MODERATE TO HIGH 'TC' BIT RESISTANCE GROUNDWATER MONITORING WELL INSTALLED TO 26.05m. CLASS 18 MACHINE SLOTTED AND HAND SLOTTED 50mm DIA. PVC STANDPIPE 8.05m TO 26.05m. CASING 0.07m TO 8.05m. 2mm SAND FILTER PACK 7.5m TO 26.05m. BENTONITE SEAL 3.05m TO 7.5m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
					74									
						73								

JK 3.02.4 LIB.GLB Log JK AUGERHOLE - MASTER 35535YC LINDFIELD.GPJ <<DrawingFile>> 18/12/2024 10:05 10.01.00.01 D:\gpr Lab and In Situ Tool - DGD [Lib: JK 3.02.4 2019-05-31 Proj: JK 3.01.0 2018-03-20]

CORED BOREHOLE LOG

Client: SUNDALE NORTHLAND DEVELOPMENT P/L
ATF SUNDALE NORTHLAND DEVELOPMENT UNIT TRUST

Project: PROPOSED RESIDENTIAL DEVELOPMENT

Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: 35535YC **Core Size:** HQ **R.L. Surface:** ~79.6 m

Date: 17/10/24 TO 18/10/24 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK330 **Bearing:** N/A **Logged/Checked By:** S.W./T.C.

Water Loss Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_p(50)$	SPACING (mm)	DEFECT DETAILS		Formation
										Specific	General	
		76			START CORING AT 3.79m							
		75	4		SANDSTONE: fine to medium grained, light grey and red brown, bedded at 0-10°.	SW	M - H	0.50			(4.32m) Be, 0°, P, R, Clay Ct	Hawkesbury Sandstone
		75	5		SANDSTONE: fine to medium grained, light grey, with grey laminae, bedded at 0-15°.			0.40				
		74	6					1.1				
		74	5					0.80			(5.37m) Be, 0°, P, R, Clay Ct	
		74	6					0.70			(5.74m) Be, 0°, P, R, Clay Ct	
		74	6					1.4			(5.88m) XWS, 0°, 40 mm.t	
		73	7		SANDSTONE: fine to medium grained, grey, with dark grey laminae, bedded at 10-20°.	FR		2.0				
		73	7					0.90			(6.88m) Be, 0°, P, R, Cb Ct	
		72	8					1.1				
		71	9					1.5				
		71	8					1.1				
		71	8					1.6				
		71	9					1.7				
		70	9					1.4			(9.23m) Be, 20°, P, R, Clay Ct	
		70	9					1.6				
		70	9					1.5				

JK 9.02.4 LIB.GLB Log_JK CORED BOREHOLE - MASTER - 35535YC LINDFIELD.GPJ -<DrawingFile>> 18/12/2024 10:04 10:01:00.01 D:\git\Lab and in Situ Tool - DGD\Lib_JK 9.02.4 2019-05-31 Pj_JK 0.01.0.2019-05-20

CORED BOREHOLE LOG

Client: SUNDALE NORTHLAND DEVELOPMENT P/L
ATF SUNDALE NORTHLAND DEVELOPMENT UNIT TRUST

Project: PROPOSED RESIDENTIAL DEVELOPMENT

Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: 35535YC **Core Size:** HQ **R.L. Surface:** ~79.6 m

Date: 17/10/24 TO 18/10/24 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK330 **Bearing:** N/A **Logged/Checked By:** S.W./T.C.

Water Loss/Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_p(50)$	DEFECT DETAILS		Formation
									SPACING (mm)	DESCRIPTION Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness	
									600 200 60 20	Specific General	
			69		SANDSTONE: fine to medium grained, grey, with dark grey laminae, bedded at 10-20°. (continued)	FR	H	1.2			
			11	1.4							
			68	1.2							
			12	1.3							
			13	1.5							
		67	13	2.1				(12.50m) Be, 0°, P, R, Clay Ct (12.56m) J, 55°, P, R, Fe Ct			
		66	14	1.5				(13.59m) J, 30°, Ir, R, Cn (13.64m) Be, 5°, P, R, Clay Ct			
		65	15	1.7							
		64	16	1.6							
			63	2.0							
				1.6				(16.32m) Be, 0°, P, R, Cb Ct			
				1.2	(16.61m) Be, 5°, P, R, Clay Ct						
				1.8							

JK 9.02.4 LIB.GLB Log_JK_CORED BOREHOLE - MASTER_35535YC LINDFIELD.GPJ -<DrawingFile>> 18/12/2024 10:04 10.01.00.01 D:\geol Lab and in Situ Tool - DCD\Lib_JK 9.02.4 2019.05.31 Pj_JK 0.01.0.2019.05.20

CORED BOREHOLE LOG

Client: SUNDALE NORTHLAND DEVELOPMENT P/L
ATF SUNDALE NORTHLAND DEVELOPMENT UNIT TRUST

Project: PROPOSED RESIDENTIAL DEVELOPMENT

Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: 35535YC **Core Size:** HQ **R.L. Surface:** ~79.6 m

Date: 17/10/24 TO 18/10/24 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK330 **Bearing:** N/A **Logged/Checked By:** S.W./T.C.

Water Loss Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_p(50)$	DEFECT DETAILS		Formation
									SPACING (mm)	DESCRIPTION Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness	
					SANDSTONE: fine to medium grained, grey, with dark grey laminae and carbonaceous lenses, bedded at 0-20°. <i>(continued)</i>	FR	H	VL-0.1	600		
								L-0.3			
			62					M-0.3			
			18					H-1			
								H-3			
								VL-10			
								Et			
									600		
									200		
									60		
									20		
			61								
			19								
			60								
			20								
			59								
			21								
			58								
			22								
			57								
			23								
			56								

JK 9.02.4 LIB.GLB Log JK CORED BOREHOLE - MASTER 35535YC LINDFIELD.GPJ <-DrawingFile>> 18/12/2024 10:04 10.01.00.01 Dajjal Lab and in Situ Tool - DCD Lib JK 9.02.4 2019.05.31 Pj JK 0.01.02019.05.20

CORED BOREHOLE LOG

Client: SUNDALE NORTHLAND DEVELOPMENT P/L
ATF SUNDALE NORTHLAND DEVELOPMENT UNIT TRUST

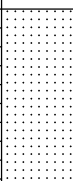
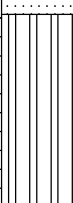
Project: PROPOSED RESIDENTIAL DEVELOPMENT

Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: 35535YC **Core Size:** HQ **R.L. Surface:** ~79.6 m

Date: 17/10/24 TO 18/10/24 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK330 **Bearing:** N/A **Logged/Checked By:** S.W./T.C.

Water Loss/Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_p(50)$	DEFECT DETAILS		Formation
									SPACING (mm)	DESCRIPTION Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness	
									Specific	General	
	90% RETURN	55	25		SANDSTONE: fine to medium grained, grey, with dark grey laminae and carbonaceous lenses, bedded at 0-20°. (continued)	FR	H	1.7			Hawkesbury Sandstone
		54	26		SILTSTONE: dark grey, with occasional fine grained sandstone, bedded at 0-5°.			1.3 2.2		(24.98m) Be, 0°, P, R, Cn	
		26			END OF BOREHOLE AT 26.05 m			1.4 2.1			
		53	27								
		52	28								
		51	29								
		50	30								
		49									

JK 9.02.4 LIB.GLB Log_JK_CORED BOREHOLE - MASTER_35535YC LINDFIELD.GPJ -<DrawingFile>> 18/12/2024 10:04 10.01.00.01 Dajjal Lab and in Situ Tool - DCD Lib_JK 9.02.4 2019.05.31 Pj:JK 0.01.02019.05.20

JKEnvironments

ENVIRONMENTAL LOG



Log No.
BH301
1/1

Environmental logs are not to be used for geotechnical purposes

Client: SUNDALE NORTHLAND DEVELOPMENT PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: E35535BW **Method:** HAND AUGER **R.L. Surface:** N/A
Date: 7/4/25 **Datum:** -
Plant Type: HAND AUGER **Logged/Checked by:** C.B./V.B.

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL									
DRY ON COMPLETION	█	█	█	█	█	0	[Cross-hatched pattern]	CI-CH	FILL: Silty clay, low to medium plasticity, dark brown, trace of sand, igneous and sandstone gravel, slag, ash, roots and root fibres.	w<PL			SCREEN: 10.91kg 0-0.1m, NO FCF
						0.1-0.25m, NO FCF			FILL: Silty clay, medium to high plasticity, orange brown, trace of sandstone and ironstone gravel, ash and root fibres.	w≈PL			SCREEN: 10.58kg
						0.25-0.5m, NO FCF	0.5	[Diagonal hatched pattern]	Silty CLAY: medium to high plasticity, orange brown, trace of ironstone bands.	w≈PL			SCREEN: 10.61kg
									END OF BOREHOLE AT 0.75m				SCREEN: 6.34kg 0.5-0.75m, NO FCF
													RESIDUAL REFUSAL ON IRONSTONE BANDS
						1							
						1.5							
						2							
						2.5							
						3							
						3.5							

JKEnvironments

ENVIRONMENTAL LOG



Log No.
BH302
1/1

Environmental logs are not to be used for geotechnical purposes

SDUP302: 0-0.1m

Client: SUNDALE NORTHLAND DEVELOPMENT PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: E35535BW **Method:** HAND AUGER **R.L. Surface:** N/A
Date: 7/4/25 **Datum:** -
Plant Type: HAND AUGER **Logged/Checked by:** C.B./V.B.

Groundwater Record	SAMPLES					Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL	DB									
DRY ON COMPLETION							0			FILL: Silty clay, low to medium plasticity, dark brown, trace of sand, igneous and sandstone gravel, glass and plastic fragments, and ash.	w<PL			GRASS COVER SCREEN: 10.71kg 0-0.1m, NO FCF SCREEN: 11.84kg 0.1-0.5m, NO FCF
						0.5		CI-CH	Silty CLAY: medium to high plasticity, orange brown, trace of ironstone bands. END OF BOREHOLE AT 0.6m	w~PL			RESIDUAL	
							1							REFUSAL ON IRONSTONE BANDS
							1.5							
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG



Log No.
BH303
1/1

Environmental logs are not to be used for geotechnical purposes

Client: SUNDALE NORTHLAND DEVELOPMENT PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: E35535BW **Method:** HAND AUGER **R.L. Surface:** N/A
Date: 9/4/25 **Datum:** -
Plant Type: HAND AUGER **Logged/Checked by:** C.B./V.B.

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL									
DRY ON COMPLETION	█	█	█	█	█	0	[Cross-hatched pattern]		FILL: Silty clay, low to medium plasticity, dark brown, trace of sand, igneous and sandstone gravel, ash, roots and root fibres.	w<PL			SCREEN: 10.31kg 0-0.1m, NO FCF SCREEN: 11.37kg 0.1-0.4m, NO FCF
	█	█	█	█	█	0.5			FILL: Silty clay, medium to high plasticity, orange brown and light brown, trace of igneous gravel, ash and root fibres.	w<PL			SCREEN: 3.81kg 0.4-0.7m, NO FCF
	█	█	█	█	█	0.85	[Diagonal lines pattern]	CI-CH	Silty CLAY: medium to high plasticity, orange brown.	w<PL			RESIDUAL
						1			END OF BOREHOLE AT 0.85m				
						1.5							
						2							
						2.5							
						3							
						3.5							

JKEnvironments

ENVIRONMENTAL LOG



Log No.
BH304
1/1

Environmental logs are not to be used for geotechnical purposes

Client:	SUNDALE NORTHLAND DEVELOPMENT PTY LTD
Project:	PROPOSED RESIDENTIAL DEVELOPMENT
Location:	12-16 BENT STREET, LINDFIELD, NSW

Job No.: E35535BW	Method: HAND AUGER	R.L. Surface: N/A
Date: 9/4/25	Datum: -	
Plant Type: HAND AUGER	Logged/Checked by: C.B./V.B.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL									
DRY ON COMPLETION						0			FILL: Silty clay, low to medium plasticity, dark brown, trace of sand, igneous and sandstone gravel, glass, slag, ash, roots and root fibres.	w<PL			SCREEN: 10.77kg 0-0.1m, NO FCF SCREEN: 10.70kg 0.1-0.45m, NO FCF
						0.5		CI-CH	Silty CLAY: medium to high plasticity, orange brown.	w<PL			RESIDUAL
						1			END OF BOREHOLE AT 0.75m				
						1.5							
						2							
						2.5							
						3							
						3.5							

JKEnvironments

ENVIRONMENTAL LOG



Log No.
TP305
1/1

Environmental logs are not to be used for geotechnical purposes

Client: SUNDALE NORTHLAND DEVELOPMENT PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: E35535BW **Method:** TEST PIT **R.L. Surface:** N/A
Date: 9/4/25 **Datum:** -
Plant Type: 1.7T EXCAVATOR **Logged/Checked by:** C.B./V.B.

Groundwater Record	SAMPLES					Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL	DB									
DRY ON COMPLETION	█	█	█	█	█		0			FILL: Silty clay, medium plasticity, dark brown, trace of sand, igneous and sandstone gravel, concrete and tile fragments, roots and root fibres.	w<PL			GRASS COVER
	█	█	█	█	█		0.5			FILL: Silty clay, medium to high plasticity, light brown, trace of igneous gravel, ash and root fibres.	w≈PL			SCREEN: 10.76kg 0-0.1m, NO FCF SCREEN: 12.29kg 0.1-0.2m, NO FCF SCREEN: 10.69kg 0.2-0.5m, NO FCF
	█	█	█	█	█		1		CI-CH	Silty CLAY: medium to high plasticity, orange brown and light brown, trace of ironstone bands and root fibres.	w≈PL			RESIDUAL
							1.5			END OF TEST PIT AT 1.1m				
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG



Log No.
BH306
1/1

Environmental logs are not to be used for geotechnical purposes

SDUP304: 0-0.1m

Client:	SUNDALE NORTHLAND DEVELOPMENT PTY LTD
Project:	PROPOSED RESIDENTIAL DEVELOPMENT
Location:	12-16 BENT STREET, LINDFIELD, NSW

Job No.: E35535BW	Method: HAND AUGER	R.L. Surface: N/A
Date: 9/4/25	Datum: -	
Plant Type: HAND AUGER	Logged/Checked by: C.B./V.B.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL									
DRY ON COMPLETION						0			FILL: Silty clay, low to medium plasticity, dark brown, trace of sand, igneous and sandstone gravel, plastic and root fibres.	w _z PL			GRASS COVER SCREEN: 11.55kg 0-0.1m, NO FCF SCREEN: 11.65kg 0.1-0.6m, NO FCF
						0.5		CI-CH	Silty CLAY: medium to high plasticity, orange brown, trace of ironstone gravel and ash.	w _z PL			RESIDUAL
						1			END OF BOREHOLE AT 0.9m				
						1.5							
						2							
						2.5							
						3							
						3.5							

JKEnvironments

ENVIRONMENTAL LOG



Log No.
BH307
1/1

Environmental logs are not to be used for geotechnical purposes

Client:	SUNDALE NORTHLAND DEVELOPMENT PTY LTD
Project:	PROPOSED RESIDENTIAL DEVELOPMENT
Location:	12-16 BENT STREET, LINDFIELD, NSW

Job No.: E35535BW	Method: HAND AUGER	R.L. Surface: N/A
Date: 9/4/25	Datum: -	
Plant Type: HAND AUGER	Logged/Checked by: C.B./V.B.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL									
DRY ON COMPLETION						0			FILL: Silty sandy clay, low to medium plasticity, brown, trace of sand, igneous and sandstone gravel, roots and root fibres.	w<PL			GRASS COVER
						0.5			FILL: Silty clay, medium to high plasticity, orange brown, trace of igneous and ironstone gravel and ash.	w<PL			SCREEN: 11.47kg 0-0.1m, NO FCF SCREEN: 10.56kg 0.1-0.4m, NO FCF
									CI-CH	Silty CLAY: medium to high plasticity, orange brown, trace of ironstone gravel and ash.	w<PL		
						1			END OF BOREHOLE AT 0.8m				
						1.5							
						2							
						2.5							
						3							
						3.5							

JKEnvironments

ENVIRONMENTAL LOG



Log No.
BH308
1/1

Environmental logs are not to be used for geotechnical purposes

Client:	SUNDALE NORTHLAND DEVELOPMENT PTY LTD
Project:	PROPOSED RESIDENTIAL DEVELOPMENT
Location:	12-16 BENT STREET, LINDFIELD, NSW

Job No.: E35535BW	Method: HAND AUGER	R.L. Surface: N/A
Date: 7/4/25	Datum: -	
Plant Type: HAND AUGER	Logged/Checked by: C.B./V.B.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL									
DRY ON COMPLETION						0			FILL: Silty clay, low to medium plasticity, dark brown, trace of sand, igneous and sandstone gravel and ash.	w<PL			SCREEN: 12.34kg 0-0.1m, NO FCF SCREEN: 11.69kg 0.1-0.45m, NO FCF
						0.5		CI	Silty CLAY: medium plasticity, orange brown, trace of ironstone bands and ash.	w≈PL			RESIDUAL SCREEN: 10.53kg 0.45-0.75m, NO FCF
						1			END OF BOREHOLE AT 0.75m				REFUSAL ON IRONSTONE BANDS
						1.5							
						2							
						2.5							
						3							
						3.5							

JKEnvironments

ENVIRONMENTAL LOG



Log No.
BH309
1/1

Environmental logs are not to be used for geotechnical purposes

Client:	SUNDALE NORTHLAND DEVELOPMENT PTY LTD
Project:	PROPOSED RESIDENTIAL DEVELOPMENT
Location:	12-16 BENT STREET, LINDFIELD, NSW

Job No.: E35535BW	Method: HAND AUGER	R.L. Surface: N/A
Date: 9/4/25	Datum: -	
Plant Type: HAND AUGER	Logged/Checked by: C.B./V.B.	

Groundwater Record	SAMPLES					Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL	DB									
DRY ON COMPLETION							0			FILL: Silty clay, medium plasticity, light brown and brown, trace of igneous and ironstone gravel, glass and root fibres.	w _z PL			GRASS COVER
							0.5		CI-CH	Silty CLAY: medium to high plasticity, orange brown, trace of ironstone gravel and ash.	w _z PL			SCREEN: 10.83kg 0-0.1m, NO FCF SCREEN: 11.34kg 0.1-0.2m, NO FCF RESIDUAL
							1			END OF BOREHOLE AT 0.7m				
							1.5							
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG



Log No.
TP310
1/1

Environmental logs are not to be used for geotechnical purposes

Client: SUNDALE NORTHLAND DEVELOPMENT PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: E35535BW **Method:** TEST PIT **R.L. Surface:** N/A
Date: 7/4/25 **Datum:** -
Plant Type: 1.7T EXCAVATOR **Logged/Checked by:** C.B./V.B.

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL									
DRY ON COMPLETION						0			FILL: Silty clay, low to medium plasticity, dark brown, trace of igneous and sandstone gravel, sandstone boulders and plastic.	w<PL			SCREEN: 11.53kg 0-0.1m, NO FCF SCREEN: 10.81kg 0.1-0.4m, NO FCF
						0.5			as above, but brown. END OF TEST PIT AT 0.45m	w≈PL			INSUFFICIENT RETURN FOR BULK SCREEN REFUSAL ON SANDSTONE BOULDERS
						1							
						1.5							
						2							
						2.5							
						3							
						3.5							

JKEnvironments

ENVIRONMENTAL LOG



Log No.
TP311
1/1

Environmental logs are not to be used for geotechnical purposes

Client:	SUNDALE NORTHLAND DEVELOPMENT PTY LTD
Project:	PROPOSED RESIDENTIAL DEVELOPMENT
Location:	12-16 BENT STREET, LINDFIELD, NSW

Job No.: E35535BW	Method: TEST PIT	R.L. Surface: N/A
Date: 7/4/25	Datum: -	
Plant Type: 1.7T EXCAVATOR Logged/Checked by: C.B./V.B.		

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL									
DRY ON COMPLETION						0		CI-CH	FILL: Silty clay, low to medium plasticity, dark brown, trace of igneous and sandstone gravel, sandstone, bricks, ash, roots and root fibres.	w<PL			SCREEN: 10.78kg 0-0.1m, FCF1
					0.5	FILL: Silty clay, low to medium plasticity, brown, trace of sand, igneous and sandstone gravel, ash and root fibres.			w≈PL			SCREEN: 11.38kg 0.1-0.6m, NO FCF	
					1	Silty CLAY: medium to high plasticity, orange brown, trace of ironstone bands and ash.			w≈PL			RESIDUAL	
						as above, but without ash.							
						1.5			END OF TEST PIT AT 1.3m				
						2							
						2.5							
						3							
						3.5							

JKEnvironments

ENVIRONMENTAL LOG



Log No.
BH312
1/1

Environmental logs are not to be used for geotechnical purposes

SDUP303: 0-0.1m

Client:	SUNDALE NORTHLAND DEVELOPMENT PTY LTD
Project:	PROPOSED RESIDENTIAL DEVELOPMENT
Location:	12-16 BENT STREET, LINDFIELD, NSW

Job No.: E35535BW	Method: HAND AUGER	R.L. Surface: N/A
Date: 9/4/25	Datum: -	
Plant Type: HAND AUGER	Logged/Checked by: C.B./V.B.	

Groundwater Record	SAMPLES					Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL	DB									
DRY ON COMPLETION							0			FILL: Silty clay, low to medium plasticity, dark brown, trace of sand, igneous, sandstone and ironstone gravel, roots and root fibres.	w<PL			GRASS COVER
							0.5		CI-CH	Silty CLAY: medium to high plasticity, orange brown, trace of ironstone gravel and ash.	w≈PL			SCREEN: 10.46kg 0-0.1m, NO FCF SCREEN: 10.06kg 0.1-0.4m, NO FCF RESIDUAL
							1			END OF BOREHOLE AT 0.8m				
							1.5							
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG



Log No.
BH313
1/1

Environmental logs are not to be used for geotechnical purposes

Client:	SUNDALE NORTHLAND DEVELOPMENT PTY LTD
Project:	PROPOSED RESIDENTIAL DEVELOPMENT
Location:	12-16 BENT STREET, LINDFIELD, NSW

Job No.: E35535BW	Method: HAND AUGER	R.L. Surface: N/A
Date: 9/4/25	Datum: -	
Plant Type: HAND AUGER	Logged/Checked by: C.B./V.B.	

Groundwater Record	SAMPLES					Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL	DB									
DRY ON COMPLETION							0			FILL: Silty clay, low to medium plasticity, dark brown, trace of sand, sandstone and igneous gravel, ash, roots and root fibres.	w<PL			GRASS COVER
							0.5		CI-CH	Silty CLAY: medium to high plasticity, orange brown, trace of ash. END OF BOREHOLE AT 0.5m	w<PL			SCREEN: 10.95kg 0-0.1m, NO FCF SCREEN: 10.41kg 0.1-0.4m, NO FCF RESIDUAL
							1							
							1.5							
							2							
							2.5							
							3							
							3.5							HAND AUGER REFUSAL

JKEnvironments

ENVIRONMENTAL LOG



Log No.
TP314
1/1

Environmental logs are not to be used for geotechnical purposes

SDUP301: 0-0.1m

Client:	SUNDALE NORTHLAND DEVELOPMENT PTY LTD
Project:	PROPOSED RESIDENTIAL DEVELOPMENT
Location:	12-16 BENT STREET, LINDFIELD, NSW

Job No.: E35535BW	Method: TEST PIT	R.L. Surface: N/A
Date: 7/4/25	Datum: -	
Plant Type: 1.7T EXCAVATOR Logged/Checked by: C.B./V.B.		

Groundwater Record	SAMPLES					Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL	DB									
DRY ON COMPLETION							0			FILL: Silty gravelly sand, fine to medium grained, dark brown, fine to medium grained, sub-angular and angular igneous gravel, trace of sandstone gravel, asphalt and tile, glass, and root fibres.	D			GRASS COVER
							0.5		CI-CH	FILL: Silty clay, medium to high plasticity, orange brown, trace of sandstone gravel, plastic, ash and root fibres. Silty CLAY: medium to high plasticity, red brown and grey, trace of ironstone bands, roots and root fibres.	w≈PL			SCREEN: 14.94kg 0-0.1m, NO FCF SCREEN: 10.51kg 0.1-0.4m, NO FCF RESIDUAL
							1			END OF TEST PIT AT 0.9m				
							1.5							
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG



Log No.
TP315
1/1

Environmental logs are not to be used for geotechnical purposes

Client: SUNDALE NORTHLAND DEVELOPMENT PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: E35535BW **Method:** TEST PIT **R.L. Surface:** N/A
Date: 7/4/25 **Datum:** -
Plant Type: 1.7T EXCAVATOR **Logged/Checked by:** C.B./V.B.

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL									
DRY ON COMPLETION						0			FILL: Silty gravelly clay, medium plasticity, dark brown, fine to medium grained, sub-angular and angular igneous gravel, trace of sand, sandstone gravel, glass, concrete and plastic fragments, ash and root fibres.	w \approx PL			GRASS COVER
						0.5		FILL: Silty clay, medium plasticity, grey brown and orange brown, trace of sand, igneous and sandstone gravel, concrete fragments and root fibres.	w<PL				SCREEN: 11.47kg 0-0.1m, NO FCF SCREEN: 11.38kg 0.1-0.2m, NO FCF
						1		FILL: Silty clay, medium to high plasticity, orange brown, trace of igneous gravel, ash, roots and root fibres. as above, but dark brown.	w<PL				SCREEN: 12.12kg 0.2-0.4m, NO FCF SCREEN: 10.19kg 0.4-0.7m, NO FCF
						1.5		CI-CH Silty CLAY: medium to high plasticity, orange brown and red brown, trace of ironstone bands.	w \approx PL				SCREEN: 10.48kg 0.7-1.4m, NO FCF
						2		END OF TEST PIT AT 1.8m					
						2.5							
						3							
						3.5							

JKEnvironments

ENVIRONMENTAL LOG



Log No.
TP316
1/1

Environmental logs are not to be used for geotechnical purposes

Client: SUNDALE NORTHLAND DEVELOPMENT PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: E35535BW **Method:** TEST PIT **R.L. Surface:** N/A
Date: 7/4/25 **Datum:** -
Plant Type: 1.7T EXCAVATOR **Logged/Checked by:** C.B./V.B.

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL									
DRY ON COMPLETION						0			FILL: Silty sand, fine to medium grained, dark brown, trace of igneous, sandstone and quartz gravel, roots and root fibres.	D			GRASS AND SHRUB COVER SCREEN: 10.58kg 0-0.1m, NO FCF SCREEN: 10.83kg 0.1-0.2m, NO FCF SCREEN: 10.93kg 0.2-0.6m, NO FCF SCREEN: 11.76kg 0.6-1.4m, NO FCF
						0.5			FILL: Silty clay, low to medium plasticity, dark brown, trace of igneous gravel and ash.	w<PL			
						1			FILL: Silty clay, medium to high plasticity, orange brown and red brown, trace of sandstone gravel, ash and root fibres.	w<PL			
						1.5		CI-CH	Silty CLAY: medium to high plasticity, grey and orange brown.	w<PL			RESIDUAL
						2			END OF TEST PIT AT 1.8m				
						2.5							
						3							
						3.5							

JKEnvironments

ENVIRONMENTAL LOG



Log No.
BH317
1/1

Environmental logs are not to be used for geotechnical purposes

Client: SUNDALE NORTHLAND DEVELOPMENT PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 12-16 BENT STREET, LINDFIELD, NSW

Job No.: E35535BW **Method:** HAND AUGER **R.L. Surface:** N/A
Date: 9/4/25 **Datum:** -
Plant Type: HAND AUGER **Logged/Checked by:** C.B./V.B.

Groundwater Record	SAMPLES					Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL	DB									
DRY ON COMPLETION							0			FILL: Silty clay, low to medium plasticity, dark brown, trace of sand, igneous and sandstone gravel, plastic, slag, ash, roots and root fibres.	w<PL			GRASS COVER SCREEN: 10.92kg 0-0.1m, NO FCF SCREEN: 10.04kg 0.1-0.5m, NO FCF
							0.5		CI-CH	Silty CLAY: medium to high plasticity, orange brown.	w<PL			RESIDUAL
							1			END OF BOREHOLE AT 0.8m				
							1.5							
							2							
							2.5							
							3							
							3.5							



ENVIRONMENTAL LOGS EXPLANATION NOTES

INTRODUCTION

These notes have been provided to amplify the environmental report in regard to classification methods, field procedures and certain matters relating to the logging of soil and rock. Not all notes are necessarily relevant to all reports.

Where geotechnical borehole logs are utilised for environmental purpose, reference should also be made to the explanatory notes included in the geotechnical report. Environmental logs are not suitable for geotechnical purposes.

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Environmental studies include gathering and assimilating limited facts about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such facts obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and time when the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726:2017 'Geotechnical Site Investigations'. In general, descriptions cover the following properties – soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geoenvironmental practice.

Soil types are described according to the predominating particle size and behaviour as set out in the attached soil classification table qualified by the grading of other particles present (eg. sandy clay) as set out below:

Soil Classification	Particle Size
Clay	< 0.002mm
Silt	0.002 to 0.075mm
Sand	0.075 to 2.36mm
Gravel	2.36 to 63mm
Cobbles	63 to 200mm
Boulders	> 200mm

Non-cohesive soils are classified on the basis of relative density, generally from the results of Standard Penetration Test (SPT) as below:

Relative Density	SPT 'N' Value (blows/300mm)
Very loose (VL)	< 4
Loose (L)	4 to 10
Medium dense (MD)	10 to 30
Dense (D)	30 to 50
Very Dense (VD)	> 50

Cohesive soils are classified on the basis of strength (consistency) either by use of a hand penetrometer, vane shear, laboratory testing and/or tactile engineering examination. The strength terms are defined as follows.

Classification	Unconfined Compressive Strength (kPa)	Indicative Undrained Shear Strength (kPa)
Very Soft (VS)	≤ 25	≤ 12
Soft (S)	> 25 and ≤ 50	> 12 and ≤ 25
Firm (F)	> 50 and ≤ 100	> 25 and ≤ 50
Stiff (St)	> 100 and ≤ 200	> 50 and ≤ 100
Very Stiff (VSt)	> 200 and ≤ 400	> 100 and ≤ 200
Hard (Hd)	> 400	> 200
Friable (Fr)	Strength not attainable – soil crumbles	

Rock types are classified by their geological names, together with descriptive terms regarding weathering, strength, defects, etc. Where relevant, further information regarding rock classification is given in the text of the report. In the Sydney Basin, 'shale' is used to describe fissile mudstone, with a weakness parallel to bedding. Rocks with alternating inter-laminations of different grain size (eg. siltstone/claystone and siltstone/fine grained sandstone) are referred to as 'laminite'.

INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application. All methods except test pits, hand auger drilling and portable Dynamic Cone Penetrometers require the use of a mechanical rig which is commonly mounted on a truck chassis or track base.

Test Pits: These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils and 'weaker' bedrock if it is safe to descend into the pit. The depth of penetration is limited to about 3m for a backhoe and up to 6m for a large excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the

structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

Hand Auger Drilling: A borehole of 50mm to 100mm diameter is advanced by manually operated equipment. Refusal of the hand auger can occur on a variety of materials such as obstructions within any fill, tree roots, hard clay, gravel or ironstone, cobbles and boulders, and does not necessarily indicate rock level.

Continuous Spiral Flight Augers: The borehole is advanced using 75mm to 115mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling and insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface by the flights or may be collected after withdrawal of the auger flights, but they can be very disturbed and layers may become mixed. Information from the auger sampling (as distinct from specific sampling by SPTs or undisturbed samples) is of limited reliability due to mixing or softening of samples by groundwater, or uncertainties as to the original depth of the samples. Augering below the groundwater table is of even lesser reliability than augering above the water table.

Rock Augering: Use can be made of a Tungsten Carbide (TC) bit for auger drilling into rock to indicate rock quality and continuity by variation in drilling resistance and from examination of recovered rock cuttings. This method of investigation is quick and relatively inexpensive but provides only an indication of the likely rock strength and predicted values may be in error by a strength order. Where rock strengths may have a significant impact on construction feasibility or costs, then further investigation by means of cored boreholes may be warranted.

Wash Boring: The borehole is usually advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be assessed from the cuttings, together with some information from “feel” and rate of penetration.

Mud Stabilised Drilling: Either Wash Boring or Continuous Core Drilling can use drilling mud as a circulating fluid to stabilise the borehole. The term ‘mud’ encompasses a range of products ranging from bentonite to polymers. The mud tends to mask the cuttings and reliable identification is only possible from intermittent intact sampling (eg. from SPT and U50 samples) or from rock coring, etc.

Continuous Core Drilling: A continuous core sample is obtained using a diamond tipped core barrel. Provided full core recovery is achieved (which is not always possible in very low strength rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation. In rocks, NMLC or HQ triple tube core barrels, which give a core of about 50mm and 61mm diameter, respectively, is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as NO CORE. The location of NO CORE recovery is determined on site by the supervising engineer; where the location is uncertain, the loss is placed at the bottom of the drill run.

Standard Penetration Tests: Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils, as a means of indicating density or strength and also of obtaining a relatively undisturbed sample. The test procedure is

described in Australian Standard 1289.6.3.1–2004 (R2016) ‘*Methods of Testing Soils for Engineering Purposes, Soil Strength and Consolidation Tests – Determination of the Penetration Resistance of a Soil – Standard Penetration Test (SPT)*’.

The test is carried out in a borehole by driving a 50mm diameter split sample tube with a tapered shoe, under the impact of a 63.5kg hammer with a free fall of 760mm. It is normal for the tube to be driven in three successive 150mm increments and the ‘N’ value is taken as the number of blows for the last 300mm. In dense sands, very hard clays or weak rock, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

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

N = 13
4, 6, 7

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

N > 30
15, 30/40mm

The results of the test can be related empirically to the engineering properties of the soil.

A modification to the SPT is where the same driving system is used with a solid 60° tipped steel cone of the same diameter as the SPT hollow sampler. The solid cone can be continuously driven for some distance in soft clays or loose sands, or may be used where damage would otherwise occur to the SPT. The results of this Solid Cone Penetration Test (SCPT) are shown as ‘N_c’ on the borehole logs, together with the number of blows per 150mm penetration.

LOGS

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

The terms and symbols used in preparation of the logs are defined in the following pages.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than ‘straight line’ variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

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

- Although groundwater may be present, in low permeability soils it may enter the hole slowly or perhaps not at all during the time it 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 and may not be the same at the time of construction.
- 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 be washed out of the hole or 'reverted' chemically if reliable water observations are to be made.

More reliable measurements can be made by installing standpipes which are read after the groundwater level has stabilised at intervals ranging from several days to 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 perched water tables or surface water.

FILL

The presence of fill materials can often be determined only by the inclusion of foreign objects (eg. bricks, steel, etc) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult with limited testing and sampling to reliably assess the extent of the fill.

The presence of fill materials is usually regarded with caution as the possible variation in density and material type is much greater than with natural soil deposits. Consequently, there is an increased risk of adverse environmental characteristics or behaviour. If the volume and nature of fill is of importance to a project, then frequent test pit excavations are preferable to boreholes.

LABORATORY TESTING

Laboratory testing has not been undertaken to confirm the soil classification and rock strengths indicated on the environmental logs unless noted in the report.

SYMBOL LEGENDS

SOIL



FILL



TOPSOIL



CLAY (CL, CI, CH)



SILT (ML, MH)



SAND (SP, SW)



GRAVEL (GP, GW)



SANDY CLAY (CL, CI, CH)



SILTY CLAY (CL, CI, CH)



CLAYEY SAND (SC)



SILTY SAND (SM)



GRAVELLY CLAY (CL, CI, CH)



CLAYEY GRAVEL (GC)



SANDY SILT (ML, MH)



PEAT AND HIGHLY ORGANIC SOILS (Pt)

ROCK



CONGLOMERATE



SANDSTONE



SHALE/MUDSTONE



SILTSTONE



CLAYSTONE



COAL



LAMINITE



LIMESTONE



PHYLLITE, SCHIST



TUFF



GRANITE, GABBRO



DOLERITE, DIORITE



BASALT, ANDESITE



QUARTZITE

OTHER MATERIALS



BRICKS OR PAVERS



CONCRETE



ASPHALTIC CONCRETE

CLASSIFICATION OF COARSE AND FINE GRAINED SOILS

Major Divisions		Group Symbol	Typical Names	Field Classification of Sand and Gravel	Laboratory Classification	
Coarse grained soil (more than 68% of soil excluding oversize fraction is greater than 0.075mm)	GRAVEL (more than half of coarse fraction is larger than 2.36mm)	GW	Gravel and gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	$C_u > 4$ $1 < C_c < 3$
		GP	Gravel and gravel-sand mixtures, little or no fines, uniform gravels	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	Fails to comply with above
		GM	Gravel-silt mixtures and gravel-sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	≥ 12% fines, fines are silty	Fines behave as silt
		GC	Gravel-clay mixtures and gravel-sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength	≥ 12% fines, fines are clayey	Fines behave as clay
	SAND (more than half of coarse fraction is smaller than 2.36mm)	SW	Sand and gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	$C_u > 6$ $1 < C_c < 3$
		SP	Sand and gravel-sand mixtures, little or no fines	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	Fails to comply with above
		SM	Sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	≥ 12% fines, fines are silty	N/A
		SC	Sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength	≥ 12% fines, fines are clayey	

Laboratory Classification Criteria

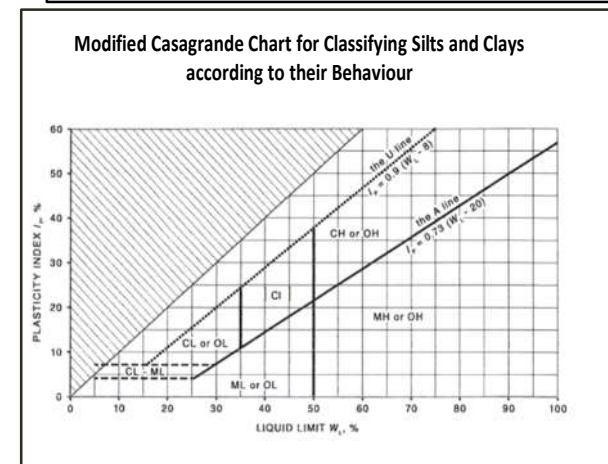
A well graded coarse grained soil is one for which the coefficient of uniformity $C_u > 4$ and the coefficient of curvature $1 < C_c < 3$. Otherwise, the soil is poorly graded. These coefficients are given by:

$$C_u = \frac{D_{60}}{D_{10}} \quad \text{and} \quad C_c = \frac{(D_{30})^2}{D_{10} D_{60}}$$

Where D_{10} , D_{30} and D_{60} are those grain sizes for which 10%, 30% and 60% of the soil grains, respectively, are smaller.

- NOTES:**
- For a coarse grained soil with a fines content between 5% and 12%, the soil is given a dual classification comprising the two group symbols separated by a dash; for example, for a poorly graded gravel with between 5% and 12% silt fines, the classification is GP-GM.
 - Where the grading is determined from laboratory tests, it is defined by coefficients of curvature (C_c) and uniformity (C_u) derived from the particle size distribution curve.
 - Clay soils with liquid limits $> 35\%$ and $\leq 50\%$ may be classified as being of medium plasticity.
 - The U line on the Modified Casagrande Chart is an approximate upper bound for most natural soils.

Major Divisions		Group Symbol	Typical Names	Field Classification of Silt and Clay			Laboratory Classification
				Dry Strength	Dilatancy	Toughness	
fine grained soils (more than 35% of soil excluding oversize fraction is less than 0.075mm)	SILT and CLAY (low to medium plasticity)	ML	Inorganic silt and very fine sand, rock flour, silty or clayey fine sand or silt with low plasticity	None to low	Slow to rapid	Low	Below A line
		CL, CI	Inorganic clay of low to medium plasticity, gravelly clay, sandy clay	Medium to high	None to slow	Medium	Above A line
		OL	Organic silt	Low to medium	Slow	Low	Below A line
	SILT and CLAY (high plasticity)	MH	Inorganic silt	Low to medium	None to slow	Low to medium	Below A line
		CH	Inorganic clay of high plasticity	High to very high	None	High	Above A line
		OH	Organic clay of medium to high plasticity, organic silt	Medium to high	None to very slow	Low to medium	Below A line
	Highly organic soil	Pt	Peat, highly organic soil	–	–	–	–





LOG SYMBOLS

Log Column	Symbol	Definition		
Groundwater Record		Standing water level. Time delay following completion of drilling/excavation may be shown.		
		Extent of borehole/test pit collapse shortly after drilling/excavation.		
		Groundwater seepage into borehole or test pit noted during drilling or excavation.		
Samples	ES	Sample taken over depth indicated, for environmental analysis.		
	U50	Undisturbed 50mm diameter tube sample taken over depth indicated.		
	DB	Bulk disturbed sample taken over depth indicated.		
	DS	Small disturbed bag sample taken over depth indicated.		
	ASB	Soil sample taken over depth indicated, for asbestos analysis.		
	ASS	Soil sample taken over depth indicated, for acid sulfate soil analysis.		
	SAL	Soil sample taken over depth indicated, for salinity analysis.		
	PFAS	Soil sample taken over depth indicated, for analysis of Per- and Polyfluoroalkyl Substances.		
Field Tests	N = 17 4, 7, 10	Standard Penetration Test (SPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration. 'Refusal' refers to apparent hammer refusal within the corresponding 150mm depth increment.		
	N _c =	5	Solid Cone Penetration Test (SCPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration for 60° solid cone driven by SPT hammer. 'R' refers to apparent hammer refusal within the corresponding 150mm depth increment.	
		7		
		3R		
VNS = 25 PID = 100	Vane shear reading in kPa of undrained shear strength. Photoionisation detector reading in ppm (soil sample headspace test).			
Moisture Condition (Fine Grained Soils)	w > PL	Moisture content estimated to be greater than plastic limit.		
	w ≈ PL	Moisture content estimated to be approximately equal to plastic limit.		
	w < PL	Moisture content estimated to be less than plastic limit.		
	w ≈ LL	Moisture content estimated to be near liquid limit.		
	w > LL	Moisture content estimated to be wet of liquid limit.		
	(Coarse Grained Soils)	D	DRY – runs freely through fingers.	
M		MOIST – does not run freely but no free water visible on soil surface.		
W		WET – free water visible on soil surface.		
Strength (Consistency) Cohesive Soils	VS	VERY SOFT – unconfined compressive strength ≤ 25kPa.		
	S	SOFT – unconfined compressive strength > 25kPa and ≤ 50kPa.		
	F	FIRM – unconfined compressive strength > 50kPa and ≤ 100kPa.		
	St	STIFF – unconfined compressive strength > 100kPa and ≤ 200kPa.		
	VSt	VERY STIFF – unconfined compressive strength > 200kPa and ≤ 400kPa.		
	Hd	HARD – unconfined compressive strength > 400kPa.		
	Fr	FRIABLE – strength not attainable, soil crumbles.		
	()	Bracketed symbol indicates estimated consistency based on tactile examination or other assessment.		
Density Index/ Relative Density (Cohesionless Soils)		Density Index (I_D) Range (%)	SPT 'N' Value Range (Blows/300mm)	
	VL	VERY LOOSE	≤ 15	0 – 4
	L	LOOSE	> 15 and ≤ 35	4 – 10
	MD	MEDIUM DENSE	> 35 and ≤ 65	10 – 30
	D	DENSE	> 65 and ≤ 85	30 – 50
	VD	VERY DENSE	> 85	> 50
	()	Bracketed symbol indicates estimated density based on ease of drilling or other assessment.		



Log Column	Symbol	Definition
Hand Penetrometer Readings	300 250	Measures reading in kPa of unconfined compressive strength. Numbers indicate individual test results on representative undisturbed material unless noted otherwise.
Remarks	'V' bit 'TC' bit T ₆₀ Soil Origin	<p>Hardened steel 'V' shaped bit.</p> <p>Twin pronged tungsten carbide bit.</p> <p>Penetration of auger string in mm under static load of rig applied by drill head hydraulics without rotation of augers.</p> <p>The geological origin of the soil can generally be described as:</p> <p>RESIDUAL – soil formed directly from insitu weathering of the underlying rock. No visible structure or fabric of the parent rock.</p> <p>EXTREMELY WEATHERED – soil formed directly from insitu weathering of the underlying rock. Material is of soil strength but retains the structure and/or fabric of the parent rock.</p> <p>ALLUVIAL – soil deposited by creeks and rivers.</p> <p>ESTUARINE – soil deposited in coastal estuaries, including sediments caused by inflowing creeks and rivers, and tidal currents.</p> <p>MARINE – soil deposited in a marine environment.</p> <p>AEOLIAN – soil carried and deposited by wind.</p> <p>COLLUVIAL – soil and rock debris transported downslope by gravity, with or without the assistance of flowing water. Colluvium is usually a thick deposit formed from a landslide. The description 'slopewash' is used for thinner surficial deposits.</p> <p>LITTORAL – beach deposited soil.</p>



Classification of Material Weathering

Term	Abbreviation	Definition
Residual Soil	RS	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.
Extremely Weathered	XW	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.
Highly Weathered	Distinctly Weathered (Note 1)	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Moderately Weathered		
Slightly Weathered	SW	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
Fresh	FR	Rock shows no sign of decomposition of individual minerals or colour changes.

NOTE 1: The term 'Distinctly Weathered' is used where it is not practicable to distinguish between 'Highly Weathered' and 'Moderately Weathered' rock. 'Distinctly Weathered' is defined as follows: 'Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores'. There is some change in rock strength.

Rock Material Strength Classification

Term	Abbreviation	Uniaxial Compressive Strength (MPa)	Guide to Strength	
			Point Load Strength Index $Is_{(50)}$ (MPa)	Field Assessment
Very Low Strength	VL	0.6 to 2	0.03 to 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30mm thick can be broken by finger pressure.
Low Strength	L	2 to 6	0.1 to 0.3	Easily scored with a knife; indentations 1mm to 3mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150mm long by 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium Strength	M	6 to 20	0.3 to 1	Scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
High Strength	H	20 to 60	1 to 3	A piece of core 150mm long by 50mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High Strength	VH	60 to 200	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely High Strength	EH	> 200	> 10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

ABBREVIATIONS AND EXPLANATIONS

Abbreviations used in the Tables:

ABC:	Ambient Background Concentration	PCBs:	Polychlorinated Biphenyls
ACM:	Asbestos Containing Material	PCE:	Perchloroethylene (Tetrachloroethylene or Tetrachloroethene)
AF:	Asbestos Fines	PQL:	Practical Quantitation Limit
B(a)P:	Benzo(a)pyrene	RS:	Rinsate Sample
EILs:	Ecological Investigation Levels	SAC:	Site Assessment Criteria
ESLs:	Ecological Screening Levels	TB:	Trip Blank
FA:	Fibrous Asbestos	TCA:	1,1,1 Trichloroethane (methyl chloroform)
HILs:	Health Investigation Levels	TCE:	Trichloroethylene (Trichloroethene)
HSLs:	Health Screening Levels	TS:	Trip Spike
kg/L	kilograms per litre	TRH:	Total Recoverable Hydrocarbons
NA:	Not Analysed		
NC:	Not Calculated		
NEPM:	National Environmental Protection Measure		
NL:	Not Limiting		
NSL:	No Set Limit		
OCP:	Organochlorine Pesticides		
OPP:	Organophosphorus Pesticides		
PAHs:	Polycyclic Aromatic Hydrocarbons		
%w/w:	weight per weight		
ppm:	Parts per million		

PSI Tables

Table Specific Explanations:

HIL Tables:

- The chromium results are for Total Chromium which includes Chromium III and VI. For initial screening purposes, we have assumed that the samples contain only Chromium VI unless demonstrated otherwise by additional analysis.
- Carcinogenic PAHs is a toxicity weighted sum of analyte concentrations for a specific list of PAH compounds relative to B(a)P. It is also referred to as the B(a)P Toxic Equivalence Quotient (TEQ).

EIL/ESL Table:

- ABC Values for selected metals have been adopted from the published background concentrations presented in Olszowy et. al., (1995), Trace Element Concentrations in Soils from Rural and Urban New South Wales (the 25th percentile values for old suburbs with high traffic have been quoted).

QA/QC Table:

- Field blank, Inter and Intra laboratory duplicate results are reported in mg/kg.
- Trip spike results are reported as percentage recovery.
- Field rinsate results are reported in µg/L.

TABLE S1

SOIL LABORATORY RESULTS COMPARED TO NEPM 2013.

HIL-B: 'Residential with minimal opportunities for soil access; including dwellings with fully/permanently paved yards like high-rise buildings'

All data in mg/kg unless stated otherwise			HEAVY METALS							PAHs		ORGANOCHLORINE PESTICIDES (OCPs)							OP PESTICIDES (OPPs)	TOTAL PCBs	ASBESTOS FIBRES		
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	Carcinogenic PAHs	HCB	Endosulfan	Methoxychlor	Aldrin & Dieldrin	Chlordane	DDT, DDD & DDE	Heptachlor	Chlorpyrifos			
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	100
Site Assessment Criteria (SAC)			500	150	500	30000	1200	120	1200	60000	400	4	15	400	500	10	90	600	10	340	1	Detected/Not Detected	
Sample Reference	Sample Depth	Sample Description																					
BH2	0-0.1	Fill: Sandy Silty Clay	55	0.4	26	29	260	<0.1	4	370	4.6	0.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH2 - Lab replicate	0-0.1	Fill: Sandy Silty Clay	52	0.5	21	32	230	<0.1	5	400	4.9	0.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
BH2	0.5-0.7	Silty Clay	7	<0.4	14	7	13	<0.1	3	13	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH3	0-0.1	Fill: Sandy Silty Clay	7	0.7	13	39	140	0.1	4	330	4.8	1.3	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	Not Detected
BH3	0.5-0.7	Silty Clay	5	<0.4	15	10	13	<0.1	3	20	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH8a	0-0.1	Fill: Sandy Silty Clay	4	0.4	12	17	81	1.3	3	40	11	2.9	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH9	0-0.1	Fill: Silty Sandy Clay	6	<0.4	27	22	86	0.4	3	110	1.2	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH9	0.3-0.5	Fill: Silty Sandy Clay	8	<0.4	13	21	83	0.2	3	92	0.2	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH9	0.8-1.0	Silty Clay	16	<0.4	27	24	18	<0.1	1	15	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH101	0-0.1	Fill: Silty Gravelly Sand	<4	<0.4	98	33	29	<0.1	82	68	0.2	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH101 - Lab replicate	0-0.1	Fill: Silty Gravelly Sand	<4	<0.4	95	32	27	<0.1	82	65	0.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
BH101	0.3-0.4	Silty Clay	10	<0.4	25	8	22	<0.1	2	14	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH102	0-0.1	Fill: Silty Sand	6	<0.4	8	18	68	<0.1	3	63	<0.05	<0.5	<0.1	<0.1	<0.1	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH102	0.5-0.6	Fill: Silty Clay	10	<0.4	20	18	91	<0.1	3	64	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SDUP1	0-0.1	Fill: Sandy Silty Clay	7	0.8	13	43	170	0.1	4	350	3.3	1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	NA
SDUP2	0-0.1	Fill: Sandy Silty Clay	61	0.8	29	28	270	0.2	5	410	3.6	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Total Number of Samples			16	16	16	16	16	16	16	16	16	16	11	11	11	11	11	11	11	11	11	11	7
Maximum Value			61	0.8	98	43	270	1.3	82	410	11	2.9	<PQL	<PQL	<PQL	1	<PQL	0.3	<PQL	<PQL	<PQL	<PQL	Not Detected

Concentration above the SAC
 Concentration above the PQL
 Asbestos Detected

VALUE
Bold
Detected

TABLE S2
SOIL LABORATORY RESULTS COMPARED TO HSLs
 All data in mg/kg unless stated otherwise

					C ₆ -C ₁₀ (F1)	>C ₁₀ -C ₁₆ (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	Field PID Measurement
PQL - Envirolab Services					25	50	0.2	0.5	1	1	1	ppm
NEPM 2013 HSL Land Use Category					HSL-A/B: LOW/HIGH DENSITY RESIDENTIAL							
Sample Reference	Sample Depth	Sample Description	Depth Category	Soil Category								
BH2	0-0.1	Fill: Sandy Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	2
BH2 - Lab replicate	0-0.1	Fill: Sandy Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	2
BH2	0.5-0.7	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.9
BH3	0-0.1	Fill: Sandy Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.5
BH3	0.5-0.7	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	3.1
BH8a	0-0.1	Fill: Sandy Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.4
BH9	0-0.1	Fill: Silty Sandy Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.2
BH9	0.3-0.5	Fill: Silty Sandy Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.4
BH9	0.8-1.0	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	2.5
BH101	0-0.1	Fill: Silty Gravelly Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	3.8
BH101 - Lab replicate	0-0.1	Fill: Silty Gravelly Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	3.8
BH101	0.3-0.4	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	3
BH102	0-0.1	Fill: Silty Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	7.4
BH102	0.5-0.6	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	4.6
SDUP1	0-0.1	Fill: Sandy Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	NA
SDUP2	0-0.1	Fill: Sandy Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	NA
Total Number of Samples					16	16	16	16	16	16	16	14
Maximum Value					<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	7.4

Concentration above the SAC

VALUE

Concentration above the PQL

Bold

The guideline corresponding to the concentration above the SAC is highlighted in grey in the Site Assessment Criteria Table below

PSI Tables

HSL SOIL ASSESSMENT CRITERIA

Sample Reference	Sample Depth	Sample Description	Depth Category	Soil Category	C ₆ -C ₁₀ (F1)	>C ₁₀ -C ₁₆ (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene
BH2	0-0.1	Fill: Sandy Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH2 - Lab replicate	0-0.1	Fill: Sandy Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH2	0.5-0.7	Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH3	0-0.1	Fill: Sandy Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH3	0.5-0.7	Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH8a	0-0.1	Fill: Sandy Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH9	0-0.1	Fill: Silty Sandy Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH9	0.3-0.5	Fill: Silty Sandy Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH9	0.8-1.0	Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH101	0-0.1	Fill: Silty Gravelly Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH101 - Lab replicate	0-0.1	Fill: Silty Gravelly Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH101	0.3-0.4	Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH102	0-0.1	Fill: Silty Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH102	0.5-0.6	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
SDUP1	0-0.1	Fill: Sandy Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
SDUP2	0-0.1	Fill: Sandy Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3

TABLE S3
SOIL LABORATORY RESULTS COMPARED TO MANAGEMENT LIMITS
 All data in mg/kg unless stated otherwise

			C ₆ -C ₁₀ (F1) plus BTEX	>C ₁₀ -C ₁₆ (F2) plus naphthalene	>C ₁₆ -C ₃₄ (F3)	>C ₃₄ -C ₄₀ (F4)
PQL - Envirolab Services			25	50	100	100
NEPM 2013 Land Use Category			RESIDENTIAL, PARKLAND & PUBLIC OPEN SPACE			
Sample Reference	Sample Depth	Soil Texture				
BH2	0-0.1	Fine	<25	<50	240	120
BH2 - Lab replicate	0-0.1	Fine	<25	<50	<100	<100
BH2	0.5-0.7	Fine	<25	<50	<100	<100
BH3	0-0.1	Fine	<25	<50	100	<100
BH3	0.5-0.7	Fine	<25	<50	<100	<100
BH8a	0-0.1	Fine	<25	<50	210	<100
BH9	0-0.1	Fine	<25	<50	<100	<100
BH9	0.3-0.5	Fine	<25	<50	<100	<100
BH9	0.8-1.0	Fine	<25	<50	<100	<100
BH101	0-0.1	Coarse	<25	<50	130	180
BH101 - Lab replicate	0-0.1	Coarse	<25	<50	130	160
BH101	0.3-0.4	Fine	<25	<50	<100	<100
BH102	0-0.1	Coarse	<25	<50	<100	<100
BH102	0.5-0.6	Fine	<25	<50	<100	<100
SDUP1	0-0.1	Fine	<25	<50	110	<100
SDUP2	0-0.1	Fine	<25	<50	<100	<100
Total Number of Samples			16	16	16	16
Maximum Value			<PQL	<PQL	240	180
Concentration above the SAC			VALUE			
Concentration above the PQL			Bold			

MANAGEMENT LIMIT ASSESSMENT CRITERIA

Sample Reference	Sample Depth	Soil Texture	C ₆ -C ₁₀ (F1) plus BTEX	>C ₁₀ -C ₁₆ (F2) plus naphthalene	>C ₁₆ -C ₃₄ (F3)	>C ₃₄ -C ₄₀ (F4)
BH2	0-0.1	Fine	800	1000	3500	10000
BH2 - Lab replicate	0-0.1	Fine	800	1000	3500	10000
BH2	0.5-0.7	Fine	800	1000	3500	10000
BH3	0-0.1	Fine	800	1000	3500	10000
BH3	0.5-0.7	Fine	800	1000	3500	10000
BH8a	0-0.1	Fine	800	1000	3500	10000
BH9	0-0.1	Fine	800	1000	3500	10000
BH9	0.3-0.5	Fine	800	1000	3500	10000
BH9	0.8-1.0	Fine	800	1000	3500	10000
BH101	0-0.1	Coarse	700	1000	2500	10000
BH101 - Lab replicate	0-0.1	Coarse	700	1000	2500	10000
BH101	0.3-0.4	Fine	800	1000	3500	10000
BH102	0-0.1	Coarse	700	1000	2500	10000
BH102	0.5-0.6	Fine	800	1000	3500	10000
SDUP1	0-0.1	Fine	800	1000	3500	10000
SDUP2	0-0.1	Fine	800	1000	3500	10000

TABLE S4
SOIL LABORATORY RESULTS COMPARED TO DIRECT CONTACT CRITERIA
 All data in mg/kg unless stated otherwise

Analyte	C ₆ -C ₁₀	>C ₁₀ -C ₁₆	>C ₁₆ -C ₃₄	>C ₃₄ -C ₄₀	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	PID
PQL - Envirolab Services	25	50	100	100	0.2	0.5	1	1	1	
CRC 2011 - Direct contact Criteria	5,600	4,200	5,800	8,100	140	21,000	5,900	17,000	2,200	
Site Use	HIGH DENSITY RESIDENTIAL - DIRECT SOIL CONTACT									
Sample Reference	Sample Depth									
BH2	0-0.1	<25	<50	240	120	<0.2	<0.5	<1	<1	2
BH2 - Lab replicate	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	2
BH2	0.5-0.7	<25	<50	<100	<100	<0.2	<0.5	<1	<1	1.9
BH3	0-0.1	<25	<50	100	<100	<0.2	<0.5	<1	<1	1.5
BH3	0.5-0.7	<25	<50	<100	<100	<0.2	<0.5	<1	<1	3.1
BH8a	0-0.1	<25	<50	210	<100	<0.2	<0.5	<1	<1	1.4
BH9	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	1.2
BH9	0.3-0.5	<25	<50	<100	<100	<0.2	<0.5	<1	<1	1.4
BH9	0.8-1.0	<25	<50	<100	<100	<0.2	<0.5	<1	<1	2.5
BH101	0-0.1	<25	<50	130	180	<0.2	<0.5	<1	<1	3.8
BH101 - Lab replicate	0-0.1	<25	<50	130	160	<0.2	<0.5	<1	<1	3.8
BH101	0.3-0.4	<25	<50	<100	<100	<0.2	<0.5	<1	<1	3
BH102	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	7.4
BH102	0.5-0.6	<25	<50	<100	<100	<0.2	<0.5	<1	<1	4.6
SDUP1	0-0.1	<25	<50	110	<100	<0.2	<0.5	<1	<1	NA
SDUP2	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	NA
Total Number of Samples		16	16	16	16	16	16	16	16	14
Maximum Value		<PQL	<PQL	240	180	<PQL	<PQL	<PQL	<PQL	7.4

Concentration above the SAC
 Concentration above the PQL

VALUE
 Bold

PSI Tables

FIELD DATA															LABORATORY DATA											
Date Sampled	Sample reference	Sample Depth	Visible ACM in top 100mm	Approx. Volume of Soil (L)	Soil Mass (g)	Mass ACM (g)	Mass Asbestos in ACM (g)	[Asbestos from ACM in soil] (%w/w)	Mass ACM <7mm (g)	Mass Asbestos in ACM <7mm (g)	[Asbestos from ACM <7mm in soil] (%w/w)	Mass FA (g)	Mass Asbestos in FA (g)	[Asbestos from FA in soil] (%w/w)	Lab Report Number	Sample reference	Sample Depth	Sample Mass (g)	Asbestos ID in soil (AS4964) >0.1g/kg	Trace Analysis	Total Asbestos (g/kg)	Asbestos ID in soil <0.1g/kg	ACM >7mm Estimation (g)	FA and AF Estimation (g)	ACM >7mm Estimation % (w/w)	FA and AF Estimation % (w/w)
SAC															0.04 0.001 0.001 0.04 0.001											
4/11/2022	BH2	0-0.1	No	11	12,550	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	309855	BH2	0-0.1	495.89	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
4/11/2022	BH2	0.1-0.5	NA	10	10,140	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4/11/2022	BH3	0-0.1	No	11	11,210	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	309855	BH3	0-0.1	491.68	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
4/11/2022	BH3	0.1-0.5	NA	11	10,880	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4/11/2022	BH8A	0-0.1	No	10	10,180	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	309855	BH8A	0-0.1	605.44	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
4/11/2022	BH8A	0.1-0.6	NA	10	10,200	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
10/11/2022	BH9	0-0.1	No	10	10,590	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	310306	BH9	0-0.1	483.11	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
10/11/2022	BH9	0.1-0.5	NA	10	10,240	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	310306	BH9	0.3-0.5	321	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
14/10/2024	BH101	0-0.1	No	10	12,810	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	364388	BH101	0-0.1	963.5	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
14/10/2024	BH102	0-0.1	No	10	10,370	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	364388	BH102	0-0.1	628.97	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
14/10/2024	BH102	0.1-1.0	NA	<10	3,860	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Concentration above the SAC **VALUE**

PSI Tables

TABLE S6
SOIL LABORATORY RESULTS COMPARED TO NEPM 2013 EILs AND ESLs
 All data in mg/kg unless stated otherwise

Land Use Category				URBAN RESIDENTIAL AND PUBLIC OPEN SPACE																	
				AGED HEAVY METALS-EILs						EILs		ESLs									
				Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C ₆ -C ₁₀ (F1)	>C ₁₀ -C ₁₆ (F2)	>C ₁₆ -C ₃₄ (F3)	>C ₃₄ -C ₄₀ (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P	
PQL - Envirolab Services				4	1	1	1	1	1	1	0.1	25	50	100	100	0.2	0.5	1	1	0.05	
Ambient Background Concentration (ABC)				NSL	13	28	163	5	122	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	
Sample Reference	Sample Depth	Sample Description	Soil Texture	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C ₆ -C ₁₀ (F1)	>C ₁₀ -C ₁₆ (F2)	>C ₁₆ -C ₃₄ (F3)	>C ₃₄ -C ₄₀ (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P	
BH2	0-0.1	Fill: Sandy Silty Clay	Fine	55	26	29	260	4	370	<1	<0.1	<25	<50	240	120	<0.2	<0.5	<1	<1	0.4	
BH2 - Lab replicate	0-0.1	Fill: Sandy Silty Clay	Fine	52	21	32	230	5	400	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.4	
BH2	0.5-0.7	Silty Clay	Fine	7	14	7	13	3	13	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05	
BH3	0-0.1	Fill: Sandy Silty Clay	Fine	7	13	39	140	4	330	<1	<0.1	<25	<50	100	<100	<0.2	<0.5	<1	<1	1.1	
BH3	0.5-0.7	Silty Clay	Fine	5	15	10	13	3	20	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05	
BH8a	0-0.1	Fill: Sandy Silty Clay	Fine	4	12	17	81	3	40	<1	<0.1	<25	<50	210	<100	<0.2	<0.5	<1	<1	2.2	
BH9	0-0.1	Fill: Silty Sandy Clay	Fine	6	27	22	86	3	110	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.2	
BH9	0.3-0.5	Fill: Silty Sandy Clay	Fine	8	13	21	83	3	92	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.07	
BH9	0.8-1.0	Silty Clay	Fine	16	27	24	18	1	15	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05	
BH101	0-0.1	Fill: Silty Gravelly Sand	Coarse	<4	98	33	29	82	68	<1	<0.1	<25	<50	130	180	<0.2	<0.5	<1	<1	<0.05	
BH101 - Lab replicate	0-0.1	Fill: Silty Gravelly Sand	Coarse	<4	95	32	27	82	65	<1	<0.1	<25	<50	130	160	<0.2	<0.5	<1	<1	<0.05	
BH101	0.3-0.4	Silty Clay	Fine	10	25	8	22	2	14	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05	
BH102	0-0.1	Fill: Silty Sand	Coarse	6	8	18	68	3	63	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05	
BH102	0.5-0.6	Fill: Silty Clay	Fine	10	20	18	91	3	64	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05	
SDUP1	0-0.1	Fill: Sandy Silty Clay	Fine	7	13	43	170	4	350	<1	<0.1	<25	<50	110	<100	<0.2	<0.5	<1	<1	0.81	
SDUP2	0-0.1	Fill: Sandy Silty Clay	Fine	61	29	28	270	5	410	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.3	
Total Number of Samples				16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Maximum Value				61	98	43	270	82	410	<PQL	<PQL	<PQL	<PQL	<PQL	240	180	<PQL	<PQL	<PQL	<PQL	2.2

Concentration above the SAC **VALUE**
 Concentration above the PQL **Bold**
 The guideline corresponding to the elevated value is highlighted in grey in the EIL and ESL Assessment Criteria Table below

EIL AND ESL ASSESSMENT CRITERIA

Sample Reference	Sample Depth	Sample Description	Soil Texture	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C ₆ -C ₁₀ (F1)	>C ₁₀ -C ₁₆ (F2)	>C ₁₆ -C ₃₄ (F3)	>C ₃₄ -C ₄₀ (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
BH2	0-0.1	Fill: Sandy Silty Clay	Fine	100	200	90	1300	35	190	170	180	180	120	1300	5600	65	105	125	45	20
BH2 - Lab replicate	0-0.1	Fill: Sandy Silty Clay	Fine	100	200	90	1300	35	190	170	180	180	120	1300	5600	65	105	125	45	20
BH2	0.5-0.7	Silty Clay	Fine	100	200	90	1300	35	190	170	--	180	120	1300	5600	65	105	125	45	20
BH3	0-0.1	Fill: Sandy Silty Clay	Fine	100	200	90	1300	35	190	170	180	180	120	1300	5600	65	105	125	45	20
BH3	0.5-0.7	Silty Clay	Fine	100	200	90	1300	35	190	170	--	180	120	1300	5600	65	105	125	45	20
BH8a	0-0.1	Fill: Sandy Silty Clay	Fine	100	200	90	1300	35	190	170	180	180	120	1300	5600	65	105	125	45	20
BH9	0-0.1	Fill: Silty Sandy Clay	Fine	100	200	90	1300	35	190	170	180	180	120	1300	5600	65	105	125	45	20
BH9	0.3-0.5	Fill: Silty Sandy Clay	Fine	100	200	90	1300	35	190	170	180	180	120	1300	5600	65	105	125	45	20
BH9	0.8-1.0	Silty Clay	Fine	100	200	90	1300	35	190	170	--	180	120	1300	5600	65	105	125	45	20
SDUP1	0-0.1	Fill: Sandy Silty Clay	Fine	100	200	90	1300	35	190	170	180	180	120	1300	5600	65	105	125	45	20
SDUP2	0-0.1	Fill: Sandy Silty Clay	Fine	100	200	90	1300	35	190	170	180	180	120	1300	5600	65	105	125	45	20
BH101	0-0.1	Fill: Silty Gravelly Sand	Coarse	100	200	90	1300	35	190	170	180	180	120	300	2800	50	85	70	105	20
BH101 - Lab replicate	0-0.1	Fill: Silty Gravelly Sand	Coarse	100	200	90	1300	35	190	170	180	180	120	300	2800	50	85	70	105	20
BH101	0.3-0.4	Silty Clay	Fine	100	200	90	1300	35	190	170	--	180	120	1300	5600	65	105	125	45	20
BH102	0-0.1	Fill: Silty Sand	Coarse	100	200	90	1300	35	190	170	180	180	120	300	2800	50	85	70	105	20
BH102	0.5-0.6	Fill: Silty Clay	Fine	100	200	90	1300	35	190	170	--	180	120	1300	5600	65	105	125	45	20
SDUP1	0-0.1	Fill: Sandy Silty Clay	Fine	100	200	90	1300	35	190	170	180	180	120	1300	5600	65	105	125	45	20
SDUP2	0-0.1	Fill: Sandy Silty Clay	Fine	100	200	90	1300	35	190	170	180	180	120	1300	5600	65	105	125	45	20

ABBREVIATIONS AND EXPLANATIONS

Abbreviations used in the Tables:

ANZG	Australian and New Zealand Guidelines	PCE:	Perchloroethylene (Tetrachloroethylene or Tetrachloroethene)
B(a)P:	Benzo(a)pyrene	PFAS	Per- and polyfluoroalkyl substances
CRC:	Cooperative Research Centre	PFHxS	Perfluorohexanesulfonic acid
FTS:	Fluorotelomer sulfonic acid	PFOA	Perfluorooctanoic acid
GIL:	Groundwater Investigation Levels	PFOS	Perfluorooctanesulfonic acid
NA:	Not Analysed	PQL:	Practical Quantitation Limit
NC:	Not Calculated	SAC:	Site Assessment Criteria
NEMP	National Environmental Management Plan	TCA:	1,1,1 Trichloroethane (methyl chloroform)
NEPM:	National Environmental Protection Measure	TCE:	Trichloroethylene (Trichloroethene)
NHMRC:	National Health and Medical Research Council	TRH:	Total Recoverable Hydrocarbons
NSL:	No Set Limit	USEPA	United States Environmental Protection Agency
PAHs:	Polycyclic Aromatic Hydrocarbons	VOCC:	Volatile Organic Chlorinated Compounds
ppm:	Parts per million	WHO:	World Health Organisation

Table Specific Explanations:

Groundwater Ecology Tables:

- 95% refers to a concentration that has been derived to protect 95% of aquatic species

Groundwater Quality Screening Tables

TABLE G1 SUMMARY OF GROUNDWATER LABORATORY RESULTS COMPARED TO ECOLOGICAL GILs SAC All results in µg/L unless stated otherwise.								
	PQL EnviroLab Services	ANZG 2018 Fresh Waters	SAMPLES					
			MW101	MW101 Lab replicate	MW102	MW103	MW103 Lab replicate	WDUP101
Inorganic Compounds and Parameters								
pH	-	6.5 - 8.5	4	4	6.3	5.9	[NT]	NA
Electrical Conductivity (µS/cm)	1	NSL	860	860	2200	1600	[NT]	NA
Turbidity (NTU)	-	NSL	12	12	6.6	2.4	[NT]	NA
Redox Potential (Eh)	-	NSL	252	[NT]	-35	6	[NT]	NA
Total Dissolved Solids (TDS) (mg/L)	5	NSL	550	[NT]	1400	1000	[NT]	NA
Total Suspended Solids (TSS) (mg/L)	5	NSL	6	[NT]	6	13	[NT]	NA
Total Organic Carbon (TOC) (mg/L)	1	NSL	6	[NT]	7	6	[NT]	NA
Dissolved Oxygen (mg/L)	0.1	NSL	4.2	[NT]	5	4.5	[NT]	NA
Total Hardness (as CaCO3) (mg/L)	3	NSL	45	[NT]	360	130	[NT]	NA
Silica (SiO2) (mg/L)	0.1	NSL	57	[NT]	12	32	[NT]	NA
Phosphorus (mg/L)	0.05	NSL	<0.05	[NT]	<0.05	<0.05	[NT]	NA
Metals and Metalloids								
Arsenic (As III)	1	24	<1	[NT]	3	<1	NA	3
Cadmium	0.1	0.2	<0.1	[NT]	<0.1	<0.1	NA	<0.1
Chromium (SAC for Cr III adopted)	1	3.3	<1	[NT]	<1	<1	NA	<1
Copper	1	1.4	8	[NT]	<1	<1	NA	<1
Lead	1	3.4	<1	[NT]	<1	<1	NA	<1
Total Mercury (inorganic)	0.05	0.06	<0.05	[NT]	<0.05	<0.05	NA	NA
Nickel	1	11	16	[NT]	21	36	NA	20
Zinc	1	8	68	[NT]	27	120	NA	26
Aluminium	10	55	380	[NT]	<10	50	NA	NA
Silver	1	NSL	<1	[NT]	<1	<1	NA	NA
Antimony	1	NSL	<1	[NT]	<1	<1	NA	NA
Barium	1	NSL	16	[NT]	86	64	NA	NA
Beryllium	0.5	NSL	0.9	[NT]	<0.5	2	NA	NA
Boron	20	940	50	[NT]	40	40	NA	NA
Cobalt	1	NSL	10	[NT]	19	33	NA	NA
Iron	10	NSL	900	[NT]	5900	28000	NA	NA
Lithium	1	1900	17	[NT]	54	28	NA	NA
Manganese	5	NSL	480	[NT]	4400	3400	NA	NA
Molybdenum	1	5	<1	[NT]	<1	<1	NA	NA
Selenium	1	0.05	<1	[NT]	<1	<1	NA	NA
Strontium	1	NSL	10	[NT]	190	52	NA	NA
Uranium	0.5	NSL	<0.5	[NT]	<0.5	<0.5	NA	NA
Vanadium	1	NSL	<1	[NT]	<1	<1	NA	NA
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)								
Benzene	1	950	<1	<1	<1	<1	NA	<1
Toluene	1	180	<1	<1	<1	<1	NA	<1
Ethylbenzene	1	80	<1	<1	<1	<1	NA	<1
m+p-xylene	2	75	<2	<2	<2	<2	NA	<2
o-xylene	1	350	<1	<1	<1	<1	NA	<1
Total xylenes	2	NSL	<2	<2	<2	<2	NA	<2
Total Recoverable Hydrocarbons (TRHs)								
TRH F1	10	NSL	<10	<10	<10	<10	NA	<10
TRH F2	50	NSL	<50	<50	<50	<50	NA	<50
TRH F3	100	NSL	<100	<100	<100	<100	NA	<100
TRH F4	100	NSL	<100	<100	<100	<100	NA	<100
Volatile Organic Compounds (VOCs), including chlorinated VOCs								
Dichlorodifluoromethane	10	NSL	<10	<10	<10	<10	NA	<10
Chloromethane	10	NSL	<10	<10	<10	<10	NA	<10
Vinyl Chloride	10	100	<10	<10	<10	<10	NA	<10
Bromomethane	10	NSL	<10	<10	<10	<10	NA	<10
Chloroethane	10	NSL	<10	<10	<10	<10	NA	<10
Trichlorofluoromethane	10	NSL	<10	<10	<10	<10	NA	<10
1,1-Dichloroethene	1	700	<1	<1	<1	<1	NA	<1
Trans-1,2-dichloroethene	1	NSL	<1	<1	<1	<1	NA	<1
1,1-dichloroethane	1	90	<1	<1	<1	<1	NA	<1
Cis-1,2-dichloroethane	1	NSL	<1	<1	<1	<1	NA	<1
Bromochloromethane	1	NSL	<1	<1	<1	<1	NA	<1
Chloroform	1	370	<1	<1	<1	<1	NA	<1
2,2-dichloropropane	1	NSL	<1	<1	<1	<1	NA	<1
1,2-dichloroethane	1	1900	<1	<1	<1	<1	NA	<1
1,1,1-trichloroethane	1	270	<1	<1	<1	<1	NA	<1
1,1-dichloropropene	1	NSL	<1	<1	<1	<1	NA	<1
Cyclohexane	1	NSL	<1	<1	<1	<1	NA	<1
Carbon tetrachloride	1	240	<1	<1	<1	<1	NA	<1
Benzene	1	950	<1	<1	<1	<1	NA	<1
Dibromomethane	1	NSL	<1	<1	<1	<1	NA	<1
1,2-dichloropropane	1	900	<1	<1	<1	<1	NA	<1
Trichloroethene	1	330	<1	<1	<1	<1	NA	<1
Bromodichloromethane	1	NSL	<1	<1	<1	<1	NA	<1
trans-1,3-dichloropropane	1	NSL	<1	<1	<1	<1	NA	<1
cis-1,3-dichloropropane	1	NSL	<1	<1	<1	<1	NA	<1
1,1,2-trichloroethane	1	600	<1	<1	<1	<1	NA	<1
Toluene	1	180	<1	<1	<1	<1	NA	<1
1,3-dichloropropane	1	1100	<1	<1	<1	<1	NA	<1
Dibromochloromethane	1	NSL	<1	<1	<1	<1	NA	<1
1,2-dibromoethane	1	NSL	<1	<1	<1	<1	NA	<1
Tetrachloroethene	1	70	<1	<1	<1	<1	NA	<1
1,1,1,2-tetrachloroethane	1	NSL	<1	<1	<1	<1	NA	<1
Chlorobenzene	1	55	<1	<1	<1	<1	NA	<1
Ethylbenzene	1	80	<1	<1	<1	<1	NA	<1
Bromoform	1	NSL	<1	<1	<1	<1	NA	<1
m+p-xylene	2	75	<2	<2	<2	<2	NA	<2
Styrene	1	NSL	<1	<1	<1	<1	NA	<1
1,1,2,2-tetrachloroethane	1	400	<1	<1	<1	<1	NA	<1
o-xylene	1	350	<1	<1	<1	<1	NA	<1
1,2,3-trichloropropane	1	NSL	<1	<1	<1	<1	NA	<1
Isopropylbenzene	1	30	<1	<1	<1	<1	NA	<1
Bromobenzene	1	NSL	<1	<1	<1	<1	NA	<1
n-propyl benzene	1	NSL	<1	<1	<1	<1	NA	<1
2-chlorotoluene	1	NSL	<1	<1	<1	<1	NA	<1
4-chlorotoluene	1	NSL	<1	<1	<1	<1	NA	<1
1,3,5-trimethyl benzene	1	NSL	<1	<1	<1	<1	NA	<1
Tert-butyl benzene	1	NSL	<1	<1	<1	<1	NA	<1
1,2,4-trimethyl benzene	1	NSL	<1	<1	<1	<1	NA	<1
1,3-dichlorobenzene	1	260	<1	<1	<1	<1	NA	<1
Sec-butyl benzene	1	NSL	<1	<1	<1	<1	NA	<1
1,4-dichlorobenzene	1	60	<1	<1	<1	<1	NA	<1
4-isopropyl toluene	1	NSL	<1	<1	<1	<1	NA	<1
1,2-dichlorobenzene	1	160	<1	<1	<1	<1	NA	<1
n-butyl benzene	1	NSL	<1	<1	<1	<1	NA	<1
1,2-dibromo-3-chloropropane	1	NSL	<1	<1	<1	<1	NA	<1
1,2,4-trichlorobenzene	1	85	<1	<1	<1	<1	NA	<1
Hexachlorobutadiene	1	NSL	<1	<1	<1	<1	NA	<1
1,2,3-trichlorobenzene	1	3	<1	<1	<1	<1	NA	<1
Polycyclic Aromatic Hydrocarbons (PAHs)								
Naphthalene	0.2	16	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Acenaphthylene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Acenaphthene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Fluorene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Phenanthrene	0.1	0.6	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Anthracene	0.1	0.01	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Fluoranthene	0.1	1	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Pyrene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Benzo(a)anthracene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Chrysene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Benzo(b,j,k)fluoranthene	0.2	NSL	<0.2	<0.2	<0.2	<0.2	NA	<0.2
Benzo(a)pyrene	0.1	0.1	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Indeno(1,2,3-c,d)pyrene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Dibenzo(a,h)anthracene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Benzo(g,h,i)perylene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Anions and Cations								
Calcium (mg/L)	0.5	NSL	0.8	[NT]	38	5.3	NA	NA
Potassium (mg/L)	0.5	NSL	1	[NT]	8.2	2	NA	NA
Sodium (mg/L)	0.5	NSL	140	[NT]	310	210	NA	NA
Magnesium (mg/L)	0.5	NSL	10	[NT]	64	29	NA	NA
Hydroxide Alkalinity (as CaCO3) (mg/L)	5	NSL	<5	<5	<5	<5	NA	NA
Bicarbonate Alkalinity (as CaCO3) (mg/L)	5	NSL	<5	<5	220	92	NA	NA
Carbonate Alkalinity (as CaCO3) (mg/L)	5	NSL	<5	<5	<5	<5	NA	NA
Total Alkalinity (as CaCO3) (mg/L)	5	NSL	<5	<5	220	92	NA	NA
Sulphate (mg/L)	1	NSL	110	[NT]	55	66	NA	NA
Chloride (mg/L)	1	NSL	190	[NT]	570	430	NA	NA
Ionic Balance (%)	-	NSL	-3	[NT]	-2	-12	NA	NA
Sodium Adsorption Ratio (SAR)	0.01	NSL	9.2	[NT]	7	7.9	NA	NA
Nutrients								
Ammonia (mg/L) (pH dependent)	0.005	0.9	0.045	0.04	0.036	0.016	[NT]	NA
Nitrate (mg/L)	0.005	NSL	<0.005	<0.005	<0.005	<0.025	[NT]	NA
Nitrite (mg/L)	0.005	NSL	<0.005	<0.005	<0.005	<0.025	[NT]	NA
Nitrogen Oxides (NOx) (mg/L)	0.005	NSL	<0.005	<0.005	<0.005	<0.025	[NT]	NA
Total Nitrogen (mg/L)	0.1	NSL	<0.1	[NT]	<0.1	<0.1	[NT]	NA
Phosphate (mg/L)	0.005	NSL	<0.005	<0.005	<0.025	<0.025		

TABLE G2 SUMMARY OF GROUNDWATER LABORATORY RESULTS COMPARED TO HUMAN CONTACT GILS All results in µg/L unless stated otherwise.								
	PQL EnviroLab Services	Recreational (10 x NHMRC ADWG)	SAMPLES					
			MW101	MW101 Lab replicate	MW102	MW103	MW103 Lab replicate	WDUP101
Inorganic Compounds and Parameters								
pH	-	6.5 - 8.5	4	4	6.3	5.9	[NT]	NA
Electrical Conductivity (µS/cm)	1	NSL	860	860	2200	1600	[NT]	NA
Turbidity (NTU)	-	NSL	12	12	6.6	2.4	[NT]	NA
Redox Potential (Eh)	-	NSL	252	[NT]	-35	6	[NT]	NA
Total Dissolved Solids (TDS) (mg/L)	5	NSL	550	[NT]	1400	1000	1000	NA
Total Suspended Solids (TSS) (mg/L)	5	NSL	6	[NT]	6	13	[NT]	NA
Total Organic Carbon (TOC) (mg/L)	1	NSL	6	[NT]	7	6	[NT]	NA
Dissolved Oxygen (mg/L)	0.1	NSL	4.2	[NT]	5	4.5	[NT]	NA
Total Hardness (as CaCO3) (mg/L)	3	NSL	45	[NT]	360	130	[NT]	NA
Silica (SiO2) (mg/L)	0.1	NSL	57	57	12	32	[NT]	NA
Phosphorus (mg/L)	0.05	NSL	<0.05	[NT]	<0.05	<0.05	[NT]	NA
Metals and Metalloids								
Arsenic (As III)	1	100	<1	[NT]	3	<1	NA	3
Cadmium	0.1	20	<0.1	[NT]	<0.1	<0.1	NA	<0.1
Chromium (total)	1	500	<1	[NT]	<1	<1	NA	<1
Copper	1	2000	8	[NT]	<1	<1	NA	<1
Lead	1	100	<1	[NT]	<1	<1	NA	<1
Total Mercury (inorganic)	0.05	10	<0.05	<0.05	<0.05	<0.05	NA	NA
Nickel	1	200	16	[NT]	21	36	NA	20
Zinc	1	30000	68	[NT]	27	120	NA	26
Aluminium	10	NSL	380	[NT]	<10	50	NA	NA
Silver	1	1000	<1	[NT]	<1	<1	NA	NA
Antimony	1	30	<1	[NT]	<1	<1	NA	NA
Barium	1	20000	16	[NT]	86	64	NA	NA
Beryllium	0.5	600	0.9	[NT]	<0.5	2	NA	NA
Boron	20	40000	50	[NT]	40	40	NA	NA
Cobalt	1	NSL	10	[NT]	19	33	NA	NA
Iron	10	NSL	900	[NT]	5900	28000	NA	NA
Lithium	1	NSL	17	[NT]	54	28	NA	NA
Manganese	5	5000	480	[NT]	4400	3400	NA	NA
Molybdenum	1	500	<1	[NT]	<1	<1	NA	NA
Selenium	1	100	<1	[NT]	<1	<1	NA	NA
Strontium	1	NSL	10	[NT]	190	52	NA	NA
Uranium	0.5	200	<0.5	[NT]	<0.5	<0.5	NA	NA
Vanadium	1	NSL	<1	[NT]	<1	<1	NA	NA
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)								
Benzene	1	10	<1	<1	<1	<1	NA	<1
Toluene	1	8000	<1	<1	<1	<1	NA	<1
Ethylbenzene	1	3000	<1	<1	<1	<1	NA	<1
m+p-xylene	2	NSL	<2	<2	<2	<2	NA	<2
o-xylene	1	NSL	<1	<1	<1	<1	NA	<1
Total xylenes	2	6000	<2	<2	<2	<2	NA	<2
Total Recoverable Hydrocarbons (TRHs)								
TRH F1	10	NSL	<10	<10	<10	<10	NA	<10
TRH F2	50	NSL	<50	<50	<50	<50	NA	<50
TRH F3	100	NSL	<100	<100	<100	<100	NA	<100
TRH F4	100	NSL	<100	<100	<100	<100	NA	<100
Volatile Organic Compounds (VOCs), including chlorinated VOCs								
Dichlorodifluoromethane	10	NSL	<10	<10	<10	<10	NA	<10
Chloromethane	10	NSL	<10	<10	<10	<10	NA	<10
Vinyl Chloride	10	3	<10	<10	<10	<10	NA	<10
Bromomethane	10	NSL	<10	<10	<10	<10	NA	<10
Chloroethane	10	NSL	<10	<10	<10	<10	NA	<10
Trichlorofluoromethane	10	NSL	<10	<10	<10	<10	NA	<10
1,1-Dichloroethene	1	300	<1	<1	<1	<1	NA	<1
Trans-1,2-dichloroethene	1	600	<1	<1	<1	<1	NA	<1
1,1-dichloroethane	1	NSL	<1	<1	<1	<1	NA	<1
Cis-1,2-dichloroethane	1	600	<1	<1	<1	<1	NA	<1
Bromochloromethane	1	2500	<1	<1	<1	<1	NA	<1
Chloroform	1	NSL	<1	<1	<1	<1	NA	<1
2,2-dichloropropane	1	NSL	<1	<1	<1	<1	NA	<1
1,2-dichloroethane	1	30	<1	<1	<1	<1	NA	<1
1,1,1-trichloroethane	1	NSL	<1	<1	<1	<1	NA	<1
1,1-dichloropropene	1	NSL	<1	<1	<1	<1	NA	<1
Cyclohexane	1	NSL	<1	<1	<1	<1	NA	<1
Carbon tetrachloride	1	30	<1	<1	<1	<1	NA	<1
Benzene	1	10	<1	<1	<1	<1	NA	<1
Dibromomethane	1	NSL	<1	<1	<1	<1	NA	<1
1,2-dichloropropane	1	NSL	<1	<1	<1	<1	NA	<1
Trichloroethene	1	NSL	<1	<1	<1	<1	NA	<1
Bromodichloromethane	1	NSL	<1	<1	<1	<1	NA	<1
trans-1,3-dichloropropene	1	1000	<1	<1	<1	<1	NA	<1
cis-1,3-dichloropropene	1	1000	<1	<1	<1	<1	NA	<1
1,1,2-trichloroethane	1	NSL	<1	<1	<1	<1	NA	<1
Toluene	1	8000	<1	<1	<1	<1	NA	<1
1,3-dichloropropane	1	NSL	<1	<1	<1	<1	NA	<1
Dibromochloromethane	1	NSL	<1	<1	<1	<1	NA	<1
1,2-dibromoethane	1	NSL	<1	<1	<1	<1	NA	<1
Tetrachloroethene	1	500	<1	<1	<1	<1	NA	<1
1,1,1,2-tetrachloroethane	1	NSL	<1	<1	<1	<1	NA	<1
Chlorobenzene	1	3000	<1	<1	<1	<1	NA	<1
Ethylbenzene	1	3000	<1	<1	<1	<1	NA	<1
Bromobenzene	1	NSL	<1	<1	<1	<1	NA	<1
m+p-xylene	2	NSL	<2	<2	<2	<2	NA	<2
Styrene	1	300	<1	<1	<1	<1	NA	<1
1,1,2,2-tetrachloroethane	1	NSL	<1	<1	<1	<1	NA	<1
o-xylene	1	NSL	<1	<1	<1	<1	NA	<1
1,2,3-trichloropropane	1	NSL	<1	<1	<1	<1	NA	<1
Isopropylbenzene	1	NSL	<1	<1	<1	<1	NA	<1
Bromobenzene	1	NSL	<1	<1	<1	<1	NA	<1
n-propyl benzene	1	NSL	<1	<1	<1	<1	NA	<1
2-chlorotoluene	1	NSL	<1	<1	<1	<1	NA	<1
4-chlorotoluene	1	NSL	<1	<1	<1	<1	NA	<1
1,3,5-trimethyl benzene	1	NSL	<1	<1	<1	<1	NA	<1
Tert-butyl benzene	1	NSL	<1	<1	<1	<1	NA	<1
1,2,4-trimethyl benzene	1	NSL	<1	<1	<1	<1	NA	<1
1,3-dichlorobenzene	1	200	<1	<1	<1	<1	NA	<1
Sec-butyl benzene	1	NSL	<1	<1	<1	<1	NA	<1
1,4-dichlorobenzene	1	400	<1	<1	<1	<1	NA	<1
4-isopropyl toluene	1	NSL	<1	<1	<1	<1	NA	<1
1,2-dichlorobenzene	1	15000	<1	<1	<1	<1	NA	<1
n-butyl benzene	1	NSL	<1	<1	<1	<1	NA	<1
1,2-dibromo-3-chloropropane	1	NSL	<1	<1	<1	<1	NA	<1
1,2,4-trichlorobenzene	1	300	<1	<1	<1	<1	NA	<1
1,2,3-trichlorobenzene	1	NSL	<1	<1	<1	<1	NA	<1
Hexachlorobutadiene	1	7	<1	<1	<1	<1	NA	<1
Polycyclic Aromatic Hydrocarbons (PAHs)								
Naphthalene	0.2	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Acenaphthylene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Acenaphthene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Fluorene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Phenanthrene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Anthracene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Fluoranthene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Pyrene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Benzo(a)anthracene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Chrysene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Benzo(b,j,k)fluoranthene	0.2	NSL	<0.2	<0.2	<0.2	<0.2	NA	<0.2
Benzo(a)pyrene	0.1	0.1	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Indeno(1,2,3-c,d)pyrene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Dibenzo(a,h)anthracene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Benzo(g,h,i)perylene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	NA	<0.1
Anions and Cations								
Calcium (mg/L)	0.5	NSL	0.8	[NT]	38	5.3	NA	NA
Potassium (mg/L)	0.5	NSL	1	[NT]	8.2	2	NA	NA
Sodium (mg/L)	0.5	NSL	140	[NT]	310	210	NA	NA
Magnesium (mg/L)	0.5	NSL	10	[NT]	64	29	NA	NA
Hydroxide Alkalinity (as CaCO3) (mg/L)	5	NSL	<5	<5	<5	<5	NA	NA
Bicarbonate Alkalinity (as CaCO3) (mg/L)	5	NSL	<5	<5	220	92	NA	NA
Carbonate Alkalinity (as CaCO3) (mg/L)	5	NSL	<5	<5	<5	<5	NA	NA
Total Alkalinity (as CaCO3) (mg/L)	5	NSL	<5	<5	220	92	NA	NA
Sulphate (mg/L)	1	NSL	110	[NT]	55	66	NA	NA
Chloride (mg/L)	1	NSL	190	[NT]	570	430	NA	NA
Ionic Balance (%)	-	NSL	-3	[NT]	-2	-12	NA	NA
Sodium Adsorption Ratio (SAR)	0.01	NSL	9.2	[NT]	7	7.9	NA	NA
Nutrients								
Ammonia (mg/L) (pH dependent)	0.005	NSL	0.045	0.04	0.036	0.016	[NT]	NA
Nitrate (mg/L)	0.005	50000	<0.005	<0.005	<0.005	<0.025	[NT]	NA
Nitrite (mg/L)	0.005	30000	<0.005	<0.005	<0.005	<0.025	[NT]	NA
Nitrogen Oxides (NOX) (mg/L)	0.005	NSL	<0.005	<0.005	<0.005	<0.025	[NT]	NA
Total Nitrogen (mg/L)	0.1	NSL	<0.1	[NT]	<0.1	<0.1	[NT]	NA
Phosphate (mg/L)	0.005	NSL	<0.005	&				

TABLE G3
SUMMARY OF PFAS CONCENTRATIONS IN GROUNDWATER - ECOLOGY
 All results in µg/L unless stated otherwise.

	PQL Envirolab Services	NEMP 2018 95% Freshwater	SAMPLES			
			MW101	MW102	MW103	WDUP101
PFAS Compound						
Perfluorobutanesulfonic acid	0.1	NSL	0.0059	<0.0004	0.001	<0.0004
Perfluoropentanesulfonic acid	0.1	NSL	0.002	<0.001	<0.001	<0.001
Perfluorohexanesulfonic acid - PFHxS	0.1	NSL	0.036	<0.0002	0.0065	<0.0002
Perfluoroheptanesulfonic acid	0.1	NSL	0.001	<0.001	<0.001	<0.001
Perfluorooctanesulfonic acid PFOS	0.1	0.13	0.025	<0.0002	0.002	<0.0002
Perfluorodecanesulfonic acid	0.2	NSL	<0.002	<0.002	<0.002	<0.002
Perfluorobutanoic acid	0.2	NSL	<0.02	<0.02	<0.02	<0.02
Perfluoropentanoic acid	0.2	NSL	0.007	<0.004	<0.004	<0.004
Perfluorohexanoic acid	0.1	NSL	0.0093	<0.0004	0.002	<0.0004
Perfluoroheptanoic acid	0.1	NSL	0.003	<0.0004	0.0005	<0.0004
Perfluorooctanoic acid PFOA	0.1	220	0.0055	<0.0002	0.001	<0.0002
Perfluorononanoic acid	0.1	NSL	<0.001	<0.001	<0.001	<0.001
Perfluorodecanoic acid	0.5	NSL	<0.002	<0.002	<0.002	<0.002
Perfluoroundecanoic acid	0.5	NSL	<0.002	<0.002	<0.002	<0.002
Perfluorododecanoic acid	0.5	NSL	<0.005	<0.005	<0.005	<0.005
Perfluorotridecanoic acid	0.5	NSL	<0.01	<0.01	<0.01	<0.01
Perfluorotetradecanoic acid	5	NSL	<0.05	<0.05	<0.05	<0.05
4:2 FTS	0.1	NSL	<0.001	<0.001	<0.001	<0.001
6:2 FTS	0.1	NSL	<0.0004	<0.0004	<0.0004	<0.0004
8:2 FTS	0.1	NSL	<0.0004	<0.0004	<0.0004	<0.0004
10:2 FTS	0.1	NSL	<0.002	<0.002	<0.002	<0.002
Perfluorooctane sulfonamide	1	NSL	<0.01	<0.01	<0.01	<0.01
N-Methyl perfluorooctane sulfonamide	1	NSL	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctanesulfonamide	1	NSL	<0.1	<0.1	<0.1	<0.1
N-Me perfluorooctanesulfonamid ethanol	1	NSL	<0.05	<0.05	<0.05	<0.05
N-Et perfluorooctanesulfonamid ethanol	5	NSL	<0.5	<0.5	<0.5	<0.5
MePerfluorooctanesulf-amid oacetic acid	0.2	NSL	<0.002	<0.002	<0.002	<0.002
EtPerfluorooctanesulf-amid oacetic acid	0.2	NSL	<0.002	<0.002	<0.002	<0.002
Total Positive PFHxS & PFOS	0.1	NSL	0.061	<0.0002	0.008	<0.0002
Total Positive PFOS & PFOA	0.1	NSL	0.03	<0.0002	0.0025	<0.0002
Total Positive PFAS	0.1	NSL	0.095	<0.0002	0.012	<0.0002
Positive PFAS result Bold PFAS result above the SAC Bold						

TABLE G4
SUMMARY OF PFAS CONCENTRATIONS IN GROUNDWATER - HUMAN HEALTH
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	NEMP 2020 Recreational	SAMPLES			
			MW101	MW102	MW103	WDUP101
PFAS Compound						
Perfluorobutanesulfonic acid	0.1	NSL	0.0059	<0.0004	0.001	<0.0004
Perfluoropentanesulfonic acid	0.1	NSL	0.002	<0.001	<0.001	<0.001
Perfluorohexanesulfonic acid - PFHxS	0.1	NSL	0.036	<0.0002	0.0065	<0.0002
Perfluoroheptanesulfonic acid	0.1	NSL	0.001	<0.001	<0.001	<0.001
Perfluorooctanesulfonic acid PFOS	0.1	NSL	0.025	<0.0002	0.002	<0.0002
Perfluorodecanesulfonic acid	0.2	NSL	<0.002	<0.002	<0.002	<0.002
Perfluorobutanoic acid	0.2	NSL	<0.02	<0.02	<0.02	<0.02
Perfluoropentanoic acid	0.2	NSL	0.007	<0.004	<0.004	<0.004
Perfluorohexanoic acid	0.1	NSL	0.0093	<0.0004	0.002	<0.0004
Perfluoroheptanoic acid	0.1	NSL	0.003	<0.0004	0.0005	<0.0004
Perfluorooctanoic acid PFOA	0.1	10	0.0055	<0.0002	0.001	<0.0002
Perfluorononanoic acid	0.1	NSL	<0.001	<0.001	<0.001	<0.001
Perfluorodecanoic acid	0.5	NSL	<0.002	<0.002	<0.002	<0.002
Perfluoroundecanoic acid	0.5	NSL	<0.002	<0.002	<0.002	<0.002
Perfluorododecanoic acid	0.5	NSL	<0.005	<0.005	<0.005	<0.005
Perfluorotridecanoic acid	0.5	NSL	<0.01	<0.01	<0.01	<0.01
Perfluorotetradecanoic acid	5	NSL	<0.05	<0.05	<0.05	<0.05
4:2 FTS	0.1	NSL	<0.001	<0.001	<0.001	<0.001
6:2 FTS	0.1	NSL	<0.0004	<0.0004	<0.0004	<0.0004
8:2 FTS	0.1	NSL	<0.0004	<0.0004	<0.0004	<0.0004
10:2 FTS	0.1	NSL	<0.002	<0.002	<0.002	<0.002
Perfluorooctane sulfonamide	1	NSL	<0.01	<0.01	<0.01	<0.01
N-Methyl perfluorooctane sulfonamide	1	NSL	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctanesulfonamide	1	NSL	<0.1	<0.1	<0.1	<0.1
N-Me perfluorooctanesulfonamid oethanol	1	NSL	<0.05	<0.05	<0.05	<0.05
N-Et perfluorooctanesulfonamid oethanol	5	NSL	<0.5	<0.5	<0.5	<0.5
MePerfluorooctanesulf-amid oacetic acid	0.2	NSL	<0.002	<0.002	<0.002	<0.002
EtPerfluorooctanesulf-amid oacetic acid	0.2	NSL	<0.002	<0.002	<0.002	<0.002
Total Positive PFHxS & PFOS	0.1	2	0.061	<0.0002	0.008	<0.0002
Total Positive PFOS & PFOA	0.1	NSL	0.03	<0.0002	0.0025	<0.0002
Total Positive PFAS	0.1	NSL	0.095	<0.0002	0.012	<0.0002

Positive PFAS result **Bold**
PFAS result above the SAC **Bold**

ABBREVIATIONS AND EXPLANATIONS

Abbreviations used in the Tables:

ABC:	Ambient Background Concentration	PCBs:	Polychlorinated Biphenyls
ACM:	Asbestos Containing Material	PQL:	Practical Quantitation Limit
ADWG:	Australian Drinking Water Guidelines	RS:	Rinsate Sample
AF:	Asbestos Fines	SAC:	Site Assessment Criteria
ANZG:	Australian and New Zealand Guidelines	SSA:	Site Specific Assessment
B(a)P:	Benzo(a)pyrene	SSHSLs:	Site Specific Health Screening Levels
CEC:	Cation Exchange Capacity	TB:	Trip Blank
CRC:	Cooperative Research Centre	TS:	Trip Spike
EILs:	Ecological Investigation Levels	TRH:	Total Recoverable Hydrocarbons
ESLs:	Ecological Screening Levels	USEPA:	United States Environmental Protection Agency
FA:	Fibrous Asbestos	WHO:	World Health Organisation
GIL:	Groundwater Investigation Levels		
HILs:	Health Investigation Levels		
HSLs:	Health Screening Levels		
HSL-SSA:	Health Screening Level-Site Specific Assessment		
kg/L	kilograms per litre		
NA:	Not Analysed		
NC:	Not Calculated		
NEPM:	National Environmental Protection Measure		
NHMRC:	National Health and Medical Research Council		
NL:	Not Limiting		
NSL:	No Set Limit		
OCP:	Organochlorine Pesticides		
OPP:	Organophosphorus Pesticides		
PAHs:	Polycyclic Aromatic Hydrocarbons		
%w/w:	weight per weight		
ppm:	Parts per million		

DSI Tables

Table Specific Explanations:

HIL Tables:

- The chromium results are for Total Chromium which includes Chromium III and VI. For initial screening purposes, we have assumed that the samples contain only Chromium VI unless demonstrated otherwise by additional analysis.
- Carcinogenic PAHs is a toxicity weighted sum of analyte concentrations for a specific list of PAH compounds relative to B(a)P. It is also referred to as the B(a)P Toxic Equivalence Quotient (TEQ).

EIL/ESL Table:

- ABC Values for selected metals have been adopted from the published background concentrations presented in Olszowy et. al., (1995), Trace Element Concentrations in Soils from Rural and Urban New South Wales (the 25th percentile values for old suburbs with high traffic have been quoted).

QA/QC Table:

- Field blank, Inter and Intra laboratory duplicate results are reported in mg/kg.
- Trip spike results are reported as percentage recovery.
- Field rinsate results are reported in µg/L.

TABLE S1
SOIL LABORATORY RESULTS COMPARED TO NEPM 2013.
HIL-B: 'Residential with minimal opportunities for soil access; including dwellings with fully/permanently paved yards like high-rise buildings'

All data in mg/kg unless stated otherwise			HEAVY METALS								PAHs		ORGANOCHLORINE PESTICIDES (OCPs)							OP PESTICIDES (OPPs)	TOTAL PCBs	ASBESTOS FIBRES	
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	Carcinogenic PAHs	HCB	Endosulfan	Methoxychlor	Aldrin & Dieldrin	Chlordane	DDT, DDD & DDE	Heptachlor	Chlorpyrifos			
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	100
Site Assessment Criteria (SAC)			500	150	500	30000	1200	120	1200	60000	400	4	15	400	500	10	90	600	10	340	1	Detected/Not Detected	
Sample Reference	Sample Depth	Sample Description																					
BH301	0-0.1	Fill: Silty Clay	7	<0.4	22	72	230	0.2	6	150	6	1	<0.1	<0.1	<0.1	<0.1	<0.1	1	<0.1	<0.1	<0.1	Not Detected	
BH301	0-0.1	Lab Duplicate	6	0.4	24	73	250	0.2	5	150	5.5	1	<0.1	<0.1	<0.1	<0.1	<0.1	1	<0.1	<0.1	<0.1	NA	
BH301	0.6-0.7	Silty Clay	12	<0.4	25	12	19	<0.1	3	6	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
BH302	0-0.1	Fill: Silty Clay	7	<0.4	11	26	94	0.2	2	45	1.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected	
BH303	0-0.1	Fill: Silty Clay	29	<0.4	34	38	610	0.2	4	100	3.5	0.7	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	Not Detected	
BH304	0-0.1	Fill: Silty Clay	10	<0.4	15	38	210	0.2	6	160	5.5	1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	Not Detected	
TP305	0-0.1	Fill: Silty Clay	<4	<0.4	8	34	700	0.1	5	78	8.6	1.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected	
BH306	0-0.1	Fill: Silty Clay	5	<0.4	9	17	96	2.3	3	48	0.86	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected	
BH307	0-0.1	Fill: Silty Clay	8	0.5	12	38	200	0.2	3	150	9.4	1.6	<0.1	<0.1	<0.1	<0.1	<0.1	1	<0.1	<0.1	<0.1	Not Detected	
BH308	0-0.1	Fill: Silty Clay	70	<0.4	12	29	92	<0.1	5	55	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected	
BH308	0.5-0.6	Silty Clay	13	<0.4	29	6	18	<0.1	3	7	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
BH309	0-0.1	Fill: Silty Clay	11	<0.4	13	10	30	<0.1	3	25	0.2	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected	
BH309	0-0.1	Lab Duplicate	13	<0.4	15	11	33	<0.1	3	27	0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	
TP310	0-0.1	Fill: Silty Clay	9	0.7	13	99	260	0.3	6	340	1.7	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected	
TP311	0-0.1	Fill: Silty Clay	15	<0.4	15	88	180	0.3	5	360	2.9	0.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected	
TP311	1.0-1.1	Silty Clay	7	<0.4	20	8	12	<0.1	4	17	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
BH312	0-0.1	Fill: Silty Clay	5	<0.4	10	39	72	0.1	2	63	0.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected	
BH313	0-0.1	Fill: Silty Clay	17	0.5	22	100	120	1.6	6	210	1.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected	
TP314	0-0.1	Fill: Silty Gravelly Sand	<4	<0.4	83	27	14	<0.1	72	51	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected	
TP315	0-0.1	Fill: Silty Gravelly Clay	6	<0.4	18	15	39	<0.1	10	77	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected	
TP315	0.2-0.4	Fill: Silty Clay	7	<0.4	10	10	24	<0.1	<1	6	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected	
TP316	0-0.1	Fill: Silty Sand	10	0.5	11	22	96	<0.1	5	79	0.07	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected	
BH317	0-0.1	Fill: Silty Clay	12	0.7	21	46	190	0.2	5	360	25	3.8	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	Not Detected	
BH317	0-0.1	Lab Duplicate	13	0.9	18	54	240	0.2	5	450	23	3.6	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	NA	
SP1	0.4-0.5	Fill: Silty Sand	340	1	24	86	1000	0.3	6	320	2.8	0.6	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	Not Detected	
SP2	0.3-0.4	Fill: Silty Sand	12	1	15	81	260	0.2	6	350	1.8	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	Not Detected	
SP3	0.4-0.5	Fill: Silty Sand	8	0.8	14	55	180	0.2	7	320	0.4	<0.5	<0.1	<0.1	<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	Not Detected	
SP4	0.4-0.5	Fill: Silty Sand	16	0.6	22	52	190	0.2	6	260	2.2	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected	
SDUP301	0-0.1	Duplicate of TP314	<4	<0.4	77	24	19	<0.1	67	47	0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	
SDUP301	0-0.1	Lab Duplicate	<4	<0.4	71	21	9	<0.1	61	35	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	
SDUP301	0-0.1	Lab triplicate	4	<0.4	91	29	15	<0.1	76	76	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
SDUP302	0-0.1	Duplicate of BH302	10	0.8	13	110	300	0.3	7	380	1.7	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	
SDUP304	0-0.1	Duplicate of BH306	4.9	<0.40	9.6	40	80	<0.10	2.4	58	1.2	<0.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
FCF1-TP311	0-0.1	FCF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Detected	
SP4-FCF1	0-0.1	FCF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Detected	
FCF-Area	Surface	FCF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Detected	
Total Number of Samples			33	33	33	33	33	33	33	33	32	32	28	28	28	28	28	28	28	28	28	25	
Maximum Value			340	1	91	110	1000	2.3	76	450	25	3.8	<PQL	<PQL	<PQL	0.1	<PQL	1	<PQL	<PQL	<PQL	Detected	

Concentration above the SAC **VALUE**
 Concentration above the PQL **Bold**
 Asbestos Detected **Detected**

TABLE S2
SOIL LABORATORY RESULTS COMPARED TO HSLs
 All data in mg/kg unless stated otherwise

					C ₆ -C ₁₀ (F1)	>C ₁₀ -C ₁₆ (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	Field PID Measurement
PQL - Envirolab Services					25	50	0.2	0.5	1	1	1	ppm
NEPM 2013 HSL Land Use Category					HSL-A/B: LOW/HIGH DENSITY RESIDENTIAL							
Sample Reference	Sample Depth	Sample Description	Depth Category	Soil Category								
BH301	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.2
BH301	0-0.1	Lab Duplicate	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	NA
BH301	0.6-0.7	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.3
BH302	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.3
BH303	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.3
BH304	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.2
TP305	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.1
BH306	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.4
BH307	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.3
BH308	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.3
BH308	0.5-0.6	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.4
BH309	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.4
BH309	0-0.1	Lab Duplicate	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	NA
TP310	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.2
TP311	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.1
TP311	1.0-1.1	Silty Clay	1m to <2m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.2
BH312	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.3
BH313	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.4
TP314	0-0.1	Fill: Silty Gravelly Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.4
TP315	0-0.1	Fill: Silty Gravelly Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.3
TP315	0.2-0.4	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.4
TP316	0-0.1	Fill: Silty Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.3
BH317	0-0.1	Fill: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.4
BH317	0-0.1	Lab Duplicate	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	NA
SP1	0.4-0.5	Fill: Silty Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.3
SP2	0.3-0.4	Fill: Silty Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.4
SP3	0.4-0.5	Fill: Silty Sand	0m to <1m	Sand	<50	150	<0.4	<1	<2	<2	<2	0.5
SP3 - Silica gel	0.4-0.5	Fill: Silty Sand	0m to <1m	Sand	NA	<50	NA	NA	NA	NA	NA	NA
SP4	0.4-0.5	Fill: Silty Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.4
SP4 - Silica gel	0.4-0.5	Fill: Silty Sand	0m to <1m	Sand	NA	<50	NA	NA	NA	NA	NA	NA
SP4 - Silica gel	0.4-0.5	Lab replicate	0m to <1m	Sand	NA	<50	NA	NA	NA	NA	NA	NA
SDUP301	0-0.1	Duplicate of TP314	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	NA
SDUP301	0-0.1	Lab Duplicate	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	NA
SDUP302	0-0.1	Duplicate of BH302	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	NA
SDUP304	0-0.1	Duplicate of BH306	0m to <1m	Sand	<25	<50	<0.20	<0.50	<1.0	<1.0	<1.0	NA
Total Number of Samples					32	32	32	32	32	32	32	25
Maximum Value					<PQL	150	<PQL	<PQL	<PQL	<PQL	<PQL	0.5

Concentration above the SAC **VALUE**
 Concentration above the PQL **Bold**
 The guideline corresponding to the concentration above the SAC is highlighted in grey in the Site Assessment Criteria Table below

HSL SOIL ASSESSMENT CRITERIA

Sample Reference	Sample Depth	Sample Description	Depth Category	Soil Category	C ₆ -C ₁₀ (F1)	>C ₁₀ -C ₁₆ (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene
BH301	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH301	0-0.1	Lab Duplicate	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH301	0.6-0.7	Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH302	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH303	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH304	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
TP305	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH306	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH307	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH308	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH308	0.5-0.6	Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH309	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH309	0-0.1	Lab Duplicate	0m to <1m	Sand	45	110	0.5	160	55	40	3
TP310	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
TP311	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
TP311	1.0-1.1	Silty Clay	1m to <2m	Sand	70	240	0.5	220	NL	60	NL
BH312	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH313	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
TP314	0-0.1	Fill: Silty Gravelly Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
TP315	0-0.1	Fill: Silty Gravelly Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
TP315	0.2-0.4	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
TP316	0-0.1	Fill: Silty Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH317	0-0.1	Fill: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH317	0-0.1	Lab Duplicate	0m to <1m	Sand	45	110	0.5	160	55	40	3
SP1	0.4-0.5	Fill: Silty Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
SP2	0.3-0.4	Fill: Silty Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
SP3	0.4-0.5	Fill: Silty Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
SP4	0.4-0.5	Fill: Silty Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
SDUP301	0-0.1	Duplicate of TP314	0m to <1m	Sand	45	110	0.5	160	55	40	3
SDUP301	0-0.1	Lab Duplicate	0m to <1m	Sand	45	110	0.5	160	55	40	3
SDUP302	0-0.1	Duplicate of BH302	0m to <1m	Sand	45	110	0.5	160	55	40	3
SDUP304	0-0.1	Duplicate of BH306	0m to <1m	Sand	45	110	0.5	160	55	40	3

TABLE S3
SOIL LABORATORY RESULTS COMPARED TO MANAGEMENT LIMITS
All data in mg/kg unless stated otherwise

			C ₆ -C ₁₀ (F1) plus BTEX	>C ₁₀ -C ₁₆ (F2) plus naphthalene	>C ₁₆ -C ₃₄ (F3)	>C ₃₄ -C ₄₀ (F4)
PQL - Envirolab Services			25	50	100	100
NEPM 2013 Land Use Category			RESIDENTIAL, PARKLAND & PUBLIC OPEN SPACE			
Sample Reference	Sample Depth	Soil Texture				
BH301	0-0.1	Fine	<25	<50	400	240
BH301	0-0.1	Fine	<25	<50	440	120
BH301	0.6-0.7	Fine	<25	<50	<100	<100
BH302	0-0.1	Fine	<25	<50	<100	<100
BH303	0-0.1	Fine	<25	<50	<100	<100
BH304	0-0.1	Fine	<25	<50	<100	<100
TP305	0-0.1	Fine	<25	<50	140	100
BH306	0-0.1	Fine	<25	<50	<100	<100
BH307	0-0.1	Fine	<25	<50	220	270
BH308	0-0.1	Fine	<25	<50	<100	140
BH308	0.5-0.6	Fine	<25	<50	<100	<100
BH309	0-0.1	Fine	<25	<50	120	280
BH309	0-0.1	Fine	<25	<50	110	210
TP310	0-0.1	Fine	<25	<50	340	280
TP311	0-0.1	Fine	<25	<50	<100	<100
TP311	1.0-1.1	Fine	<25	<50	<100	<100
BH312	0-0.1	Fine	<25	<50	<100	<100
BH313	0-0.1	Fine	<25	<50	240	220
TP314	0-0.1	Coarse	<25	<50	<100	<100
TP315	0-0.1	Fine	<25	<50	<100	<100
TP315	0.2-0.4	Fine	<25	<50	<100	<100
TP316	0-0.1	Coarse	<25	<50	<100	<100
BH317	0-0.1	Fine	<25	<50	200	120
BH317	0-0.1	Fine	<25	<50	170	110
SP1	0.4-0.5	Coarse	<25	<50	180	110
SP2	0.3-0.4	Coarse	<25	<50	190	200
SP3	0.4-0.5	Coarse	<50	150	330	260
SP4	0.4-0.5	Coarse	<25	<50	350	260
SDUP301	0-0.1	Coarse	<25	<50	<100	<100
SDUP301	0-0.1	Fine	<25	<50	190	<100
SDUP302	0-0.1	Fine	<25	<50	290	280
SDUP304	0-0.1	Fine	<25	<50	<100	<100
Total Number of Samples			32	32	32	32
Maximum Value			<PQL	150	440	280
Concentration above the SAC			VALUE			
Concentration above the PQL			Bold			

MANAGEMENT LIMIT ASSESSMENT CRITERIA

Sample Reference	Sample Depth	Soil Texture	C ₆ -C ₁₀ (F1) plus BTEX	>C ₁₀ -C ₁₆ (F2) plus naphthalene	>C ₁₆ -C ₃₄ (F3)	>C ₃₄ -C ₄₀ (F4)
BH301	0-0.1	Fine	800	1000	3500	10000
BH301	0-0.1	Fine	800	1000	3500	10000
BH301	0.6-0.7	Fine	800	1000	3500	10000
BH302	0-0.1	Fine	800	1000	3500	10000
BH303	0-0.1	Fine	800	1000	3500	10000
BH304	0-0.1	Fine	800	1000	3500	10000
TP305	0-0.1	Fine	800	1000	3500	10000
BH306	0-0.1	Fine	800	1000	3500	10000
BH307	0-0.1	Fine	800	1000	3500	10000
BH308	0-0.1	Fine	800	1000	3500	10000
BH308	0.5-0.6	Fine	800	1000	3500	10000
BH309	0-0.1	Fine	800	1000	3500	10000
BH309	0-0.1	Fine	800	1000	3500	10000
TP310	0-0.1	Fine	800	1000	3500	10000
TP311	0-0.1	Fine	800	1000	3500	10000
TP311	1.0-1.1	Fine	800	1000	3500	10000
BH312	0-0.1	Fine	800	1000	3500	10000
BH313	0-0.1	Fine	800	1000	3500	10000
TP314	0-0.1	Coarse	700	1000	2500	10000
TP315	0-0.1	Fine	800	1000	3500	10000
TP315	0.2-0.4	Fine	800	1000	3500	10000
TP316	0-0.1	Coarse	700	1000	2500	10000
BH317	0-0.1	Fine	800	1000	3500	10000
BH317	0-0.1	Fine	800	1000	3500	10000
SP1	0.4-0.5	Coarse	700	1000	2500	10000
SP2	0.3-0.4	Coarse	700	1000	2500	10000
SP3	0.4-0.5	Coarse	700	1000	2500	10000
SP4	0.4-0.5	Coarse	700	1000	2500	10000
SDUP301	0-0.1	Coarse	700	1000	2500	10000
SDUP301	0-0.1	Fine	800	1000	3500	10000
SDUP302	0-0.1	Fine	800	1000	3500	10000
SDUP304	0-0.1	Fine	800	1000	3500	10000

TABLE S4
SOIL LABORATORY RESULTS COMPARED TO DIRECT CONTACT CRITERIA
 All data in mg/kg unless stated otherwise

Analyte	C ₆ -C ₁₀	>C ₁₀ -C ₁₆	>C ₁₆ -C ₃₄	>C ₃₄ -C ₄₀	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	PID
PQL - Envirolab Services	25	50	100	100	0.2	0.5	1	1	1	
CRC 2011 -Direct contact Criteria	5,600	4,200	5,800	8,100	140	21,000	5,900	17,000	2,200	
Site Use	HIGH DENSITY RESIDENTIAL - DIRECT SOIL CONTACT									
Sample Reference	Sample Depth									
BH301	0-0.1	<25	<50	400	240	<0.2	<0.5	<1	<1	0.2
BH301	0-0.1	<25	<50	440	120	<0.2	<0.5	<1	<1	NA
BH301	0.6-0.7	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.3
BH302	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.3
BH303	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.3
BH304	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.2
TP305	0-0.1	<25	<50	140	100	<0.2	<0.5	<1	<1	0.1
BH306	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.4
BH307	0-0.1	<25	<50	220	270	<0.2	<0.5	<1	<1	0.3
BH308	0-0.1	<25	<50	<100	140	<0.2	<0.5	<1	<1	0.3
BH308	0.5-0.6	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.4
BH309	0-0.1	<25	<50	120	280	<0.2	<0.5	<1	<1	0.4
BH309	0-0.1	<25	<50	110	210	<0.2	<0.5	<1	<1	NA
TP310	0-0.1	<25	<50	340	280	<0.2	<0.5	<1	<1	0.2
TP311	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.1
TP311	1.0-1.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.2
BH312	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.3
BH313	0-0.1	<25	<50	240	220	<0.2	<0.5	<1	<1	0.4
TP314	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.4
TP315	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.3
TP315	0.2-0.4	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.4
TP316	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.3
BH317	0-0.1	<25	<50	200	120	<0.2	<0.5	<1	<1	0.4
BH317	0-0.1	<25	<50	170	110	<0.2	<0.5	<1	<1	NA
SP1	0.4-0.5	<25	<50	180	110	<0.2	<0.5	<1	<1	0.3
SP2	0.3-0.4	<25	<50	190	200	<0.2	<0.5	<1	<1	0.4
SP3	0.4-0.5	<50	150	330	260	<0.4	<1	<2	<2	0.5
SP4	0.4-0.5	<25	<50	350	260	<0.2	<0.5	<1	<1	0.4
SDUP301	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	NA
SDUP301	0-0.1	<25	<50	190	<100	<0.2	<0.5	<1	<1	NA
SDUP302	0-0.1	<25	<50	290	280	<0.2	<0.5	<1	<1	NA
SDUP304	0-0.1	<25	<50	<100	<100	<0.20	<0.50	<1.0	<1.0	NA
Total Number of Samples		32	32	32	32	32	32	32	32	25
Maximum Value		<PQL	150	440	280	<PQL	<PQL	<PQL	<PQL	0.5
Concentration above the SAC		VALUE								
Concentration above the PQL		Bold								

TABLE S5
ASBESTOS QUANTIFICATION - FIELD OBSERVATIONS AND LABORATORY RESULTS
HSL-B: Residential with minimal opportunities for soil access

FIELD DATA														LABORATORY DATA												
Date Sampled	Sample reference	Sample Depth	Visible ACM in top 100mm	Approx. Volume of Soil (L)	Soil Mass (g)	Mass ACM (g)	Mass Asbestos in ACM (g)	[Asbestos from ACM in soil] (%w/w)	Mass ACM <7mm (g)	Mass Asbestos in ACM <7mm (g)	[Asbestos from ACM <7mm in soil] (%w/w)	Mass FA (g)	Mass Asbestos in FA (g)	[Asbestos from FA in soil] (%w/w)	Lab Report Number	Sample reference	Sample Depth	Sample Mass (g)	Asbestos ID in soil (AS4964) >0.1g/kg	Trace Analysis	Total Asbestos (g/kg)	Asbestos ID in soil <0.1g/kg	ACM >7mm Estimation (g)	FA and AF Estimation (g)	ACM >7mm Estimation (%(w/w))	FA and AF Estimation (%(w/w))
SAC			No	0.04					0.001		0.001		0.04 0.001													
7/04/2025	BH301	0-0.1	No	10	10,910	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	377981	BH301	0-0.1	571.27	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
7/04/2025	BH301	0.1-0.25	NA	10	10,580	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7/04/2025	BH301	0.25-0.5	NA	10	10,610	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7/04/2025	BH301	0.5-0.75	NA	<10	6,340	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7/04/2025	BH302	0-0.1	No	10	10,710	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	377981	BH302	0-0.1	597.06	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
7/04/2025	BH302	0.1-0.5	NA	10	11,840	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9/04/2025	BH303	0-0.1	No	10	10,310	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	377981	BH303	0-0.1	642.39	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
9/04/2025	BH303	0.1-0.4	NA	10	11,370	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9/04/2025	BH303	0.4-0.7	NA	<10	3,810	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9/04/2025	BH304	0-0.1	No	10	10,770	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	377981	BH304	0-0.1	649.57	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
9/04/2025	BH304	0.1-0.45	NA	10	10,700	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7/04/2025	TP305	0-0.1	No	10	10,760	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	377981	TP305	0-0.1	735.51	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
7/04/2025	TP305	0.1-0.2	NA	10	12,210	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7/04/2025	TP305	0.2-0.5	NA	10	10,690	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9/04/2025	BH306	0-0.1	No	10	11,560	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	377981	BH306	0-0.1	562.95	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
9/04/2025	BH306	0.1-0.6	NA	10	11,650	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9/04/2025	BH307	0-0.1	No	10	11,470	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	377981	BH307	0-0.1	540.39	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
9/04/2025	BH307	0.1-0.4	NA	10	10,560	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7/04/2025	BH308	0-0.1	No	10	12,340	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	377981	BH308	0-0.1	723.42	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
7/04/2025	BH308	0.1-0.45	NA	10	11,690	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7/04/2025	BH308	0.45-0.75	NA	10	10,530	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9/04/2025	BH309	0-0.1	No	10	10,830	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	377981	BH309	0-0.1	588	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
9/04/2025	BH309	0.1-0.2	NA	10	11,340	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7/04/2025	TP310	0-0.1	No	10	11,530	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	377981	TP310	0-0.1	456.82	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
7/04/2025	TP310	0.1-0.4	NA	10	10,810	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7/04/2025	TP311	0-0.1	Yes	10	10,780	16.0	2.4	0.0223	No ACM <7mm observed	--	--	No FA observed	--	--	377981	TP311	0-0.1	712.99	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
7/04/2025	TP311	0.1-0.6	NA	10	11,380	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7/04/2025	TP311	0.6-0.8	NA	10	11,140	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9/04/2025	BH312	0-0.1	No	10	10,460	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	377981	BH312	0-0.1	475.13	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
9/04/2025	BH312	0.1-0.4	NA	10	10,060	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9/04/2025	BH313	0-0.1	No	10	10,950	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	377981	BH313	0-0.1	509.7	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
9/04/2025	BH313	0.4-0.5	NA	10	10,410	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7/04/2025	TP314	0-0.1	No	10	14,940	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	377981	TP314	0-0.1	938.53	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
7/04/2025	TP314	0.1-0.4	NA	10	10,510	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7/04/2025	TP315	0-0.1	No	10	11,470	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	377981	TP315	0-0.1	755.96	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
7/04/2025	TP315	0.1-0.2	NA	10	11,380	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7/04/2025	TP315	0.2-0.4	NA	10	12,120	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	377981	TP315	0.2-0.4	606.53	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
7/04/2025	TP315	0.4-0.7	NA	10	10,180	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7/04/2025	TP315	0.7-1.4	NA	10	10,480	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7/04/2025	TP316	0-0.1	No	10	10,580	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	377981	TP316	0-0.1	788.7	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
7/04/2025	TP316	0.1-0.2	NA	10	10,830	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7/04/2025	TP316	0.2-0.6	NA	10	10,930	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7/04/2025	TP316	0.6-1.4	NA	10	11,700	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9/04/2025	BH317	0-0.1	No	10	10,920	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	377981	BH317	0-0.1	567.32	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
9/04/2025	BH317	0.1-0.5	NA	10	10,040	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9/04/2025	SP1	0-0.1	No	10	10,390	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	377981	SP1	0.4-0.5	509.08	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
9/04/2025	SP2	0-0.1	NA	10	10,810	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	377981	SP2	0.3-0.4	387.81	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
9/04/2025	SP3	0-0.1	No	10360	10,360	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	377981	SP3	0.4-0.5	266.24	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001
9/04/2025	SP4	0-0.1	Yes	10	11,120	17.0	2.55	0.0229	No ACM <7mm observed	--	--	No FA observed	--	--	377981	SP4	0.4-0.5	351.23	No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001

Concentration above the SAC **VALUE**

TABLE S6
SOIL LABORATORY RESULTS COMPARED TO NEPM 2013 EILs AND ESLs
All data in mg/kg unless stated otherwise

Land Use Category				URBAN RESIDENTIAL AND PUBLIC OPEN SPACE																					
Sample Reference	Sample Depth	Sample Description	Soil Texture	pH	CEC (cmolc/kg)	Clay Content (% clay)	AGED HEAVY METALS-EILs						EILs		ESLs										
							Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C ₁₀ -C ₁₀ (F1)	>C ₁₀ -C ₁₆ (F2)	>C ₁₆ -C ₃₄ (F3)	>C ₃₄ -C ₄₀ (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P		
PQL - EnviroLab Services				-	1	-	4	1	1	1	1	1	1	0.1	25	50	100	100	0.2	0.5	1	1	0.05		
Ambient Background Concentration (ABC)				-	-	-	NSL	13	28	163	5	122	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL		
BH301	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	7	22	72	230	6	150	<1	0.1	<25	<50	400	240	<0.2	<0.5	<1	<1	0.71		
BH301	0-0.1	Lab Duplicate	Fine	6.95	35.5	12.5	6	24	73	250	5	150	<1	0.2	<25	<50	440	120	<0.2	<0.5	<1	<1	0.7		
BH301	0.6-0.7	Silty Clay	Fine	NA	NA	NA	12	25	12	19	3	6	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05		
BH302	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	7	11	26	94	2	45	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.2		
BH303	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	29	34	38	610	4	100	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.5		
BH304	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	10	15	38	210	6	160	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.66		
TP305	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	<4	8	34	700	5	78	<1	<0.1	<25	<50	140	100	<0.2	<0.5	<1	<1	1		
BH306	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	5	9	17	96	3	48	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.1		
BH307	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	8	12	38	200	3	150	<1	0.1	<25	<50	220	270	<0.2	<0.5	<1	<1	1.1		
BH308	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	70	12	29	92	5	55	<1	<0.1	<25	<50	<100	140	<0.2	<0.5	<1	<1	<0.05		
BH308	0.5-0.6	Silty Clay	Fine	NA	NA	NA	13	29	6	18	3	7	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05		
BH309	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	11	13	10	30	3	25	<1	<0.1	<25	<50	120	280	<0.2	<0.5	<1	<1	0.05		
BH309	0-0.1	Lab Duplicate	Fine	NA	NA	NA	13	15	11	33	3	27	<1	<0.1	<25	<50	110	210	<0.2	<0.5	<1	<1	0.05		
TP310	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	9	13	99	260	6	340	<1	<0.1	<25	<50	340	280	<0.2	<0.5	<1	<1	0.2		
TP311	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	15	15	88	180	5	360	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.4		
TP311	1.0-1.1	Silty Clay	Fine	NA	NA	NA	7	20	8	12	4	17	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05		
BH312	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	5	10	39	72	2	63	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.07		
BH313	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	17	22	100	120	6	210	<1	<0.1	<25	<50	240	220	<0.2	<0.5	<1	<1	0.2		
TP314	0-0.1	Fill: Silty Gravelly Sand	Coarse	8.7	26	16	<4	83	27	14	72	51	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05		
TP315	0-0.1	Fill: Silty Gravelly Clay	Fine	6.95	35.5	12.5	6	18	15	39	10	77	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05		
TP315	0.2-0.4	Fill: Silty Clay	Fine	6.95	35.5	12.5	7	10	10	24	6	6	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05		
TP316	0-0.1	Fill: Silty Sand	Coarse	NA	NA	NA	10	11	22	96	5	79	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.07		
BH317	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	12	21	46	190	5	360	<1	<0.1	<25	<50	200	120	<0.2	<0.5	<1	<1	2.7		
BH317	0-0.1	Lab Duplicate	Fine	6.95	35.5	12.5	13	18	54	240	5	450	<1	<0.1	<25	<50	170	110	<0.2	<0.5	<1	<1	2.5		
SP1	0.4-0.5	Fill: Silty Sand	Coarse	7.4	30	13	340	24	86	1000	6	320	<1	<0.1	<25	<50	180	110	<0.2	<0.5	<1	<1	0.4		
SP2	0.3-0.4	Fill: Silty Sand	Coarse	7.4	30	13	12	15	81	260	6	350	<1	<0.1	<25	<50	190	200	<0.2	<0.5	<1	<1	0.2		
SP3	0.4-0.5	Fill: Silty Sand	Coarse	7.4	30	13	8	14	55	180	7	320	<2	<0.1	<50	150	330	260	<0.4	<1	<2	<2	0.1		
SP3 - Silica gel	0.4-0.5	Fill: Silty Sand	Coarse	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	<100	<100	NA	NA	NA	NA	NA	NA		
SP4	0.4-0.5	Fill: Silty Sand	Coarse	7.4	30	13	16	22	52	190	6	260	<1	<0.1	<25	<50	350	260	<0.2	<0.5	<1	<1	0.3		
SP4 - Silica gel	0.4-0.5	Fill: Silty Sand	Coarse	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	<100	<100	NA	NA	NA	NA	NA	NA		
SP4 - Silica gel	0.4-0.5	Lab replicate	Coarse	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	<100	<100	NA	NA	NA	NA	NA	NA		
SDUP301	0-0.1	Duplicate of TP314	Coarse	8.7	26	16	<4	77	24	19	67	47	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05		
SDUP301	0-0.1	Lab Duplicate	Coarse	8.7	26	16	<4	71	21	9	61	35	<1	<0.1	<25	<50	190	<100	<0.2	<0.5	<1	<1	<0.05		
SDUP301	0-0.1	Lab triplicate	Coarse	8.7	26	16	4	91	29	15	76	76	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
SDUP302	0-0.1	Duplicate of BH302	Fine	6.95	35.5	12.5	10	13	110	300	7	380	<1	<0.1	<25	<50	290	280	<0.2	<0.5	<1	<1	0.2		
SDUP304	0-0.1	Duplicate of BH306	Fine	6.95	35.5	12.5	4.9	9.6	40	80	2.4	58	<1.0	NA	<25	<50	<100	<100	<0.20	<0.50	<1.0	<1.0	0.13		
Total Number of Samples				28	28	28	33	33	33	33	33	33	33	32	28	32	32	32	32	32	32	32	32	32	
Maximum Value				8.7	35.5	16	340	91	110	1000	76	450	<PQL	0.2	<PQL	150	440	280	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	2.7

Concentration above the SAC **VALUE**
Concentration above the PQL **Bold**
The guideline corresponding to the elevated value is highlighted in grey in the EIL and ESL Assessment Criteria Table below

EIL AND ESL ASSESSMENT CRITERIA

Sample Reference	Sample Depth	Sample Description	Soil Texture	pH	CEC (cmolc/kg)	Clay Content (% clay)	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C ₁₀ -C ₁₀ (F1)	>C ₁₀ -C ₁₆ (F2)	>C ₁₆ -C ₃₄ (F3)	>C ₃₄ -C ₄₀ (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
BH301	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	100	410	250	1300	420	1000	170	180	180	120	1300	5600	65	105	125	45	20
BH301	0-0.1	Lab Duplicate	Fine	6.95	35.5	12.5	100	410	250	1300	420	1000	170	180	180	120	1300	5600	65	105	125	45	20
BH301	0.6-0.7	Silty Clay	Fine	NA	NA	NA	100	200	90	1300	35	190	170	--	180	120	1300	5600	65	105	125	45	20
BH302	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	100	410	250	1300	420	1000	170	180	180	120	1300	5600	65	105	125	45	20
BH303	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	100	410	250	1300	420	1000	170	180	180	120	1300	5600	65	105	125	45	20
BH304	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	100	410	250	1300	420	1000	170	180	180	120	1300	5600	65	105	125	45	20
TP305	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	100	410	250	1300	420	1000	170	180	180	120	1300	5600	65	105	125	45	20
BH306	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	100	410	250	1300	420	1000	170	180	180	120	1300	5600	65	105	125	45	20
BH307	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	100	410	250	1300	420	1000	170	180	180	120	1300	5600	65	105	125	45	20
BH308	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	100	410	250	1300	420	1000	170	180	180	120	1300	5600	65	105	125	45	20
BH308	0.5-0.6	Silty Clay	Fine	NA	NA	NA	100	200	90	1300	35	190	170	--	180	120	1300	5600	65	105	125	45	20
BH309	0-0.1	Fill: Silty Clay	Fine	6.95	35.5	12.5	100	410	250	1300	420	1000											

TABLE G1 SUMMARY OF GROUNDWATER LABORATORY RESULTS COMPARED TO ECOLOGICAL GILs SAC All results in µg/L unless stated otherwise.									
	PQL Envirolab Services	ANZG 2018 Fresh Waters	SAMPLES						
			MW101	MW101 Lab replicate	MW102	MW102 Lab replicate	MW103	WDUP101	WDUP102
Inorganic Compounds and Parameters									
pH		6.5 - 8.5	4.6	NA	6.7	NA	6	NA	NA
Electrical Conductivity (µS/cm)	1	NSL	790	NA	2200	NA	1400	NA	NA
Metals and Metalloids									
Arsenic (As III)	1	24	<1	[NT]	3	3	<1	<1	3
Cadmium	0.1	0.2	<0.1	[NT]	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium (SAC for Cr III adopted)	1	3.3	<1	[NT]	<1	<1	<1	<1	<1
Copper	1	1.4	4	[NT]	<1	<1	<1	4	<1
Lead	1	3.4	<1	[NT]	<1	<1	<1	<1	<1
Total Mercury (inorganic)	0.05	0.06	<0.05	<0.05	<0.05	[NT]	<0.05	<0.05	<0.05
Nickel	1	11	12	[NT]	19	19	36	12	18
Zinc	1	8	69	[NT]	27	27	160	70	32
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)									
Benzene	1	950	<1	<1	<1	NA	<1	<1	<1
Toluene	1	180	<1	<1	<1	NA	<1	<1	<1
Ethylbenzene	1	80	<1	<1	<1	NA	<1	<1	<1
m+p-xylene	2	75	<2	<2	<2	NA	<2	<2	<2
o-xylene	1	350	<1	<1	<1	NA	<1	<1	<1
Total xylenes	2	NSL	<2	<2	<2	NA	<2	<2	<2
Polycyclic Aromatic Hydrocarbons (PAHs)									
Naphthalene	0.2	16	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Acenaphthylene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Acenaphthene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Fluorene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Phenanthrene	0.1	0.6	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Anthracene	0.1	0.01	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Fluoranthene	0.1	1	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Pyrene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Benzo(a)anthracene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Chrysene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	0.2	NSL	<0.2	<0.2	<0.2	NA	<0.2	<0.2	<0.2
Benzo(a)pyrene	0.1	0.1	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Concentration above the SAC			VALUE						
Concentration above the PQL			Bold						
GIL >PQL			Red						

TABLE G2 SUMMARY OF GROUNDWATER LABORATORY RESULTS COMPARED TO HUMAN CONTACT GILS All results in µg/L unless stated otherwise.									
	PQL EnviroLab Services	Recreational (10 x NHMRC ADWG)	SAMPLES						
			MW101	MW101 Lab replicate	MW102	MW102 Lab replicate	MW103	WDUP101	WDUP102
Inorganic Compounds and Parameters									
pH		6.5 - 8.5	4.6	NA	6.7	NA	6	NA	NA
Electrical Conductivity (µS/cm)	1	NSL	790	NA	2200	NA	1400	NA	NA
Metals and Metalloids									
Arsenic (As III)	1	100	<1	[NT]	3	3	<1	<1	3
Cadmium	0.1	20	<0.1	[NT]	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium (total)	1	500	<1	[NT]	<1	<1	<1	<1	<1
Copper	1	20000	4	[NT]	<1	<1	<1	4	<1
Lead	1	100	<1	[NT]	<1	<1	<1	<1	<1
Total Mercury (inorganic)	0.05	10	<0.05	<0.05	<0.05	[NT]	<0.05	<0.05	<0.05
Nickel	1	200	12	[NT]	19	19	36	12	18
Zinc	1	30000	69	[NT]	27	27	160	70	32
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)									
Benzene	1	10	<1	<1	<1	NA	<1	<1	<1
Toluene	1	8000	<1	<1	<1	NA	<1	<1	<1
Ethylbenzene	1	3000	<1	<1	<1	NA	<1	<1	<1
m+p-xylene	2	NSL	<2	<2	<2	NA	<2	<2	<2
o-xylene	1	NSL	<1	<1	<1	NA	<1	<1	<1
Total xylenes	2	6000	<2	<2	<2	NA	<2	<2	<2
Polycyclic Aromatic Hydrocarbons (PAHs)									
Naphthalene	0.2	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Acenaphthylene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Acenaphthene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Fluorene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Phenanthrene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Anthracene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Fluoranthene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Pyrene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Benzo(a)anthracene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Chrysene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	0.2	NSL	<0.2	<0.2	<0.2	NA	<0.2	<0.2	<0.2
Benzo(a)pyrene	0.1	0.1	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Concentration above the SAC			VALUE						
Concentration above the PQL			Bold						
GIL >PQL			Red						

TABLE G4
GROUNDWATER LABORATORY RESULTS COMPARED TO HSLs
All data in µg/L unless stated otherwise

				C ₆ -C ₁₀ (F1)	>C ₁₀ -C ₁₆ (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	PID	
PQL - Envirolab Services				10	50	1	1	1	2	1		
NEPM 2013 - Land Use Category				HSL-A/B: LOW/HIGH DENSITY RESIDENTIAL								
Sample Reference	Water Depth	Depth Category	Soil Category									
MW101	6.12	0m to <2m	Sand	<10	<50	<1	<1	<1	<2	<1	0.3	
MW101 - Lab replicate	6.12	0m to <2m	Sand	<10	<50	<1	<1	<1	<2	<1	0.3	
MW102	6.93	0m to <2m	Sand	<10	<50	<1	<1	<1	<2	<1	0.3	
MW102 - Lab replicate	6.93	0m to <2m	Sand	NA	NA	NA	NA	NA	NA	NA	0.3	
MW103	7.01	0m to <2m	Sand	<10	<50	<1	<1	<1	<2	<1	0	
WDUP101	6.12	0m to <2m	Sand	<10	<50	<1	<1	<1	<2	<1	0.3	
WDUP102	6.93	0m to <2m	Sand	<10	<50	<1	<1	<1	<2	<1	0.3	
Total Number of Samples				6	6	6	6	6	6	6	7	
Maximum Value				<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	0.3	

Concentration above the SAC **VALUE**
 Site specific assesment (SSA) required **VALUE**
 Concentration above the PQL **Bold**
 The guideline corresponding to the elevated value is highlighted in grey in the Groundwater Assessment Criteria Table below

DSL Tables

HSL GROUNDWATER ASSESSMENT CRITERIA

Sample Reference	Water Depth	Depth Category	Soil Category	C ₆ -C ₁₀ (F1)	>C ₁₀ -C ₁₆ (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene
MW101	6.12	0m to <2m	Sand	SSA	SSA	SSA	SSA	SSA	SSA	SSA
MW101 - Lab replicate	6.12	0m to <2m	Sand	SSA	SSA	SSA	SSA	SSA	SSA	SSA
MW102	6.93	0m to <2m	Sand	SSA	SSA	SSA	SSA	SSA	SSA	SSA
MW102 - Lab replicate	6.93	0m to <2m	Sand	NA	NA	NA	NA	NA	NA	NA
MW103	7.01	0m to <2m	Sand	SSA	SSA	SSA	SSA	SSA	SSA	SSA
WDUP101	6.12	0m to <2m	Sand	SSA	SSA	SSA	SSA	SSA	SSA	SSA
WDUP102	6.93	0m to <2m	Sand	SSA	SSA	SSA	SSA	SSA	SSA	SSA

TABLE G5 GROUNDWATER LABORATORY RESULTS COMPARED TO SITE SPECIFIC HSLs - RISK ASSESSMENT All results in µg/L unless stated otherwise.										
	PQL	NHMRC	WHO 2008	USEPA RSL	SAMPLES					
	Envirolab Services	ADWG 2011		Tapwater 2017	MW101	MW101 Lab replicate	MW102	MW103	WDUP101	WDUP102
Total Recoverable Hydrocarbons (TRH)										
C ₆ -C ₉ Aliphatics (assessed using F1)	10	-	100	-	<10	<10	<10	<10	<10	<10
>C ₉ -C ₁₄ Aliphatics (assessed using F2)	50	-	100	-	<50	<50	<50	<50	<50	<50
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)										
Benzene	1	1	-	-	<1	<1	<1	<1	<1	<1
Toluene	1	800	-	-	<1	<1	<1	<1	<1	<1
Ethylbenzene	1	300	-	-	<1	<1	<1	<1	<1	<1
Total xylenes	2	600	-	-	<2	<2	<2	<2	<2	<2
Polycyclic Aromatic Hydrocarbons (PAHs)										
Naphthalene	1	-	-	6.1	<1	<1	<1	<1	<1	<1
Concentration above the SAC VALUE Concentration above the PQL Bold GIL >PQL Red										

DSI Tables

TABLE Q2 GROUNDWATER QA/QC SUMMARY		TRH C6 - C10	TRH >C10-C16	TRH >C16-C34	TRH >C34-C40	Benzene	Toluene	Ethylbenzene	m+p-xylene	o-Xylene	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b,k)fluoranthene	Benzo(e)pyrene	Indeno(1,2,3-c,d)pyrene	Dibenz(a,h)anthracene	Benzo(g,h,i)perylene	Arsenic	Cadmium	Chromium VI	Copper	Lead	Mercury	Nickel	Zinc
	PQL Envirolab SYD	10	50	100	100	1	1	1	2	1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	1	0.1	1	1	1	0.05	1	1
	PQL Envirolab VIC	10	50	100	100	1.0	1.0	1.0	2.0	1.0	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	1	0.1	1	1	1	0.05	1	1
Intra laboratory duplicate	MW101	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	4	<1	<0.05	12	69
	WDUP101	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	4	<1	<0.05	12	70
	MEAN	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	4	nc	nc	12	69.5
	RPD %	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0%	nc	nc	0%	1%	
Intra laboratory duplicate	MW102	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	3	<0.1	<1	<1	<1	<0.05	19	27
	WDUP102	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	3	<0.1	<1	<1	<1	<0.05	18	32
	MEAN	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	3	nc	nc	nc	nc	nc	18.5	29.5
	RPD %	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0%	nc	nc	nc	nc	nc	5%	17%
Field Blank	TB-W201 16/04/2025	<10	280	<100	<100	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	<1	<1	<0.05	<1	<1
Trip Spike	TS-W201 16/04/2025	-	-	-	-	93%	94%	92%	91%	91%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Result outside of QA/QC acceptance criteria		Value																															

DSI Tables



Appendix D: Examples of Imported Materials and Waste Tracking Registers



Appendix E: Report Explanatory Notes



QA/QC Definitions

The QA/QC terms used in this report are defined below. The definitions are in accordance with US EPA publication SW-846, entitled *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (1994)¹⁴ methods and those described in *Environmental Sampling and Analysis, A Practical Guide*, (1991)¹⁵. The NEPM (2013) is consistent with these documents.

A. **Practical Quantitation Limit (PQL), Limit of Reporting (LOR) & Estimated Quantitation Limit (EQL)**

These terms all refer to the concentration above which results can be expressed with a minimum 95% confidence level. The laboratory reporting limits are generally set at ten times the standard deviation for the Method Detection Limit for each specific analyte. For the purposes of this report the LOR, PQL, and EQL are considered to be equivalent.

When assessing laboratory data it should be borne in mind that values at or near the PQL have two important limitations: *“The uncertainty of the measurement value can approach, and even equal, the reported value. Secondly, confirmation of the analytes reported is virtually impossible unless identification uses highly selective methods. These issues diminish when reliably measurable amounts of analytes are present. Accordingly, legal and regulatory actions should be limited to data at or above the reliable detection limit”* (Keith, 1991).

B. **Precision**

The degree to which data generated from repeated measurements differ from one another due to random errors. Precision is measured using the standard deviation or Relative Percent Difference (RPD).

C. **Accuracy**

Accuracy is a measure of the agreement between an experimental result and the true value of the parameter being measured (i.e. the proximity of an averaged result to the true value, where all random errors have been statistically removed). The assessment of accuracy for an analysis can be achieved through the analysis of known reference materials or assessed by the analysis of surrogates, field blanks, trip spikes and matrix spikes. Accuracy is typically reported as percent recovery.

D. **Representativeness**

Representativeness expresses the degree to which sample data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is primarily dependent upon the design and implementation of the sampling program. Representativeness of the data is partially ensured by the avoidance of contamination, adherence to sample handling and analysis protocols and use of proper chain-of-custody and documentation procedures.

E. **Completeness**

Completeness is a measure of the number of valid measurements in a data set compared to the total number of measurements made and overall performance against DQIs. The following information is assessed for completeness:

- Chain-of-custody forms;
- Sample receipt form;
- All sample results reported;
- All blank data reported;

¹⁴ US EPA, (1994). *SW-846: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. (US EPA SW-846)

¹⁵ Keith., H, (1991). *Environmental Sampling and Analysis, A Practical Guide*



- All laboratory duplicate and RPDs calculated;
- All surrogate spike data reported;
- All matrix spike and lab control spike (LCS) data reported and RPDs calculated;
- Spike recovery acceptable limits reported; and
- NATA stamp on reports.

F. Comparability

Comparability is the evaluation of the similarity of conditions (e.g. sample depth, sample homogeneity) under which separate sets of data are produced. Data comparability checks include a bias assessment that may arise from the following sources:

- Collection and analysis of samples by different personnel; Use of different techniques;
- Collection and analysis by the same personnel using the same methods but at different times; and
- Spatial and temporal changes (due to environmental dynamics).

G. Blanks

The purpose of laboratory and field blanks is to check for artefacts and interferences that may arise during sampling, transport and analysis.

H. Matrix Spikes

Samples are spiked with laboratory grade standards to detect interactive effects between the sample matrix and the analytes being measured. Matrix Spikes are reported as a percent recovery and are prepared for 1 in every 20 samples. Sample batches that contain less than 20 samples may be reported with a Matrix Spike from another batch. The percent recovery is calculated using the formula below. Acceptable recovery limits are 70% to 130%.

$$\frac{(\text{Spike Sample Result} - \text{Sample Result}) \times 100}{\text{Concentration of Spike Added}}$$

I. Surrogate Spikes

Samples are spiked with a known concentration of compounds that are chemically related to the analyte being investigated but unlikely to be detected in the environment. The purpose of the Surrogate Spikes is to check the accuracy of the analytical technique. Surrogate Spikes are reported as percent recovery.

J. Duplicates

Laboratory duplicates measure precision, expressed as Relative Percent Difference. Duplicates are prepared from a single field sample and analysed as two separate extraction procedures in the laboratory. The RPD is calculated using the formula where D1 is the sample concentration and D2 is the duplicate sample concentration:

$$\frac{(D1 - D2) \times 100}{\{(D1 + D2)/2\}}$$



Appendix F: Guidelines and Reference Documents



Contaminated Land Management Act 1997 (NSW)

NSW EPA, (2014). Waste Classification Guidelines - Part 1: Classifying Waste

NSW EPA, (2015). Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997

NSW EPA, (2017). Guidelines for the NSW Site Auditor Scheme, 3rd Edition

NSW EPA, (2020). Consultants Reporting on Contaminated Land, Contaminated Land Guidelines

National Environment Protection Council (NEPC), (2013). National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)

Protection of the Environment Operations Act 1997 (NSW)

Protection of the Environment Operations (waste) Regulation 2014 (NSW)

SafeWork NSW, (202022). Code of Practice: How to manage and control asbestos in the workplace

State Environmental Planning Policy (Resilience and Hazards) 2021 (NSW)

Western Australia Department of Health, (2009/2021). Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia

Work Health and Safety Regulation 2017 (NSW)