Douglas PARTNERS

GROUNDED EXPERTISE

Remediation Action Plan

Proposed Multi-Purpose School Hall

Sutherland Public School
38-54 and 66 Eton Street, Sutherland NSW

Prepared for School Infrastructure NSW

Project 224456.00

28 February 2025

Douglas Partners Pty Ltd
ABN 75 053 980 117
douglaspartners.com.au
96 Hermitage Road, West Ryde,
NSW 2114
(02) 9809 0666

Document History

Details

Project No.	224456.00
Document Title	Remediation Action Plan
Site Address	Sutherland Public School, 38-54 and 66 Eton Street, Sutherland NSW
Report Prepared For	School Infrastructure NSW
Filename	224456.00.R.004.Rev2

Status and Review

Status	Prepared by	Reviewed by	Date issued
Revision 0	Jiaqi Zhou	Paul Gorman	10 December 2024
Revision 1	Jiaqi Zhou	Paul Gorman	13 January 2025
Revision 2	Jiaqi Zhou	Paul Gorman	28 February 2025

Distribution of Copies

Status	Issued to
Revision 0	School Infrastructure NSW
Revision 1	School Infrastructure NSW
Revision 2	School Infrastructure NSW

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

Signature		Date
Author		28 February 2025
Reviewer		28 February 2025

FS604853

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

Douglas PARTNERS | GROUNDED EXPERTISE

Table of Contents

Remediation Action Plan
Proposed Multi-Purpose School Hall– Sutherland Public School
38-54 and 66 Eton Street, Sutherland NSW

1. Introduction

Douglas Partners Pty Ltd (Douglas) has been engaged by School Infrastructure NSW (SINSW) to prepare this Remediation Action Plan (RAP) for the proposed multipurpose school hall to a portion of Sutherland Public School (SPS), located at 38-54 and 66 Eton Street, Sutherland NSW. The assessment area is limited to the area of the proposal hall, as shown on in purple dotted line in Drawing 1, Appendix A1 (the "site") and the RAP was undertaken in accordance with Douglas' proposal 224456.00.P.002.Rev0 dated 9 April 2024.

A detailed site investigation (DSI, refer to Section 7) was conducted for three options which were considered for the locations of the proposed school upgrade (refer to Drawing 2 for the three options). The preferred location for the proposed school upgrade is Option 1, therefore the information related to Option 1 was used to inform this RAP, together with information obtained through a supplementary contamination investigation, also discussed in Section 7.

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

- NEPC National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM] (NEPC, 2013);
- NSW EPA *Guidelines for Consultants Reporting on Contaminated Land* (NSW EPA, 2020); and
- CRC CARE *Remediation Action Plan: Development - Guideline on Establishing Remediation Objectives* (CRC CARE, 2019a).

The remediation objectives, devised in accordance with CRC (2019a), are to:

- Address potentially unacceptable risks to relevant environmental values from contamination; and
- Render the site suitable, from a contamination perspective, for the proposed development.

This RAP provides details of the work that will be required at the site to meet the remediation objectives.

Based on available information, it is considered that the remediation works outlined in this report constitute Category 2 Remediation under Clause 4.13 of *SEPP (Resilience and Hazards) 2021*. The consent authority must be notified at least 30 days prior to the commencement of the remediation work unless alternative conditions are applicable under the development consent.

This RAP presents the procedures and plans which provide the means by which site remediation can be achieved. The Remediation Contractor must base their detailed work methodologies around the requirements of this RAP.

This report must be read in conjunction with all appendices.

2. Proposed development

It is understood that the development of the site comprises the demolition of the current structures and the construction of a multi-purpose school hall generally on grade. The proposed hall will also accommodate amenities, canteen office space and storage areas. The footprint of the hall occupies virtually the entire site footprint. Any minor areas disturbed outside the building footprint are understood to be planned for reinstatement with asphalt surfacing.

The proposed hall sits generally at a finished floor level of around 112.8 m AHD, which is generally coincident with the existing ground level at the northern end, and raised up to about 1.2 m above existing ground level at the southern end. The building will be founded on piles. An OSD tank is proposed at the south-eastern corner of the building, sitting below ground at an RL of about 110 m AHD.

Architectural plans and sections are included in Appendix A2.

3. Scope of work

The scope of work to achieve the objectives of the RAP is as follows:

- Summarise the findings of previous investigations used to inform the status of contamination and contamination risk at the site;
- Present a conceptual site model (CSM) to list potential and likely contamination source, pathway and receptor linkages to address potentially unacceptable risks to human health and relevant environmental values from contamination;
- Define the anticipated extent of remediation;
- Assess, select and justify technically appropriate approaches to management and / or remediation to render the site suitable for its proposed use, and which will minimise potentially unacceptable risk to human health and / or the environment and which includes the consideration of the principles of ecologically sustainable development;
- Establish the remediation acceptance criteria (RAC) to be adopted for validation of remediation;
- Identify how successful implementation of the RAP will be demonstrated / validated;
- Outline waste classification, handling and tracking requirements;
- Outline environmental safeguards required to complete the remediation works;
- Include contingency plans and an unexpected finds protocol; and
- Identify the need for, and nature of, any long-term management and / or monitoring following the completion of management / remediation and, if required, provide an outline of an environmental management plan.

4. Site description

Site address	Western portion of the SPS, part of 38-54 Eton Street, Sutherland NSW
Legal description	Lots 1 to 10 in Deposited Plan 6600 Lots 5 to 10 in Deposited Plan 802
Area	Occupies approximately 1,010 m^2
Zoning (School)	Zone SP2 Infrastructure (Educational Establishment)
Local council area	Sutherland Shire Council
Current use	Primary school
Surrounding uses (i.e. proposed Option 1 location)	North – open car park area, multi-use hardstand open spaces and SPS campus's building East – Playground areas (including four tennis courts) as part the SPS South – turfed (natural and artificial) areas, multi-use hardstand open spaces followed by SPS building and West – landscaped garden beds, followed by Eton Street

The site layout is shown in Figure 1 and Drawing 1, Appendix A1.

Figure 1: Site layout and boundary (within the purple dotted line)

5. Environmental setting

Regional and site topography	Regional topography is generally elevated (>100 Australian Height datum (AHD)), sloping downwards towards the northwest into Woronora River, and gently slopes in the south westerly direction towards Savilles Creek, that eventually flows into Hacking River. Reference to the NSW 2 m elevation contour mapping indicates that the site is essentially flat, with the site slopes gently from about RL 113 m relative to AHD in the north to RL 111 in the south, as shown in Figure 1.
Soil landscape	Reference to the Sydney 1:100 000 Soil Landscape Series map indicates that the site is underlain by a landscape group known as the Gymea soil landscape. The Gymea soil landscape is an erosional soil landscape and is characterised by topography of undulating to rolling rises and

	low hills on Hawkesbury Sandstone, with local relief of 20 m to 80 m and slope gradients of 10% to 25%.
Geology	Reference to the Sydney 1:100 000 Geological Series Map indicates that the site is underlain by Hawkesbury Sandstone (shale lenses) of the Triassic period, which typically comprises fluvially deposited laminated mudstone, claystone, siltstone and sandstone.
Acid sulfate soils	Reference to the 1:25 000 Acid Sulfate Soils (ASS) Risk map indicates that the site is in an area of no known occurrence of acid sulfate soils. The nearest mapped occurrences of ASS are close to the Woronora River, which is over 1 km away from the school. The high elevation and geology at the site suggest that the presence of acid sulphate soils is unlikely. The Section 10.7 Planning Certificates also indicate that the site is not affected by the occurrence of acid sulfate soils.
Salinity	Dryland salinity risk and hazard mapping was undertaken in 2000 by the former NSW Government Departments of Land and Water Conservation to show the broad distribution of areas considered as having either a high salinity risk or a high salinity hazard. The SPS is not located within, or close to, mapped areas with high salinity risk or high salinity hazard. The nearest areas mapped as having high salinity risk / hazard are in Western Sydney.
Surface water and groundwater	The closest watercourse to the site is Savilles Creek, located approximately 600 m south of the site. The surface water from the site is expected to run in a south and south westerly direction towards Savilles Creek and be collected by the regional stormwater system. The search results of the Water NSW publicly available registered database indicated 17 registered groundwater bores located within 500 m of the site. The five closest groundwater bores indicated that the standing water levels were ranging from 2.7 to 3.64 m below the ground level (bgl). In addition, groundwater was intersected at 2.4 m depth (RL 117.6 m AHD) during detailed site investigation (DSI) (Douglas, 2023b). This was considered to be perched seepage within the soil and weathered rock profile rather than the regional groundwater table.

6. Summary of asbestos register and asbestos management plan

During the DSI (Douglas, 2023b), Douglas reviewed the asbestos register and asbestos management plan for SPS. The review indicated that asbestos containing material may be present in grounds as part of fill material. Asbestos was also detected in buildings in a few locations, including within the site. The proposed development would require the demolition of Building J (Pupil Facilities, building located at the western portion of the site), which was built in 1984. In accordance with the asbestos register, chrysotile asbestos was detected, especially in the cement sheeting used for eaves, ceilings and vinyl floor tiles. As per the asbestos register, all instances of asbestos are in good condition and do not require immediate attention for remediation.

As per the Asbestos Management Plan (AMP) for NSW Government Schools, all asbestos removal and remediation must be administered by Department of Public Works and Services (DPWS) and the Department of Education (DoE). All removals are to be undertaken according to:

- NSW Work Health and Safety Act 2011;
- NSW Work Health and Safety Regulation 2011;
- How to Manage and Control Asbestos in the Workplace: Code of Practice 2011;
- How to Safely Remove Asbestos: Code of Practice 2011; and
- Other relevant documentation issued from time to time by WorkCover NSW or SafeWork Australia.

7. Summary of previous investigations

7.1 Previous reports

The following previous reports are relevant to this RAP:

- (Douglas, 2023a) *Report on Preliminary Site Investigation (Contamination) PSI, Proposed Multi-purpose School Hall, 38-54 and 66 Eton Street, Sutherland NSW*, dated 21 September 2023 (Report reference: 224456.00.R.001.Rev0);
- Douglas (2025a)*Report on Detailed Site Investigation (Contamination), Proposed Multi-purpose School Hall, 38-54 and 66 Eton Street, Sutherland NSW*, dated 13 January 2025 (Report reference: 224456.00.R.002.Rev1); and
- Douglas (2025b)*Report on Supplementary Site Contamination Investigation, Proposed Multi-purpose School Hall, 38-54 and 66 Eton Street, Sutherland NSW*, dated 13 January 2025 (Report reference: 224456.00.R.003.Rev1).

The summary result tables and previous borehole logs for Douglas (2025a and 2025b) are provided in Appendix B.

7.1.1 PSI (Douglas, 2023a)

The PSI was undertaken for the whole of the SPS grounds and comprised a desktop review of site history and information (i.e. NSW EPA public records, historical aerial photographs, title deeds, geology, acid sulfate soil and hydrology) and environs, a site walkover and development of a conceptual site model (CSM). The objective of the PSI was to assess the potential for contamination at the SPS based on past and present land uses, to assess the suitability of the SPS for proposed development and to comment on the need for further investigation and / or management of contamination with regard to the proposed development.

The SPS history information suggests that the northern part of the SPS (including the current site) was developed into the school as early as 1888 (based on historical titles), with the central and southern portions also being developed into the school by 1950. The part of the SPS to the south of President Ave had residential dwellings until 1977 and was redeveloped into a sports ground as part of the SPS in the 1989 aerial photograph. During the period from 1943 (first available aerial photograph) it is clear that some buildings have been constructed and demolished at various times, whilst a small number have remained at least since 1943.

A search of properties with EPA notices and licences and review of the Section 10.7 Planning Certificate did not identify the SPS to be notified to the EPA as contaminated, regulated under the CLM Act, hold a licence, or have received any EPA notices.

Potential sources of contamination identified from the SPS history information reviewed and the site walkover included fill (including potential impacts from previously demolished buildings), the degradation of hazardous building materials in the current site buildings, and the application of herbicides.

The PSI suggested intrusive investigations to target the three location options for the proposed multi-purpose hall development. The objective of those investigations was to assess the suitability for each option area to support the proposed development from a contamination perspective.

7.1.2 DSI (Douglas, 2025a)

The main objective of the DSI was to assess the potential contamination across the three proposed option areas and to assess the suitability for each option area to support the proposed development from a contamination perspective.

The scope of work conducted at the time of the DSI comprised a desktop review of the PSI and the drilling and sampling of 12 boreholes (BH01 to BH12) across the three proposed option areas. Boreholes were positioned as follows:

- Boreholes BH01 to BH05 were drilled inside the proposed Option 1 area (current site);
- Boreholes BH06 to BH09 were drilled inside the proposed Option 2 area; and
- Boreholes BH10 to BH12 were drilled inside the proposed Option 3 area.

The borehole locations adopted for Option 1 are shown on Drawing 1, Appendix A1. The following generalised subsurface profile was encountered in the boreholes within Option 1:

- PAVEMENT: asphaltic concrete was present at BH01, BH02 and BH03 to depths of 0.1 m; overlying,
- FILL: Fill was encountered within all boreholes either from the ground surface or beneath the pavement to depths of between 0.2 m to 1.3 m. The fill included gravelly sand, sand, clay, sandy silt with varying proportions of igneous gravel, trace rootlets, ironstone gravel; overlying
- RESIDUAL CLAY: medium to high plasticity clay, red-brown, pale grey, yellow-brown. The consistency of the residual clay was stiff; overlying
- WEATHERED SHALE / SANDSTONE: very low strength, highly weathered Hawkesbury Sandstone, dark grey and orange-brown from around 2.3 m.

No visual or olfactory evidence (e.g. staining, odours, free phase product) was observed during the investigations to suggest the presence of contamination within the soils at the site.

Groundwater was intersected at 2.4 m depth (RL 117.6 m AHD) during auger drilling at one borehole (BH02). Free groundwater was not observed during auger drilling in any of the other boreholes. The use of drilling fluid during coring at BH01 to BH04 prevented further observations with depth.

Soil samples were collected from the boreholes and seventeen samples were selected and submitted to a NATA accredited laboratory for the analyses of heavy metals, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene and xylenes (BTEX), polyaromatic hydrocarbons (PAH), organochlorine pesticides (OCP), organophosphorus pesticides (OPP), polychlorinated biphenyls (PCB), phenols and asbestos.

All analytical results for all soil samples in Boreholes BH01 to BH05 for Option 1 were below the adopted site adopted criteria (SAC), with the following exceptions:

- Benzo(a)pyrene TEQ in samples BH01/0.5-0.6 and BD01 (duplicate sample of BH01/0.5-0.6) with concentrations of 9.5 mg/kg and 8.6 mg/kg respectively, which exceeded HIL A criteria of 3 mg/kg;
- Benzo(a)pyrene (BaP) in samples BH01/0.4-0.5, BD01, BH03/0.4-0.5 m and BH05/0.4-0.5 m with concentrations of 7 mg/kg, 6.4 mg/kg, 1.4 mg/kg and 0.71 mg/kg, which exceeded the ecological criteria of 0.7 mg/kg; and
- TRH F3(>C10-C34) in samples BH01/0.4-0.5, BD01, BH02/0.1-0.2 m, BH03/0.4-0.5 and BH04/0-0.1 m with concentrations ranging from 330 to 940 mg/kg which exceeded the ecological criteria of 300 mg/kg.

The concentrations of PAH in fill samples from the Option 1 area may be reflective of the asphalt overlay, or possibly an ash component to the fill. The PAH is not leachable which is a characteristic of ash and asphalt. The reported TRH concentrations are also related to the PAH in the same samples. Should Option 1 be selected for the location of the proposed hall, it was considered likely that the asphalt and other pavement materials will be removed to facilitate construction. The report stated that the PAH impacts above HIL A criteria will also need to be chased out and removed to landfill, capped with the proposed building slab, or further assessed through a site specific Tier 2 risk assessment.

Based on the finding of the results, Douglas considered that Option 1 is suitable or can be made suitable for the proposed hall.

7.1.3 SSI (Douglas, 2025b)

The objective of the supplementary site contamination investigation (SSI) was to provide additional sub-surface and contamination information related to the current site (Option 1) to support the proposed development from a contamination perspective.

The scope of work conducted at the time of the SSI comprised the drilling and sampling of five boreholes (BH101 to BH105) within the current site. The borehole locations are shown on Drawing 1, Appendix A1. The generalised subsurface profile encountered during the SSI was generally consistent with the findings during the DSI. It is noted that no building rubble and / or other anthropogenic inclusions (apart from trace wood fragments) and ash was noted, and no asbestos containing material (PACM) was recorded in fill at any of the boreholes within the site.

Five fill samples were selected and submitted to a NATA accredited laboratory for the analyses of heavy metals, TRH, BTEX, PAH, OCP, OPP, PCB, phenols and asbestos.

The analytical results for the tested soil samples from Boreholes BH101 to BH105 (Option 1) were below the adopted SAC, with the following exceptions:

- Lead in sample BH103/0-0.1 m with a concentration of 350 mg/kg exceeded health investigation level (HIL A) criteria of 300 mg/kg;
- Zinc in sample BH103/0-0.1 m with a concentration of 390 mg/kg exceeded environmental investigation levels (EIL A) criteria of 350 mg/kg; and
- TRH F3(>C10-C34) in sample BH103/0-0.1 with a concentration of 340 mg/kg, exceeded the ecological screening level (ESL A) of 300 mg/kg.

Based on the analytical results of the SSI and the DSI (for Option 1), the fill across the current site was preliminary classified in situ as general solid waste (GSW) (non -putrescible).

Based on the findings of the SSI and the DSI (for Option 1) it was considered that the current site can be made suitable for the proposed multi-purpose school hall, subject to implementation of the following recommendations:

- *The removal of identified asbestos and other hazardous materials in buildings within the current site;*
- *Clearance of the building by a qualified occupational hygienist following the removal of hazardous materials, and then of the ground surface post demolition;*
- *The removal of the asphalt pavement from the area subject to construction and validation;*
- *Preparation of a remediation action plan (RAP) to document a remediation process in relation to the health-based exceedances (lead and PAH) and the ecological based exceedances (PAH, zinc and TRH); and*
- *Validation of the remedial works implemented, confirming that the site is suitable for the land use from a contamination perspective.*

8. Conceptual site model

The data collected during previous investigations generally confirmed that for certain potential contaminant sources outlined in the CSM in SSI (Douglas, 2024), potentially complete exposure pathways to the identified receptors exist, whereas for others, they do not. No other sources of contamination have been identified as a result of the testing results to date. The source (and associated contaminants of potential concern (CoPC)), pathway and receptor linkages are summarised in Table 1, Table 2 and Table 3.

Table 1: Summary of potential sources

Potential sources and associated CoPC
S1: Fill: Associated with levelling, potentially impacted by demolition of former buildings and hardstand on the site.
Primary CoPC include heavy metals, TRH, BTEX, PAH, and asbestos
Secondary CoPC include PCB, OCP, phenols
S2: Former and current buildings / structures containing hazardous building materials and potentially impacting surface soils in their vicinity
CoPC include asbestos, synthetic mineral fibres (SMF), lead (in paint) and PCB

The following potential human and environmental receptors, along with relevant potential pathways, have been identified and summarised in Table 2.

Table 2: Summary of potential receptors and pathways

Potential human receptors
HR1: Current users [school workers, student and visitors]
HR2: Construction and maintenance workers
HR3: End users [school workers, student and visitors]
HR4: Adjacent site users [education (as part of the school), commercial / residential]
Potential environmental receptors
ER1: Surface water [Savilles Creek]
ER2: Groundwater; and
ER3: Terrestrial ecosystems.
Potential pathways to human receptors
HP1: Ingestion and dermal contact
HP2: Inhalation of dust and / or vapours

Potential pathways to environmental receptors
EP1: Surface water run-off **EP2:** Leaching of contaminants and vertical migration into groundwater **EP3:** Lateral migration of groundwater providing base flow to water bodies **EP4:** Inhalation, ingestion and absorption

A summary of the potentially complete exposure pathways for the proposed land use is shown in the table below.

Table 3: Summary of potentially complete exposure pathways (proposed land use)

Source and CoPC	Exposure pathway	Receptor	Comments
S1: Fill: Primary CoPC include heavy metals, TRH, PAH Secondary CoPC include PCB, OCP, phenols, BTEX and asbestos	**HP1:** Ingestion and dermal contact **HP2:** Inhalation of dust and / or vapours	**HR1:** Current users [school workers, student and visitors] **HR2:** Construction and maintenance workers **HR3:** End users [school workers, student and visitors] **HR4:** Adjacent site users [education (as part of the school), commercial / residential]	Manage in accordance with this RAP
	EP1: Surface water run-off. **EP3:** Lateral migration of groundwater providing base flow to water bodies.	**ER1:** Surface water	
	EP2: Leaching of contaminants and vertical migration into groundwater.	**ER2:** Groundwater	
	EP4: Inhalation, ingestion and absorption.	**ER3:** Terrestrial ecosystems	
S2: Former and current buildings / structures CoPC: asbestos, SMF, lead (in paint) and PCB	**HP1:** Ingestion and dermal contact **HP2:** Inhalation of dust and / or vapours	**HR1:** Current users [school workers, student and visitors] **HR2:** Construction and maintenance workers	Following the demolition of the existing building, a surface clearance inspection and certificate must be prepared to confirm that no hazardous

Source and CoPC	Exposure pathway	Receptor	Comments
		HR3: End users [school workers, student and visitors] **HR4:** Adjacent site users [education (as part of the school), commercial / residential]	building materials from the demolition works remain at the surface of the site (refer to Section 11.2).

9. Remediation extent

The field investigations reported in the DSI and SSI reports identified a similar fill and natural soil profile across the whole of the site. Despite the similarities, the identified contaminants (PAH, TRH, lead, zinc) appeared to be sporadic with no identifiable trend or obvious source (other than fill). The contaminants were found in BH01 to BH05, and BH103.

Given the similarity in fill, the sporadic nature of the contamination identified (location), the potential for similar contamination in the footprints of the existing buildings, and the potential for impacts from hazardous building materials resulting from demolition, it is considered that the remediation outlined in this RAP should apply to the entire site area, as shown on Drawing 1, Appendix A1.

10. Remediation options assessment

The objective of the remediation options assessment is to canvas various remediation options which are or may be viable to the nature and extent of contamination identified. The remediation options assessment was undertaken with reference to CRC CARE *Remediation Action Plan: Development - Guideline on Performing Remediation Options Assessment* (CRC CARE, 2019b).

The remediation options assessment is included in Appendix C.

11. Preferred remediation strategy

11.1 Rationale for selection

Based on the existing data for the site, the preferred remediation contingency options comprise:

- Option 1: Retain the existing fill (where possible) within the site, capped with the proposed building floor slab and asphalt surfacing (outside the building footprint), managed in the long term under a long-term environmental management plan (LTEMP); and / or
- Option 2: Excavation of all fill from the site footprint, preparation of a waste classification report for the excavated soils, and off-site landfill disposal under that classification.

It is also possible that the preferred remediation strategy will comprise a combination of both options.

The preferred remediation strategy will also comprise the following:

- Verify the suitability, from a contamination perspective, of any proposed imported materials to be used for site levelling; and
- Waste classification and landfill disposal of any surplus soils generated through excavations (e.g. OSD tank and footings).

11.2 Prior to Remediation

Prior to demolition work, a hazardous building materials survey (HBMS) must be undertaken to identify the type, condition, and location of hazardous building materials in the structures to be demolished. The Asbestos Register and Management Plan for the SPS should be referenced as part of the survey by an experienced occupational hygienist.

Following the completion of the HBMS, a demolition plan must be prepared to detail the process to safely remove hazardous materials in a manner to prevent risk to human and environmental health. Following the removal of the hazardous materials, a clearance inspection and report must be completed by an occupational hygienist before general demolition works commence.

Following the completion of demolition and removal works (including hardstand areas), a surface clearance inspection and certificate must be prepared by an occupational hygienist to confirm that no hazardous building materials from the demolition and removal works remain at the surface of the site.

The general sequence of remediation shall be determined by the Contractor with the aim of minimising the potential for cross contamination of 'clean' areas / soils with contaminated soils. This should include avoiding, wherever possible transporting or placing contaminated soil over 'clean' areas separating stockpiles of different origin / contamination profile, and validating the complete removal of any contaminated material placed / potentially impacting 'clean' areas.

11.3 Remediation Actions – Cap and Contain (Option 1)

11.3.1 Remediation sequence

In designing the remediation sequence for Option 1, the following items must be considered:

- It is envisaged that existing topsoil / organic rich soils will require stripping prior to general civil works. It is unlikely that these soils would be suitable to compact beneath a building slab. Therefore, these stripped soils are to be disposed off-site under a formal waste classification;
- General civil works to achieve design finished levels. Imported materials, verified by the Environmental Consultant as being suitable for use at the site may be used to raise levels. Where fill from within the site is proposed to be cut and relocated, these soils must only be placed within the site boundary (refer Drawing 1) and below the cap;
- Where underground utilities (including OSD) are required to be installed:
  - The preference is for the existing fill to be removed through the trenching and either relocated beneath the cap, or disposed off-site, then following installation the trench is lined with a marker layer and backfilled with suitable verified imported materials. This process will enable future maintenance or repairs to the service to be undertaken without the workers being exposed to the contaminated soils; or

  - Excavated soils may be backfilled into the trench following the laying of the service, however any future maintenance or repairs would need to be undertaken under the protocols listed in the LTEMP;
- Spoil generated through the installation of services, the OSD tank excavation, and / or footings within the site may be either (a) waste classified and disposed to landfill, or (b) reused beneath the cap within the site; and
- The new building ground floor slab and footings (including sub-base) are considered to be suitable as a cap over the contaminated soils. Additionally, the proposed asphalt and basecourse placed outside the building footprint is suitable as a cap over the contaminated soils. The contaminated soils are to be covered with a marker layer prior to construction of the cap (refer Section 11.3).

The following steps are to be incorporated into the sequence of remediation, civil and construction works:

- Where fill is required to be stripped or excavated for later reinstatement or disposal, stockpile on hardstand or industrial strength plastic sheeting, with the stockpile securely covered;
- Undertake civil works to form the final design ground levels, allowing for the subsequent construction of the capping layers (refer Section 0);
- Excavate and lay new services per design and either (a) remove the excavated spoils as surplus to landfill (preferred), or (b) backfill the service trenches with the excavated soil to be capped as per the remainder of the site, and Section 0. The contractor is to document the process adopted and advise the Environmental Consultant for inclusion of the details in the LTEMP. As built drawings of the service installations through the site are to be produced, noting alignments, installation depths, and backfill procedures adopted. If Option (b) is adopted, any future repairs or maintenance to services within the site are to be undertaken using appropriate PPE and controls for working in contaminated soils to be documented in the LTEMP;
- **HOLD POINT 1**: If the services trenches are to be lined and backfill with imported and verified backfill materials, the Environmental Consultant is to provide the verification prior to backfilling commencing (refer Section 15). The Environmental Consultant is to observe the lining of the trenches with a marker layer. At the discretion of the Environmental Consultant, the observations may be spot checks;
- Undertake piling / footing excavation works for the new hall. Spoil to be either disposed to landfill or reused beneath the proposed building. The contractor is the document the process adopted and advise the Environmental Consultant for inclusion of the detail in the LTEMP;
- Cover the fill across the site with a geotextile marker layer. The geotextile is to be a bright colour (not white) to assist with visual identification post capping (in the event of subsequent excavations). Separate rolls of the marker layer will be placed with an overlap of 300 mm;
- **HOLD POINT 2**: The Environmental Consultant is to inspect the laying of the marker layer, and collection of photographic evidence, prior to the placement of the cap;
- **HOLD POINT 3**: Prior to formation of the cap above the marker layer, the Environmental Consultant is to provide the verification of the suitability of the materials proposed by the contractor for use in forming the cap. This includes imported soils and / or aggregate (refer Section 15);

- Construct the cap (building ground floor slab, asphalt surfacing) as per design and provide as built drawings showing the construction details; and
- **HOLD POINT 4**: The Environmental Consultant will undertake an inspection and collect photographic evidence of the final surface following completion of the capping layer construction.

11.3.2 Capping designs

The following sections outline in more detail the design considerations for the expected two types of capping systems.

Note, should there be specific compaction requirements regarding soils or other design requirements, these are to be confirmed with the relevant consultants (e.g., civil, landscaping, services, structural and geotechnical, etc.). The figures provided in the following section are not to scale and are preliminary at this stage as the final design details for the proposed development are not known.

'Hard' capping areas

The hard capping areas comprise the new hall slab (including sub-base) and asphalt surfacing (including sub-base) outside the building footprint. There is no recommended minimum thickness, however the thickness should be design for long term durability, with the as built drawings provided to the Environmental Consultant for inclusion in the LTEMP.

Service trenches

As discussed earlier, the preferred approach for new services is to excavate and remove the fill from the service trench alignment and then backfill with approved imported material prior to laying the cap. This method allows future maintenance and repairs to services without the need for workers to become exposed to contaminated soils.

It is noted that placement of services in contaminated fill with the marker layer placed above the installed service will mean that any future maintenance or alteration of the services retained below the marker layer would entail cutting through the marker layer and therefore additional management procedures needing to be implemented will be set out in an LTEMP, including re-instatement of both the capping materials and marker layer. This approach would also require confirmation from the relevant utility provider for any active services to be retained under the marker layer.

11.4 Remediation Actions – Excavation and Disposal (Option 2)

Prior to commencement of excavation work, a waste classification assessment will take place for the material to be excavated and removed from the site. The Environmental Consultant may complete a waste classification assessment using data presented in the DSI and SSI, but may also supplement the data with additional sampling and testing. The waste classification can also be undertaken on stockpiled fill soils, again utilising existing data as applicable.

The waste classification must occur with regards to the NSW EPA Waste Classification Guidelines, Part 1: Classifying Waste (2014) and the NSW EPA Sampling Design Part 1 – Application (2022), refer Section 14. A waste classification report must be prepared and the receiving landfill facility should be contacted to obtain disposal approval. This waste classification documentation should be arranged at least 3-4 weeks prior commencement of disposal of soils.

11.4.1 Sequence of remediation

Remediation will be undertaken as follows:

- Submit an application to dispose of the soil (in accordance with the assigned waste classification) to a facility that is appropriately licensed by the NSW EPA to receive the waste, and obtain authorisation to dispose;
- To assist in the identification of the fill extent at the site, engage the Environmental Consultant to be present to witness the remedial excavation works;
- Excavate the fill from the remediation area, down to the surface of the underlying soil/bedrock (whichever is shallower);
- Load the fill directly into trucks and dispose of the soil to a facility licensed by the NSW EPA to receive the waste;
- Once all contaminated soil (i.e. all fill) is removed, the base of the excavation is to be validated in accordance with the validation plan outlined in Section 13. and
- All documents including landfill disposal dockets must be retained by the remediation contractor and forwarded to the client and Environmental Consultant. This documentation forms a key part of the validation process and is to be included in the validation report.

12. Assessment criteria

12.1 Remediation acceptance criteria

The overarching remediation acceptance criterion (RAC) to be adopted for the project is for 'no unacceptable risks posed by the relevant media (i.e. soils, groundwater or soil vapour) to human health or the environment'.

The remediation works are to be validated as meeting the RAC by the Environmental Consultant by means of visual inspection, field screening, recovery and analysis of samples and review of any available plans as set out in this report, as applicable to the remediation option adopted.

In the absence of derivation of Tier 2 site specific target levels (SSTL), the (RAC) for contaminants in soil are the same as the Tier 1 site assessment criteria (SAC) adopted for Douglas (2024) protective of human health and ecology. The following table provides a summary of the RAC.

Table 4: Remediation acceptance criteria

Item	Remediation acceptance criteria
Cap and contain: Identified contaminants comprise lead, zinc, PAH and TRH	The cap must meet the design over the brightly coloured geotextile marker layer outlined in Section 0, with inspections, approvals and documentation as outlined in the same section and / or referenced in other sections.
Excavation and disposal: Identified contaminants comprise lead, zinc, PAH, and TRH	SAC as per Appendix E

12.2 Site assessment criteria

Additional area(s) or types of contamination encountered during the course of the remediation and site redevelopment will be subject to the contingency plan or unexpected find protocol (Appendix D) and assessed using the SAC in Appendix E. The SAC are the same as the Tier 1 SAC adopted for Douglas (2024).

The SAC should also be used as part of the assessment framework for imported soils (i.e. contaminant concentrations in imported soils must comply with the SAC).

The adopted investigation and screening levels comprise levels for a generic residential with accessible soils land use scenario which includes primary school. The derivation of the SAC is included in Appendix E and the adopted SAC are listed in the summary analytical results tables for the previous investigation listed in Section 7 and in Appendix B.

The SAC are not RAC, and an exceedance of the SAC does not automatically trigger the need for remediation. Exceedances of the SAC will trigger the need for further assessment of risk by the Environmental Consultant to determine the need for remediation in accordance with NEPC (2013).

13. Validation plan

13.1 Data quality objectives

The data quality objectives (DQO) for the validation plan are included in Appendix F.

13.2 Validation assessment requirements

The following site validation work will be required:

- Field assessment by the Environmental Consultant comprising:
  - Visual inspection, including taking photographs for record purposes;
  - Collecting validation samples from excavations resulting from the removal of contaminated soils, including contaminated soil stockpile footprints (if relevant); and

- Collecting validation / characterisation samples for materials to be re-used on site.

- Laboratory analysis of validation samples at a NATA accredited laboratory for:
  - The CoPC relevant to the remediation area; and
  - Quality control (QC) samples in accordance with Section 16.
- Comparison by the Environmental Consultant of the laboratory results with the SAC and/or RAC as appropriate (refer to Section 12); and
- Preparation by the Environmental Consultant of a validation report detailing the methods and results of the remediation works and validation assessment.

13.3 **Visual inspections**

Where areas of identified contaminated soil or an unexpected find of contaminated fill is removed from the site, systematic validation samples are to be collected from the remedial excavations as set out in Section 13.4.

13.4 **Validation sampling**

It is proposed that any validation or additional site characterisation samples be collected and analysed at the following frequency:

- Small to medium excavations (base <500 m^2);
- Base of excavation: one sample per 25 m^2 or part thereof, with a minimum of three samples where the base of the excavation is fill rather than natural soils; and
- Sides of excavation: one sample per 10 m to 20 m length or part thereof with a minimum of one sample per wall. Additional samples will be collected at depths of concern where there is more than one depth of concern, with a minimum of one sample per 1.5 m depth in fill.

Large excavations (base ≥500 m^2):

- Base of excavation: sampling on a grid at a density in accordance with Table 2 in NSW EPA (2022) or a minimum of 10 samples. In sub-areas with any specific signs of concern, a higher sampling density may be required; and
- Sides of excavation: one sample per 20 m length or part thereof with a minimum of one sample per wall. Additional samples will be collected at depths of concern where there is more than one depth of concern, with a minimum of one sample per 1.5 m depth in filling.

Where contaminated soils are stored or treated on bare soils, the footprint of the stockpile will require validation following removal of the contaminated soils.

Validation samples will be analysed by a NATA accredited laboratory for the relevant CoPC relevant to the remediation area.

Validation sample test results will be compared to the RAC, as per the DQO (Appendix F). Where the RAC are considered to have not been met, the remediation excavation(s) will be expanded to 'chase-out' impacted material, as advised by the Environmental Consultant, with the validation sampling then continuing into the extended excavation. This process will continue until the impacted material has been fully chased out.

In the event that contamination extends beyond site boundaries or in areas that can't be practically chased out (e.g. under buildings), validation samples will be taken at the limit of excavation. Notwithstanding that there may be residual contamination present.

Advice may need to be obtained from a qualified geotechnical or structural engineer regarding excavation and / or structure stability if excavations approach site boundaries and / or existing structures.

14. **Waste disposal**

Disposal of waste must be to an appropriately licensed waste facility, as per *Protection of the Environment Operations Act 1997* NSW (POEO Act) and the *Protection of the Environment (Waste) Regulation 2014* NSW.

Any waste disposed off-site must be initially classified by the Environmental Consultant in accordance with:

- NSW EPA *Waste Classification Guidelines, Part 1: Classifying Waste* (NSW EPA, 2014a);
- NSW EPA *Waste Classification Guidelines, Part 2: Immobilisation of Waste* (NSW EPA, 2014b);
- NSW EPA *Waste Classification Guidelines, Part 4: Acid Sulfate Soils* (NSW EPA, 2014c); and
- NSW EPA *Addendum to the Waste Classification Guidelines (2014) - Part 1: Classifying Waste* (NSW EPA, 2016) [addendum for per- and poly-fluoroalkyl substances (PFAS)].

Samples will be collected from stockpiles / in situ fill at various depths to characterise the full depth of the material. The frequency is to be determined by the Environmental Consultant based on the risk of contamination and heterogeneity of the material.

For stockpiles comprising similar materials and a:

- Volume up to 200 m^3: a recommended minimum frequency of one sample per 25 m^3, with a minimum of three per stockpile (NSW EPA, 2022); or
- Volume greater than 200 m^3: a recommended minimum frequency of one sample per 25 m^3, with a minimum of 12 samples OR a minimum of 10 samples and calculation of the 95% upper confidence limit of the arithmetic mean for all applicable analytes (NSW EPA, 2022). Note that this does not apply to stockpiles impacted, or potentially impacted, by asbestos. For stockpiles greater than 200 m^3 which are impacted, or potentially impacted, by asbestos the Environmental Consultant shall provide guidance in accordance with NSW EPA (2022).

It may be possible to classify excavated soil / fill for reuse on another site under a relevant NSW EPA resource recovery order (RRO) so that it can be used on other sites under the requirements of the corresponding NSW EPA resource recovery exemption (RRE). For this option, the frequency of sampling should be in accordance with the relevant RRO and the contaminants to be analysed will be determined by the Environmental Consultant. The Environmental Consult will provide a report confirming the suitability of the spoil for reuse under a RRO, or otherwise.

All waste must be tracked by the Remediation Contractor from 'cradle to grave'. Copies of all consignment notes / disposal dockets (or similar) and Environment Protection Licences for receipt and disposal of the materials must be maintained by the Remediation Contractor as part of the site log and must be provided to the Environmental Consultant for inclusion in the validation report.

15. Imported material

Any soil, aggregate etc imported for the remediation works must have contaminant concentrations that meet the relevant criteria outlined in Section 12. Imported materials will only be accepted for use at the site if:

- It can legally be accepted onto the site (e.g. classified as virgin excavated natural material (VENM), accompanied by a report / certificate prepared by a qualified environmental consultant);
- Visual inspection of the imported soil confirms that the soil has no signs of concern and is consistent with those described in the supporting classification documentation;
- Have no aesthetic issues of concern, and
- The materials are validated (by inspection / sampling) by the Environmental Consultant as being suitable for use at the site.

The classification report / certificate for all material proposed for import must be reviewed and approved in writing by the Environmental Consultant prior to import. Materials to be imported may need to meet geotechnical requirements which are to be assessed by others, as required.

If permitted by the development consent and approved by the site owner, Remediation Contractor and Environmental Consultant, material classified under a NSW EPA RRO may also be accepted, provided the material can be used on site in accordance with the corresponding RRE. This could include excavated natural material (ENM), classified under NSW EPA *Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014, The excavated natural material order 2014* (NSW EPA, 2014d).

The need for check-sampling of RRO material is to be determined by the Environmental Consultant depending on the source of the material, adequacy of the supporting documentation provided and inspection(s) of material. Quarried material / VENM may need little or no check sampling.

Any recycled or blended materials proposed for importation must be sampled at a frequency of one sample per 25 m^3, with a minimum of three samples per load. The recycled material will not be permitted to be used on site until the results of the inspection and laboratory analysis have been approved in writing by the Environmental Consultant.

16. Quality assurance and quality control

Field quality assurance and quality control (QA / QC) testing will include the following:

- 10% sample intra-laboratory analysis, analysed for the same suite as primary sample;

- Rinsate samples (where re-useable sampling equipment is used), analysed for the suite of analytes analysed by the majority of the primary samples; and
- Trip spike and trip blank samples (analysed for BTEX) (approximately one per batch of samples where volatile contaminants are CoPC).

The laboratory will undertake analysis in accordance with its NATA accreditation, including in-house QA / QC procedures.

- The QC analytical results will be assessed using the following criteria:
- Sampling location rationale met the sampling objective;
- Standard operating procedures (SOP) are followed;
- Appropriate QA / QC samples are collected / prepared and analysed;
- Samples are stored under secure, temperature-controlled conditions;
- Chain of custody documentation is employed for the handling, transport and delivery of samples to the selected laboratory;
- Conformance with specified holding times;
- Accuracy of spiked samples within the laboratory's acceptable range (typically 70-130% for inorganic contaminants and greater for some organic contaminants);
- Field and laboratory duplicate, and replicate samples will have a precision average of +/- 30% relative percentage difference (RPD); and
- Rinsate samples will show that the sampling equipment (if used) is free of introduced contaminants, i.e. the analytes show that the rinsate sample is within the normal range for deionised water.

17. Management and responsibilities

17.1 Site management plan

A general site management plan for the operational phase of site remediation is included in Appendix G. The management plan includes soil, noise, dust, work health safety (WHS), remediation schedule, hours of operation and incident response. The Remediation Contractor is to implement the general site management plan for the duration of remediation works by incorporating the plan into their over-arching construction environmental management plan (CEMP).

17.2 Site responsibilities

The site management plan (Appendix G) provides a summary of the general program management and associated responsibilities. Contact details for key utilities are also included in the event of needing to respond to any incidents.

17.3 Contingency plan and unexpected finds protocol

Plans for contingency situations (e.g. encountering asbestos in fill), along with an unexpected finds protocol for dealing with unexpected finds during remediation work / earthworks, are included in Appendix D.

18. Validation reporting

18.1 Documentation

The following documents will need to be collated and reviewed by the Environmental Consultant as part of the validation assessment (including those items that are prepared by the Environmental Consultant):

- Records relating to any unexpected finds and contingency plans implemented;
- Any licences and approvals required for the remediation works (Remediation Contractor);
- Waste classification report(s) (Environmental Consultant);
- Transportation Record: comprising a record of all truckloads of soil (including aggregate) entering the site, including truck identification (e.g. registration number), date, time, source site, load characteristics (e.g. type of material, i.e. quarried aggregate, etc.), approximate volume, use (e.g. general site raising, service trenches, etc.) (Remediation Contractor);
- Disposal dockets: for any soil disposed off-site including transportation records, spoil source, spoil disposal location, receipt provided by the receiving waste facility / site (Remediation Contractor). Note: A record of the building materials disposed off-site is also to be kept and provided to the Principal, on request;
- Validation sampling and testing records;
- Imported materials records: records for any soil imported onto the site, including source site, classification reports, inspection records of soil upon receipt at site and transportation records (Remediation Contractor);
- Records relating to any unexpected finds and contingency plans implemented (Remediation Contractor);
- Laboratory certificates and chain-of-custody documentation;
- Inspections records from the Environmental Consultant;
- Photographic records by all contractors and consultants of the works undertaken within their purview of responsibilities (Remediation Contractor); and
- Surveys pre- and post-installation of geotextile marker layer and clean fill cap (Remediation Contractor).

18.2 Reporting

A validation assessment report will be prepared by the Environmental Consultant in accordance with NSW EPA (2020).

The validation report shall describe the remediation approach adopted, methodology, results and conclusion of the assessment and make a statement regarding the suitability of the site for the proposed development (school updates).

19. Conclusions

It is considered that the site can be made suitable for the proposed school hall subject to implementation of this RAP.

On completion of remediation works, a LTEMP prepared in accordance with NSW EPA guidelines will be required to outline management procedures for future ground intrusive works to maintain the integrity of the cap (if the main approach of cap and contain is adopted). The obligations within the EMP must be legally enforceable.

20. References

CRC CARE. (2019a). *Remediation Action Plan: Development - Guideline on Establishing Remediation Objectives*. National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

CRC CARE. (2019b). *Remediation Action Plan: Development - Guideline on Performing Remediation Options Assessment*. National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

Douglas. (2023a). *Report on Preliminary Site Investigation (Contamination) PSI, Proposed Multi-purpose Medium Hall, 38-54 and 66 Eton Street, Sutherland NSW, dated 21 September 2023 (Report reference: 224456.00).*

Douglas. (2023b). *Report on Detailed Site Investigation (Contamination), Proposed Multi-purpose Medium Hall, 38-54 and 66 Eton Street, Sutherland NSW, dated 30 October 2023 (Report reference: 224456.00.R.002.Rev0).*

Douglas. (2024). *Report on Supplementary Site Contamination Investigation, Proposed Multi-purpose Medium Hall, 38-54 and 66 Eton Street, Sutherland NSW, dated 13 August 2024 (Report reference: 224456.00.R.003.Rev0).*

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

NSW EPA. (2014a). *Waste Classification Guidelines, Part 1: Classifying Waste*. NSW Environment Protection Authority.

NSW EPA. (2014b). *Waste Classification Guidelines, Part 2: Immobilisation of Waste*. NSW Environment Protection Authority.

NSW EPA. (2014c). *Waste Classification Guidelines, Part 4: Acid Sulfate Soils*. NSW Environment Protection Authority.

NSW EPA. (2014d). *Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014, The excavated natural material order 2014*. NSW Environment Protection Authority.

NSW EPA. (2016). *Addendum to the Waste Classification Guidelines (2014) - Part 1: Classifying Waste*. NSW Environment Protection Authority.

NSW EPA. (2020). *Guidelines for Consultants Reporting on Contaminated Land*. Contaminated Land Guidelines: NSW Environment Protection Authority.

NSW EPA. (2022). *Sampling Design, Part 1: Application; Part 2: Interpretation*. NSW Environment Protection Authority.

21. **Limitations**

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project at 38-54 and 66 Eton Street, Sutherland NSW in line with Douglas' proposal dated 9 April 2024 and acceptance received from Glenn Francis of School Infrastructure NSW. The work was carried out under Douglas' Engagement Terms. This report is provided for the exclusive use of School Infrastructure NSW for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and / or their agents.

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

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

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

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. Douglas cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

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

Appendix A

About this Report

About this Report

November 2023

Introduction

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

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

Copyright

Borehole and Test Pit Logs

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

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

Groundwater

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

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

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

Reports

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

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

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

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

continued next page

About this Report

Site Anomalies

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

Information for Contractual Purposes

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

Site Inspection

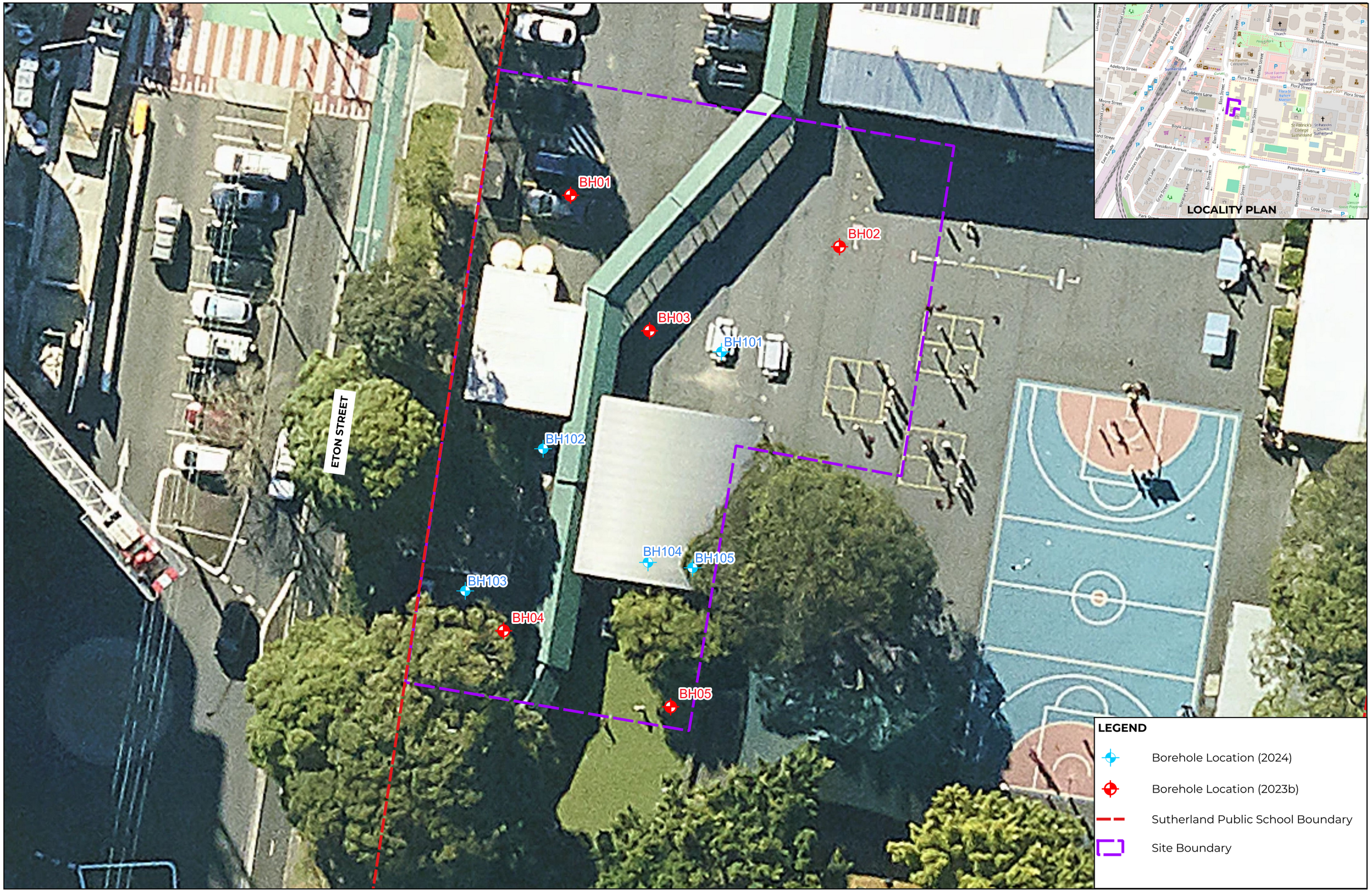
The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

intentionally blank

intentionally blank

Appendix A1

Douglas Drawings



REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	10.12.2024	EC/MN

SCALE: 0 4 8 12 16m
1:250 @ A3

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

CLIENT:
School Infrastructure NSW

NOTE:
1: Basemap from Metromap (Dated 26.05.2024)

COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 56

PROJECT NAME:
Proposed Multi-Purpose Medium Hall

PROJECT ADDRESS:
38-54 and 66 Eton Street, Sutherland

DRAWING TITLE:
Test Location Plan

PROJECT NO: **224456.01**
DRAWING NO: **1**
REVISION: **0**

LEGEND

- Sutherland Public School Boundary
- Location Options for The Proposed De

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	10.12.2024	JZ

SCALE: 0 4 8 12 16 m
1:1500 @ A3

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

CLIENT:
School Infrastructure NSW

NOTE:
1: Basemap from Metromap (Dated 9.12.2024)

COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 56

PROJECT NAME:
Proposed Multi-Purpose Medium Hall

PROJECT ADDRESS:
38-54 and 66 Eton Street, Sutherland

DRAWING TITLE:
Location Options for The Proposed Development

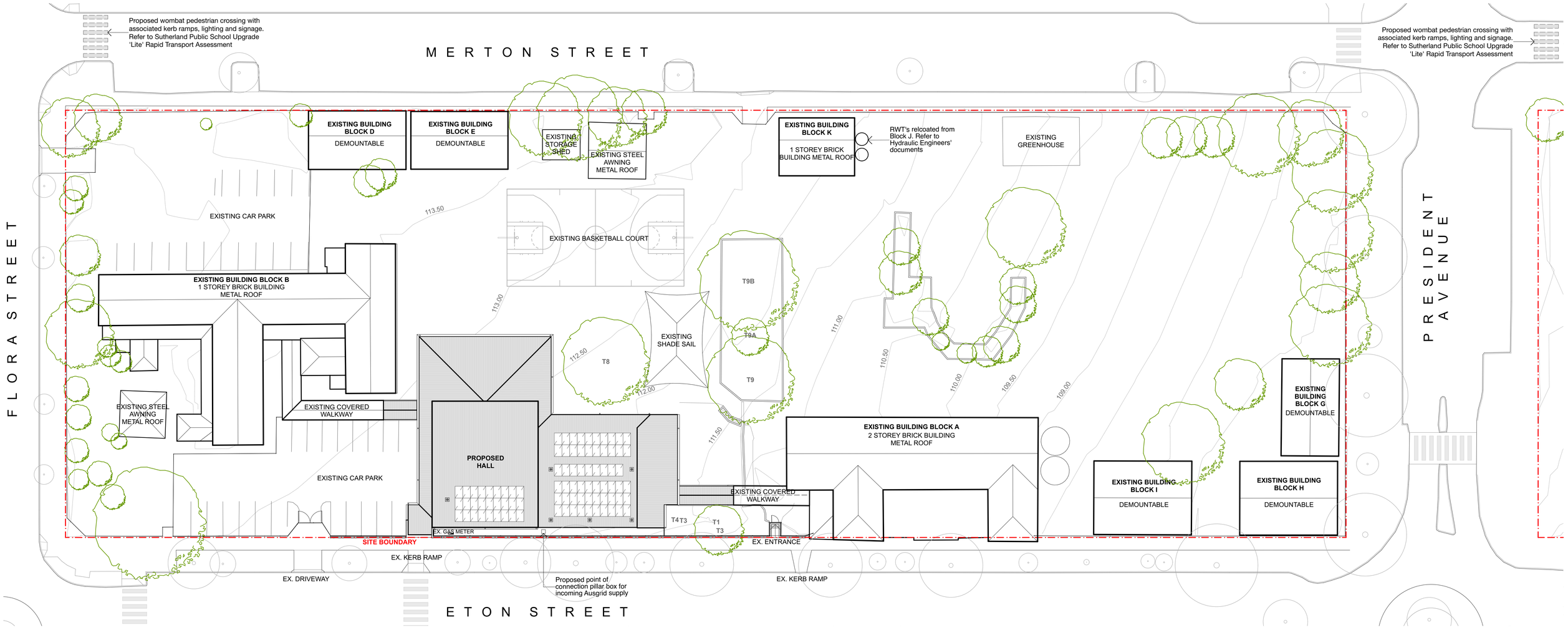
PROJECT NO: **224456.01**
DRAWING NO: **2**
REVISION: **0**

Appendix A2

Client Drawings and Sections

NOTE:

Refer to drawing A-900 COLA Relocation - Principle Priced Option



General Notes

DO NOT SCALE FROM DRAWING. USE FIGURED DIMENSIONS ONLY. CHECK ALL DIMENSIONS ON SITE BEFORE ANY MANUFACTURE OR CONSTRUCTION

All dimensions are in millimetres unless stated otherwise.
All architectural, drawings are to be read in conjunction with the relevant consultant documents. All dimensions and levels are to be checked and verified on site prior to the commencement of work, shop drawings or fabrication of any components. Refer all discrepancies to the Architect for determination. Drawings are not to be scaled, use only figured dimensions. This drawing is copyright and must not be retained, copied or used without the permission of BKA Architecture. This document has been prepared for and on behalf of the clients noted on the drawing. BKA Architecture's responsibility is to these clients only and not to any third party who may rely on these documents.
Nominated Architect (NSW) - John Baker 3552

Rev	Date	Issue
02	18/9/2024	For TSG Review
03	11/10/2024	For Concept Design
04	28/10/2024	For Coordination
05	18/11/2024	For Coordination
06	6/12/2024	For Coordination

Client
SINSW

NSW GOVERNMENT Education School Infrastructure

Architect
BKA Architecture

SYDNEY
Suite 1.04,
77 Dunning Ave,
Rosebery,
NSW 2018
T: +61 2 9318 9200
E: bka@bka.com.au
W: www.bka.com.au

NEWCASTLE
Suite 4
19 Bolton St,
Newcastle
NSW 2300
T: +61 2 4926 5563

NORTH COAST
Unit 1
10 Station St,
Bangalow
NSW 2479
T: +61 2 6687 2712

Scale at A1
1:300

North

Project Address
38-54 Eton Street, Sutherland NSW 2232

Date
6/12/2024

Drawn
AL, SB

Checked
AK, JB

Status
Not for Construction

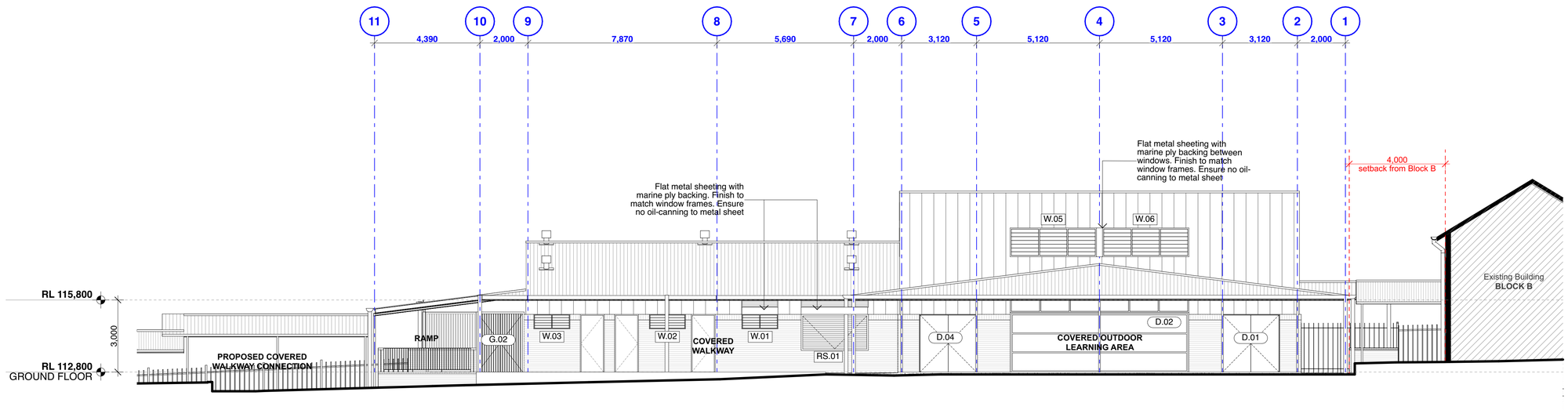
Drawing
Site Plan

Project No.
24014

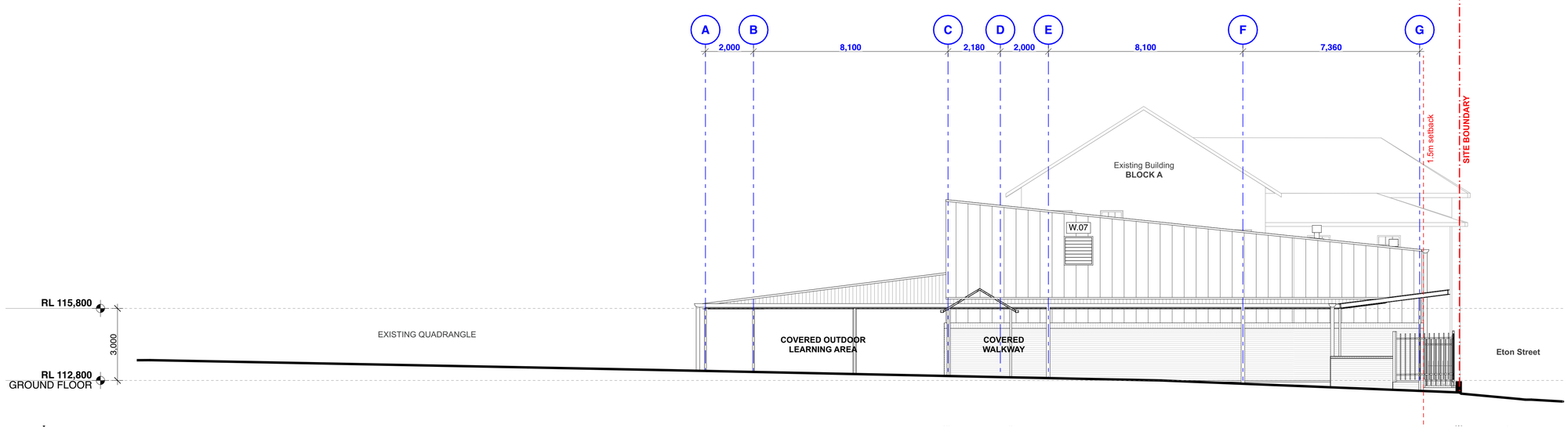
Revision
06

Drawing No.
A-005

NOTE: WINDOW LOCATION AND SIZES INDICATIVE ONLY



01 A-110 EAST ELEVATION 1:100



02 A-110 NORTH ELEVATION 1:100

General Notes

DO NOT SCALE FROM DRAWING. USE FIGURED DIMENSIONS ONLY. CHECK ALL DIMENSIONS ON SITE BEFORE ANY MANUFACTURE OR CONSTRUCTION

All dimensions are in millimetres unless stated otherwise.
All architectural, drawings are to be read in conjunction with the relevant consultant documents. All dimensions and levels are to be checked and verified on site prior to the commencement of work, shop drawings or fabrication of any components. Refer all discrepancies to the Architect for determination. Drawings are not to be scaled, use only figured dimensions. This drawing is copyright and must not be retained, copied or used without the permission of BKA Architecture. This document has been prepared for and on behalf of the clients noted on the drawing, BKA Architecture's responsibility is to these clients only and not to any third party who may rely on these documents.
Nominated Architect (NSW) - John Baker 3552

Rev	Date	Issue
04	11/10/2024	For Concept Design
05	28/10/2024	For Coordination
06	8/11/2024	For Coordination
07	18/11/2024	For Coordination
08	6/12/2024	For Coordination

Client
SINSW

NSW GOVERNMENT Education School Infrastructure

Architect
BKA Architecture

SYDNEY
Suite 1.04,
77 Dunning Ave,
Rosebery,
NSW 2018
T: +61 2 9318 9200
E: bka@bka.com.au
W: www.bka.com.au

NEWCASTLE
Suite 4
19 Bolton St,
Newcastle
NSW 2300
T: +61 2 4926 5563

NORTH COAST
Unit 1
10 Station St,
Bangalow
NSW 2479
T: +61 2 6687 2712

Scale at A1
1:100

North

Project Address
38-54 Eton Street, Sutherland
NSW 2232

Date
6/12/2024

Drawn
AL, SB

Checked
AK, JB

Status
Not for Construction

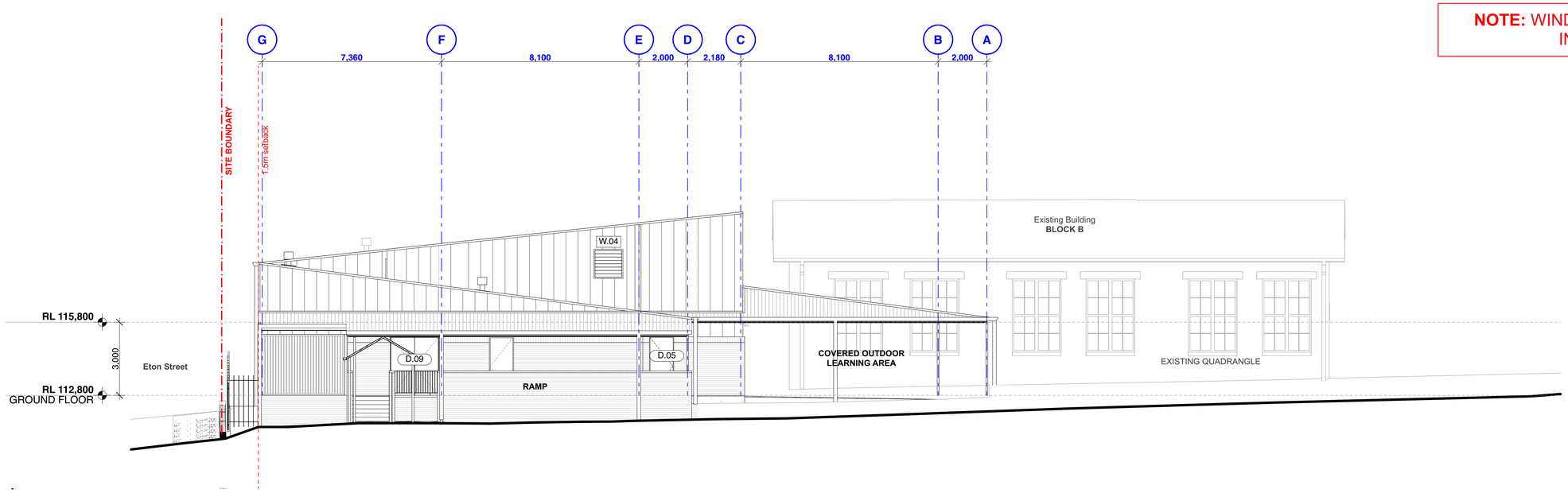
Drawing
Elevations - Sheet 01

Project No.
24014

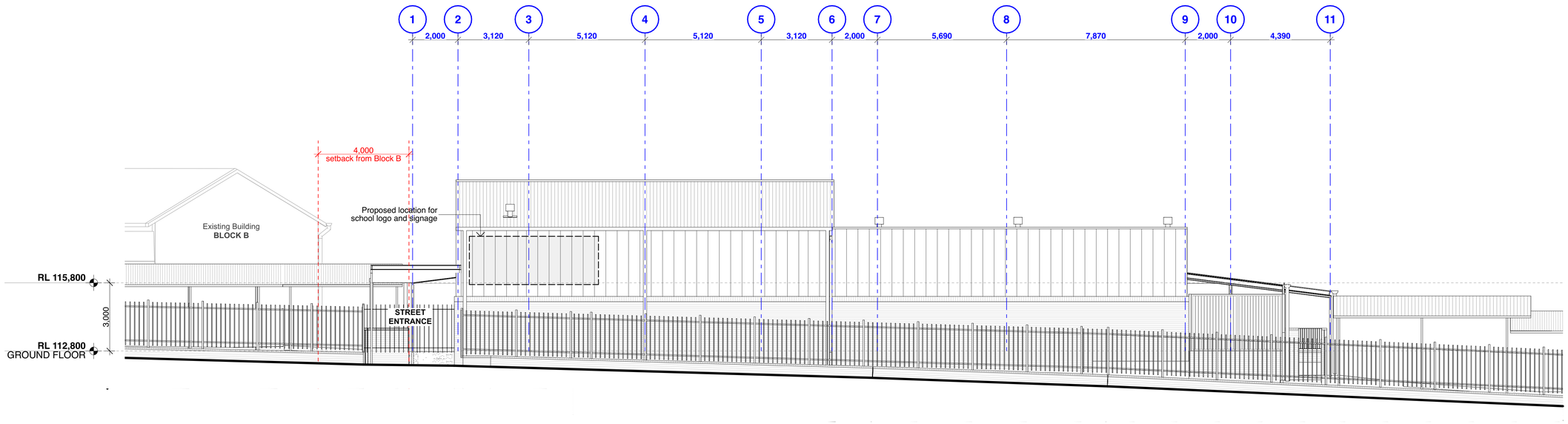
Revision
08

Drawing No.
A-200

NOTE: WINDOW LOCATION AND SIZES INDICATIVE ONLY



03 A-110 SOUTH ELEVATION 1:100



04 A-110 WEST ELEVATION 1:100

General Notes

DO NOT SCALE FROM DRAWING. USE FIGURED DIMENSIONS ONLY. CHECK ALL DIMENSIONS ON SITE BEFORE ANY MANUFACTURE OR CONSTRUCTION

All dimensions are in millimetres unless stated otherwise.
All architectural, drawings are to be read in conjunction with the relevant consultant documents. All dimensions and levels are to be checked and verified on site prior to the commencement of work, shop drawings or fabrication of any components. Refer all discrepancies to the Architect for determination. Drawings are not to be scaled, use only figured dimensions. This drawing is copyright and must not be retained, copied or used without the permission of BKA Architecture. This document has been prepared for and on behalf of the clients noted on the drawing, BKA Architecture's responsibility is to these clients only and not to any third party who may rely on these documents.
Nominated Architect (NSW) - John Baker 3552

Rev	Date	Issue
04	11/10/2024	For Concept Design
05	28/10/2024	For Coordination
06	8/11/2024	For Coordination
07	18/11/2024	For Coordination
08	6/12/2024	For Coordination

Client
SINSW

NSW GOVERNMENT Education School Infrastructure

Architect
BKA Architecture

SYDNEY
Suite 1.04,
77 Dunning Ave,
Rosebery,
NSW 2018
T: +61 2 9318 9200
E: bka@bka.com.au
W: www.bka.com.au

NEWCASTLE
Suite 4
19 Bolton St,
Newcastle
NSW 2300
T: +61 2 4926 5563

NORTH COAST
Unit 1
10 Station St,
Bangalow
NSW 2479
T: +61 2 6687 2712

Scale at A1 1:100

North

Project Address 38-54 Eton Street, Sutherland NSW 2232

Date 6/12/2024

Drawn AL, SB

Checked AK, JB

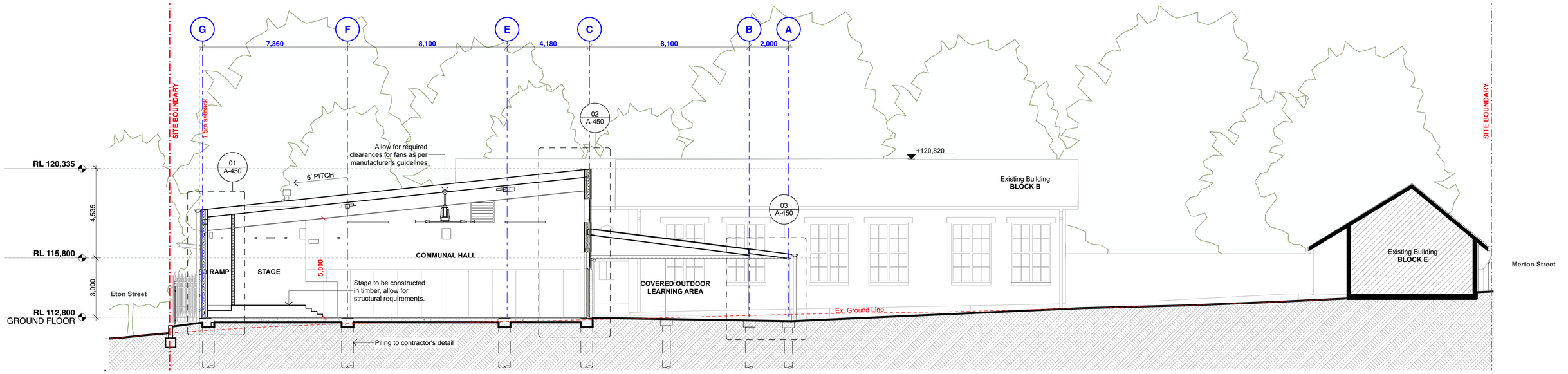
Status Not for Construction

Drawing **Elevations - Sheet 02**

Project No. **24014**

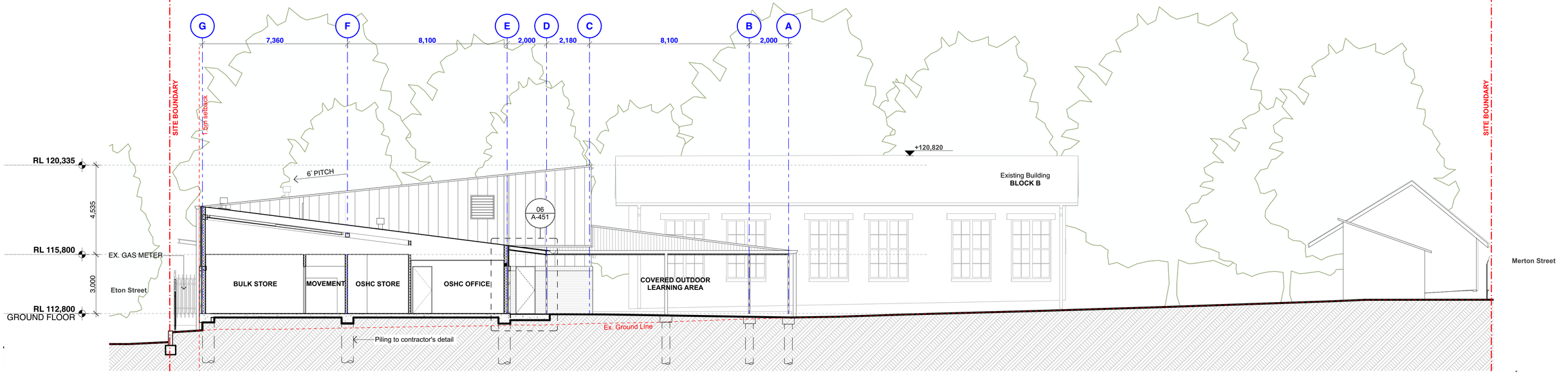
Revision **08**

Drawing No. **A-201**



01
#LayID

SECTION 1
1:100



02
#LayID

SECTION 2
1:100

General Notes

DO NOT SCALE FROM DRAWING. USE FIGURED DIMENSIONS ONLY. CHECK ALL DIMENSIONS ON SITE BEFORE ANY MANUFACTURE OR CONSTRUCTION

All dimensions are in millimetres unless stated otherwise.
All architectural, drawings are to be read in conjunction with the relevant consultant documents. All dimensions and levels are to be checked and verified on site prior to the commencement of work, shop drawings or fabrication of any components. Refer all discrepancies to the Architect for determination. Drawings are not to be scaled, use only figured dimensions. This drawing is copyright and must not be retained, copied or used without the permission of BKA Architecture. This document has been prepared for and on behalf of the clients noted on the drawing. BKA Architecture's responsibility is to these clients only and not to any third party who may rely on these documents.
Nominated Architect (NSW) - John Baker 3552

Rev	Date	Issue
04	11/10/2024	For Concept Design
05	28/10/2024	For Coordination
06	8/11/2024	For Coordination
07	18/11/2024	For Coordination
08	6/12/2024	For Coordination

Client
SINSW

NSW GOVERNMENT Education School Infrastructure

Architect
BKA Architecture

SYDNEY
Suite 1.04,
77 Dunning Ave,
Rosebery,
NSW 2018
T: +61 2 9318 9200
E: bka@bka.com.au
W: www.bka.com.au

NEWCASTLE
Suite 4
19 Bolton St,
Newcastle
NSW 2300
T: +61 2 4926 5563

NORTH COAST
Unit 1
10 Station St,
Bangalow
NSW 2479
T: +61 2 6687 2712

Scale at A1
1:100

North

Project Address
38-54 Eton Street, Sutherland
NSW 2232

Date
6/12/2024

Drawn
AL, SB

Checked
AK, JB

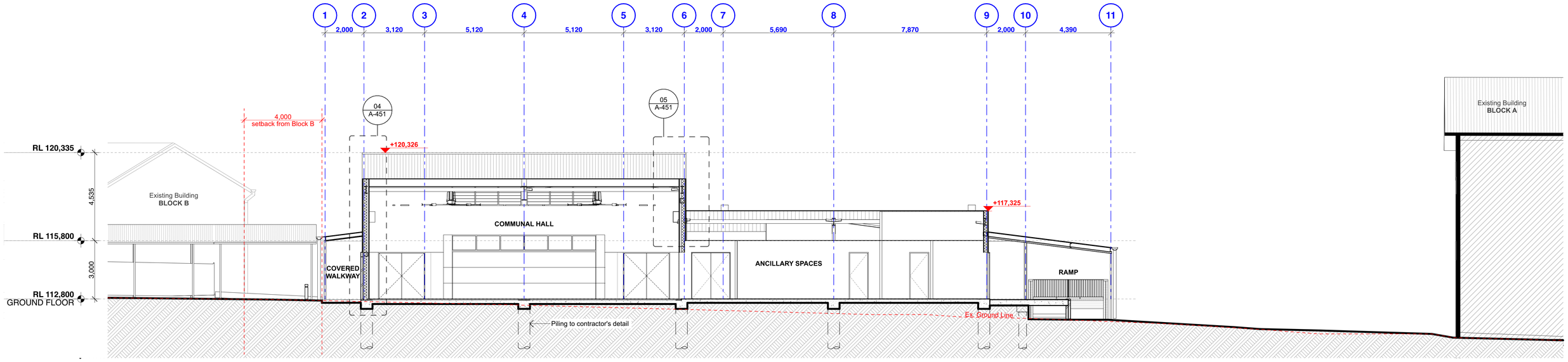
Status
Not for Construction

Drawing
Sections - Sheet 01

Project No.
24014

Revision
08

Drawing No.
A-300



03
#LayID

SECTION 3
1:100

General Notes

DO NOT SCALE FROM DRAWING. USE FIGURED DIMENSIONS ONLY. CHECK ALL DIMENSIONS ON SITE BEFORE ANY MANUFACTURE OR CONSTRUCTION

All dimensions are in millimetres unless stated otherwise.
All architectural, drawings are to be read in conjunction with the relevant consultant documents. All dimensions and levels are to be checked and verified on site prior to the commencement of work, shop drawings or fabrication of any components. Refer all discrepancies to the Architect for determination. Drawings are not to be scaled, use only figured dimensions. This drawing is copyright and must not be retained, copied or used without the permission of BKA Architecture. This document has been prepared for and on behalf of the clients noted on the drawing, BKA Architecture's responsibility is to these clients only and not to any third party who may rely on these documents.
Nominated Architect (NSW) - John Baker 3552

Rev	Date	Issue
01	11/10/2024	For Concept Design
02	28/10/2024	For Coordination
03	8/11/2024	For Coordination
04	18/11/2024	For Coordination
05	6/12/2024	For Coordination

Client
SINSW

NSW GOVERNMENT | Education School Infrastructure

Architect
BKA Architecture

SYDNEY
Suite 1.04,
77 Dunning Ave,
Rosebery,
NSW 2018
T: +61 2 9318 9200
E: bka@bka.com.au
W: www.bka.com.au

NEWCASTLE
Suite 4
19 Bolton St,
Newcastle
NSW 2300
T: +61 2 4926 5563

NORTH COAST
Unit 1
10 Station St.
Bangalow
NSW 2479
T: +61 2 6687 2712

Scale at A1
1:100

North

Date
6/12/2024

Drawn
AL, SB

Checked
AK, JB

Status
Not for Construction

Project Address
38-54 Eton Street, Sutherland
NSW 2232

Drawing
Sections - Sheet 02

Project No.
24014

Revision
05

Drawing No.
A-301

A1

GRATED DRAIN TO CAPTURE THE EXISTING WATER AWAY FROM THE BUILDING

ALLOW SLOPING AT MINIMUM 1% TO CAPTURE WATER

WHERE EX. GROUND LEVEL IS HIGHER THAN PROPOSED SLAB, BATTER TO BE FLUSH WITH LEVEL AT SLAB EDGE

PIPE DIAMETER: 225Ø
PIPE LENGTH: 22.40m
PIPE SLOPE: 1%
USIL: RL111.70
DSIL: RL111.47

PIPE DIAMETER: 225Ø
PIPE LENGTH: 10.0m
PIPE SLOPE: 2.9%
USIL: RL112.01
DSIL: RL111.72

PIPE DIAMETER: 225Ø
PIPE LENGTH: 11.50m
PIPE SLOPE: 1%
USIL: RL111.45
DSIL: RL111.34

PIPE DIAMETER: 225Ø
PIPE LENGTH: 16.20m
PIPE SLOPE: 1%
USIL: RL112.20
DSIL: RL112.03

EXISTING CARPARK WATER TO BE DISCHARGED INTO THE KERB RATHER THAN ONTO THE FOOTPATH (EXISTING CONDITION)

PLACE NEW PIT INTO EXISTING STORMWATER LINE

EXISTING STORMWATER LINE TO BE DIVERTED TO NEW STORMWATER SYSTEM

PIPE DIAMETER: 225Ø
(EXISTING)
USIL: RL111.82
DSIL: RL111.38

PIPE DIAMETER: 225Ø
PIPE LENGTH: 6.05m
PIPE SLOPE: 2.5%
USIL: RL111.36
DSIL: RL111.21

PIPE DIAMETER: 225Ø
PIPE LENGTH: 13.30m
PIPE SLOPE: 1.3%
USIL: RL111.32
DSIL: RL111.14

EXISTING STORMWATER DRAINAGE SYSTEM TO BE REMOVED

PIPE DIAMETER: 225Ø
PIPE LENGTH: 16.83m
PIPE SLOPE: 1%
USIL: RL111.12
DSIL: RL110.95

PIPE DIAMETER: 225Ø
PIPE LENGTH: 20.43m
PIPE SLOPE: 2.5%
USIL: RL111.19
DSIL: RL110.68

PIPE DIAMETER: 225Ø
PIPE LENGTH: 1.63m
PIPE SLOPE: 1.5%
USIL: RL110.93
DSIL: RL110.90

OSD TANK SIZE
APPROXIMATELY 32m³ WITH
6 x 690mm STORMFILTER
CHAMBERS

TREES TO BE REMOVED DUE TO STORMWATER PIPE CLASHING WITH TPZ

PIPE DIAMETER: 225Ø
PIPE LENGTH: 2.0m
PIPE SLOPE: 1.0%
USIL: RL110.47
DSIL: RL110.45

PIPE DIAMETER: 300Ø
PIPE LENGTH: 2.8m
PIPE SLOPE: 1.0%
USIL: RL110.27
DSIL: RL110.24

UPDATE EXISTING 100Ø STORMWATER TO PIPE DIAMETER: 375Ø
PIPE LENGTH: 6.8m
PIPE SLOPE: 1.0%
USIL: RL109.47
DSIL: RL109.40

PIPE DIAMETER: 300Ø
PIPE LENGTH: 2.2m
PIPE SLOPE: 2.5%
USIL: RL110.66
DSIL: RL110.60

EXISTING 375Ø STORMWATER DRAIN PIPE

NEW PIT

RL 112.58 (4) RL 112.53 (5) RL 112.97 (3) RL 112.37 (6) RL 111.98 (7) RL 112.00 (9) RL 111.80 (10) RL 112.65 (2) RL 112.76 (12) RL 112.05 (16) RL 111.50 (11) RL 110.55

SERVICES LEGEND

POW(OH)	Existing electrical (over head)
ExHV	Existing electrical High Voltage
ExGAS	Existing gas
ExSEW	Existing sewer
ExSW	Existing stormwater
ExCOM	Existing telecommunications
ExW	Existing water
SW	Proposed stormwater pipe
ExSEW	Existing stormwater pipe
	Grated drain (heel safe)
	Proposed grated/ sealed pit (heel safe)
	Existing stormwater pit

LEGEND

	Property boundary
FFL +112.800	Finished surface level
+18.48	Existing surface spot level
19.00	Existing Contour

BEFORE YOU DIG www.byda.com.au

SERVICE CLASHES
CONTRACTOR TO REFER TO SERVICES DOCUMENTATION AND LIAISE WITH THE RELEVANT AUTHORITY TO MITIGATE ANY SERVICE CLASHES WITH THE PROPOSED WORKS.

WARNING
BEWARE OF UNDERGROUND SERVICES.
THE LOCATION OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE BY CIVIL CONTRACTOR PRIOR TO CONSTRUCTION OF ANY CIVIL WORKS. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

TO BE PRINTED IN FULL COLOUR

NOT FOR CONSTRUCTION

Date generated: 25/11/2024 4:41:41 PM U:\PROJECTS\AU\214XX\214113_SNSW\06\04\04\28_SUTHERL4_WIP\BIM\PROPERTY\CV_CIVIL\20\PS214113-SPS-CV-4001

rev	date	description	drn	ch'k
03	25/11/24	FOR CO-ORDINATION ONLY	DC	PL
02	14/11/24	FOR REVIEW ONLY	ALA	PAL
01	07/11/24	FOR INTERNAL REVIEW	ALA	TAH

enstruct group pty ltd
Level 4, 2 Glen Street
Milsons Point NSW 2061
Australia
Telephone (02) 8904 1444
Facsimile (02) 8904 1555
www.enstruct.com.au
enstruct

project: SUTHERLAND PUBLIC SCHOOL CONCEPT DESIGN

drawing title: STORMWATER PLAN

status: PRELIMINARY

scale at A1	drawn	checked	approved
1:100	ALA	TAH	Oct-24

project no.	sheet	rev.
PS214113	PS214113-SPS-CV-4001	01

Appendix B

Summary Result Table and Borehole Logs from Previous Report(s)

Table F1: Summary of Laboratory Results – Priority metals, PAH, TRH, BTEX, phenols, OCP, OCP, PCB, Asbestos (FA/AF)

				Priority metals								PAH				TRH					
				Total Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	Naphthalene [b]	Benzo(a)pyrene (B(a)P)	Benzo(a)pyrene TEQ (B(a)P TEQ)	Total PAH	TRH C6 - C10	TRH >C10-C16	F1 ((C6-C10)-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)
			PQL	4	0.4	1	1	1	0.1	1	1	1	0.05	0.5	0.05	25	50	25	50	100	100
Sample ID	Depth	FILL/ Natural	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Supplementary Contamination Investigation (Douglas, 2024)																					
BH101	0.4 - 0.5 m	FILL/ SAND	16/07/24	10	<0.4	18	9	15	<0.1	3	10	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	**260**	**370**
				100 100	20 -	100 410	6,000 140	300 1,100	40 -	400 50	7,400 350	3 170	- 0.7	3 -	300 -	- -	- 120	45 180	110 -	- 300	- 2,800
BH102	0.4 - 0.5 m	FILL / SANDY SILT	16/07/24	6	<0.4	13	27	50	<0.1	2	97	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100
				100 100	20 -	100 410	6,000 140	300 1,100	40 -	400 50	7,400 350	3 170	- 0.7	3 -	300 -	- -	- 120	45 180	110 -	- 300	- 2,800
BD1	0 m	FILL / SANDY SILT	16/07/24	6	<0.4	13	5	17	<0.1	2	17	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100
				100 100	20 -	100 410	6,000 140	300 1,100	40 -	400 50	7,400 350	3 170	- 0.7	3 -	300 -	- -	- 120	45 180	110 -	- 300	- 2,800
BH103	0 - 0.1 m	FILL / SANDY SILT	16/07/24	10	<0.4	17	40	**350**	0.2	9	**390**	<1	**0.53**	**0.7**	**4.5**	<25	<50	<25	<50	**340**	**360**
				100 100	20 -	100 410	6,000 140	300 1,100	40 -	400 50	7,400 350	3 170	- 0.7	3 -	300 -	- -	- 120	45 180	110 -	- 300	- 2,800
BH103	0.8 - 1 m	FILL /SILTY CLAY	16/07/24	20	<0.4	29	12	26	<0.1	2	13	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100
				100 100	20 -	100 410	6,000 140	300 1,100	40 -	400 50	7,400 350	3 170	- 0.7	3 -	300 -	- -	- 120	45 180	110 -	- 300	- 2,800
BH104	0.4 - 0.5 m	FILL / SANDY SILT	16/07/24	15	<0.4	30	4	20	<0.1	3	7	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100
				100 100	20 -	100 410	6,000 140	300 1,100	40 -	400 50	7,400 350	3 170	- 0.7	3 -	300 -	- -	- 120	45 180	110 -	- 300	- 2,800
BH105	0.4 - 0.5 m	FILL /SILTY CLAY	16/07/24	9	<0.4	20	10	20	<0.1	2	13	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100
				100 100	20 -	100 410	6,000 140	300 1,100	40 -	400 50	7,400 350	3 170	- 0.7	3 -	300 -	- -	- 120	45 180	110 -	- 300	- 2,800
Detailed Site Investigation (Douglas, 2023)																					
BH01	0.5 - 0.6 m	FILL/SAND	27/09/23	10	<0.4	33	22	23	0.1	17	150	<0.1	**7**	**9.5**	**64**	<25	<50	<25	<50	**940**	**600**
				100 100	20 -	100 410	6000 180	300 1100	40 -	400 100	7400 460	3 170	- 0.7	3 -	300 -	- -	- 120	45 180	110 -	- 300	- 2800
BD01/20230927	0.5 - 0.6 m	FILL/SAND	27/09/23	5	<0.4	18	30	19	<0.1	22	150	<0.1	**6.4**	**8.6**	**56**	<25	<50	<25	<50	**940**	**760**
				100 100	20 -	100 410	6000 180	300 1100	40 -	400 100	7400 460	3 170	- 0.7	3 -	300 -	- -	- 120	45 180	110 -	- 300	- 2800
BH02	0.1 - 0.2 m	FILL/CLAY	27/09/23	8	<0.4	15	29	23	<0.1	6	31	<0.1	0.1	<0.5	**1**	<25	<50	<25	<50	**390**	**580**
				100 100	20 -	100 410	6000 180	300 1100	40 -	400 100	7400 460	3 170	- 0.7	3 -	300 -	- -	- 120	45 180	110 -	- 300	- 2800
BH03	0.4 - 0.5 m	CLAY	27/09/23	10	<0.4	26	16	24	<0.1	9	37	<0.1	**1.4**	2	**14**	<25	<50	<25	<50	**490**	**460**
				100 100	20 -	100 410	6000 180	300 1100	40 -	400 100	7400 460	3 170	- 0.7	3 -	300 -	- -	- 120	45 180	110 -	- 300	- 2800
BH04	0 - 0.1 m	FILL/SANDY SILT	27/09/23	5	<0.4	10	29	53	<0.1	8	100	<0.1	0.2	<0.5	**2.1**	<25	<50	<25	<50	**330**	**460**
				100 100	20 -	100 410	6000 180	300 1100	40 -	400 100	7400 460	3 170	- 0.7	3 -	300 -	- -	- 120	45 180	110 -	- 300	- 2800
BH04	0.9 - 1 m	FILL/SANDY SILT	27/09/23	12	<0.4	30	23	77	0.1	6	88	<0.1	0.2	<0.5	1.8	<25	<50	<25	<50	**190**	**330**
				100 100	20 -	100 410	6000 180	300 1100	40 -	400 100	7400 460	3 170	- 0.7	3 -	300 -	- -	- 120	45 180	110 -	- 300	- 2800
BH05	0.4 - 0.5 m	FILL/SANDY SILT	27/09/23	8	<0.4	15	26	130	0.1	6	110	<0.1	**0.71**	**0.9**	**6.2**	<25	<50	<25	<50	**240**	**340**
				100 100	20 -	100 410	6000 180	300 1100	40 -	400 100	7400 460	3 170	- 0.7	3 -	300 -	- -	- 120	45 180	110 -	- 300	- 2800

Lab result

HIL/HSL value EIL/ESL/EGV value

HIL/HSL exceedance EIL/ESL exceedance HIL/HSL and EIL/ESL exceedance ML exceedance ML and HIL/HSL or EIL/ESL exceedance

Indicates that asbestos has been detected by the lab, refer to the lab report **Blue** = DC exceedance **Red** = EGV-indirect exceedance HSL 0-<1 Exceedance

Bold = Lab detections - = Not tested or No HIL/HSL/EIL/ESL (as applicable) or Not applicable NL = Not limiting NAD = No Asbestos detected

HIL = Health investigation level HSL = Health screening level (excluding DC) EIL = Ecological investigation level ESL = Ecological screening level EGV = Environmental Guideline Value ML = Management Limit DC = Direct Contact HSL

Notes:

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

b Naphthalene reported as highest detection from the BTEXN or PAH suite, or if both results <PQL as lowest PQL

c EIL criteria applies to DDT only

Site Assessment Criteria (SAC):

SAC based on generic land use thresholds for Residential A with garden/accessible soil

Refer to the SAC section of report for information of SAC sources and rationale. Summary information as follows:

HIL	HIL-A (NEPC, 2013 or HEPA, 2020 (PFAS only))	EGV	EGV, all land uses, direct exposure (HEPA, 2020)
HSL (vapour intrusion)	HSL-A/B (NEPC, 2013)	ESL	Urban Residential and Public Open Space (NEPC, 2013)
DC	Direct contact HSL A Residential (Low density) (CRC CARE, 2011)	ML	Residential, Parkland and Public Open Space (NEPC, 2013)

Table F1: Summary of Laboratory Results – Priority metals, PAH, TRH, BTEX, phenols, OCP, OCP, PCB, Asbestos (FA/AF)

				BTEX				Phenols	Priority OCP									Priority OPP	PCB	Asbestos (FA/AF)		Asbestos, Other		
				Benzene	Toluene	Ethylbenzene	Total Xylenes	Total Phenolics	DDT+DDE+DDD c	Aldrin + Dieldrin	Total Chlordane	Total Endosulfan	Endrin	Heptachlor	Hexachlorobenzene	Methoxychlor	Mirex	Chlorpyriphos	Total PCB	Asb_Sample_mass	FA and AF Estimation	Asbestos ID in soil >0.1g/kg	Trace Analysis (NEPC)	Total Asbestos
			PQL	0.2	0.5	1	1	5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		0.001			0.1
Sample ID	Depth	FILL/ Natural	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	g	%(w/w)	-	-	g/kg
Supplementary Contamination Investigation (Douglas, 2024)																								
BH101	0.4 - 0.5 m	FILL/ SAND	16/07/24	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	695.94	<0.001	NAD	NAD	<0.1
				0.5 50	160 85	55 70	40 105	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0.001 -			
BH102	0.4 - 0.5 m	FILL / SANDY SILT	16/07/24	<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	430.29	<0.001	NAD	NAD	<0.1
				0.5 50	160 85	55 70	40 105	100 -	240 180	6 -	50 -	270 -	10 -	6 -	10 -	300 -	10 -	160 -	1 -	- -	0.001 -			
BD1	0 m	FILL / SANDY SILT	16/07/24	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				0.5 50	160 85	55 70	40 105	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	-	-	-
BH103	0 - 0.1 m	FILL / SANDY SILT	16/07/24	<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	371.7	<0.001	NAD	NAD	<0.1
				0.5 50	160 85	55 70	40 105	100 -	240 180	6 -	50 -	270 -	10 -	6 -	10 -	300 -	10 -	160 -	1 -	- -	0.001 -			
BH103	0.8 - 1 m	FILL /SILTY CLAY	16/07/24	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	419.25	<0.001	NAD	NAD	<0.1
				0.5 50	160 85	55 70	40 105	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0.001 -			
BH104	0.4 - 0.5 m	FILL / SANDY SILT	16/07/24	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	665.93	<0.001	NAD	NAD	<0.1
				0.5 50	160 85	55 70	40 105	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0.001 -			
BH105	0.4 - 0.5 m	FILL /SILTY CLAY	16/07/24	<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	438.35	<0.001	NAD	NAD	<0.1
				0.5 50	160 85	55 70	40 105	100 -	240 180	6 -	50 -	270 -	10 -	6 -	10 -	300 -	10 -	160 -	1 -	- -	0.001 -			
Detailed Site Investigation (Douglas, 2023)																								
BH01	0.5 - 0.6 m	FILL/SAND	27/09/23	<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	NAD	-	-
				0.5 50	160 85	55 70	40 105	100 -	240 180	6 -	50 -	270 -	10 -	6 -	10 -	300 -	10 -	160 -	1 -					
BD01/20230927	0.5 - 0.6 m	FILL/SAND	27/09/23	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				0.5 50	160 85	55 70	40 105	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -					
BH02	0.1 - 0.2 m	FILL/CLAY	27/09/23	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	-	-
				0.5 50	160 85	55 70	40 105	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -					
BH03	0.4 - 0.5 m	CLAY	27/09/23	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	-	-
				0.5 50	160 85	55 70	40 105	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -					
BH04	0 - 0.1 m	FILL/SANDY SILT	27/09/23	<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	NAD	-	-
				0.5 50	160 85	55 70	40 105	100 -	240 180	6 -	50 -	270 -	10 -	6 -	10 -	300 -	10 -	160 -	1 -					
BH04	0.9 - 1 m	FILL/SANDY SILT	27/09/23	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	-	-
				0.5 50	160 85	55 70	40 105	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -					
BH05	0.4 - 0.5 m	FILL/SANDY SILT	27/09/23	<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	NAD	-	-
				0.5 50	160 85	55 70	40 105	100 -	240 180	6 -	50 -	270 -	10 -	6 -	10 -	300 -	10 -	160 -	1 -					

Lab result

HIL/HSL value EIL/ESL/EGV value

HIL/HSL exceedance EIL/ESL exceedance HIL/HSL and EIL/ESL exceedance ML exceedance ML and HIL/HSL or EIL/ESL exceedance

Indicates that asbestos has been detected by the lab, refer to the lab report **Blue** = DC exceedance **Red** = EGV-indirect exceedance HSL 0-<1 Exceedance

Bold = Lab detections - = Not tested or No HIL/HSL/EIL/ESL (as applicable) or Not applicable NL = Not limiting NAD = No Asbestos detected

HIL = Health investigation level HSL = Health screening level (excluding DC) EIL = Ecological investigation level ESL = Ecological screening level EGV = Environmental Guideline Value ML = Management Limit DC = Direct Contact HSL

Notes:

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

b Naphthalene reported as highest detection from the BTEXN or PAH suite, or if both results <PQL as lowest PQL

c EIL criteria applies to DDT only

Site Assessment Criteria (SAC):

SAC based on generic land use thresholds for Residential A with garden/accessible soil

Refer to the SAC section of report for information of SAC sources and rationale. Summary information as follows:

HIL	HIL-A (NEPC, 2013 or HEPA, 2020 (PFAS only))	EGV	EGV, all land uses, direct exposure (HEPA, 2020)
HSL (vapour intrusion)	HSL-A/B (NEPC, 2013)	ESL	Urban Residential and Public Open Space (NEPC, 2013)
DC	Direct contact HSL A Residential (Low density) (CRC CARE, 2011)	ML	Residential, Parkland and Public Open Space (NEPC, 2013)

Douglas Partners
Geotechnics / Environment / Groundwater

Table H2 : Summary of Laboratory Results – Metals, TRH, BTEX, PAH, Phenol, OCP, OPP, PCB, Asbestos - Preliminary Waste Classification

			Metals							TRH		BTEX				PAH				Phenol	OCP		OPP	PCB	Asbestos
			Arsenic	Cadmium	Total Chromium	Lead	TCLP Lead	Mercury (inorganic)	Nickel	TRH C6 - C9	TRH C10-C36	Benzene	Toluene	Ethylbenzene	Total Xylenes	Benzo(a)pyrene (BaP)	TCLP Benzo(a)pyrene (BaP)	Total PAHs	TCLP Total PAHs	Phenol	Total Endosulfan	Total Analysed OCP	Total Analysed OPP	Total PCB	Asbestos (50 g)
		PQL	4	0.4	1	1	0.03	0.1	1	25	50	0.2	0.5	1	1	0.05	0.0001	0.05		5	0.1	0.1	0.1	0.1	
Sample ID	Depth	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-
BH01	0.5 - 0.6 m	27/09/23	10	<0.4	33	23	-	0.1	17	<25	1200	<0.2	<0.5	<1	<1	7	<0.0001	64	0.002	<5	<0.1	<0.1	<0.1	<0.1	ND
BD01/20230927	0 m		5	<0.4	18	19	-	<0.1	22	<25	1200	<0.2	<0.5	<1	<1	6.4	<0.0001	56	0.0024	-	-	-	-	-	-
BH02	0.1 - 0.2 m	27/09/23	8	<0.4	15	23	-	<0.1	6	<25	560	<0.2	<0.5	<1	<1	0.1	-	1	-	-	-	-	-	-	ND
BH03	0.4 - 0.5 m	27/09/23	10	<0.4	26	24	-	<0.1	9	<25	650	<0.2	<0.5	<1	<1	1.4	<0.0001	14	0.0004	-	-	-	-	-	ND
BH04	0 - 0.1 m	27/09/23	5	<0.4	10	53	-	<0.1	8	<25	500	<0.2	<0.5	<1	<1	0.2	-	2.1	-	<5	<0.1	<0.1	<0.1	<0.1	ND
BH04	0.9 - 1 m	27/09/23	12	<0.4	30	77	-	0.1	6	<25	220	<0.2	<0.5	<1	<1	0.2	-	1.8	-	-	-	-	-	-	ND
BH05	0.4 - 0.5 m	27/09/23	8	<0.4	15	130	0.06	0.1	6	<25	370	<0.2	<0.5	<1	<1	0.71	-	6.2	-	<5	<0.1	<0.1	<0.1	<0.1	ND
BH06	0 - 0.1 m	27/09/23	5	<0.4	13	65	-	<0.1	6	<25	320	<0.2	<0.5	<1	<1	0.4	-	2.6	-	<5	<0.1	<0.1	<0.1	<0.1	ND
BH07	0.4 - 0.5 m	28/09/23	11	<0.4	20	93	-	<0.1	6	<25	340	<0.2	<0.5	<1	<1	0.4	-	2.9	-	<5	<0.1	<0.1	<0.1	<0.1	ND
BH08	0 - 0.1 m	27/09/23	6	<0.4	15	74	-	<0.1	14	<25	170	<0.2	<0.5	<1	<1	0.4	-	3.9	-	<5	<0.1	<0.1	<0.1	<0.1	ND
BH09	0 - 0.1 m	27/09/23	5	<0.4	13	54	-	0.1	13	<25	440	<0.2	<0.5	<1	<1	0.08	-	0.4	-	<5	<0.1	<0.1	<0.1	<0.1	ND
BH09	0.9 - 1 m	27/09/23	11	<0.4	19	34	-	<0.1	6	<25	<50	<0.2	<0.5	<1	<1	<0.05	-	<0.05	-	-	-	-	-	-	ND
BH10	0.4 - 0.5 m	28/09/23	10	0.4	24	210	0.07	<0.1	5	<25	<50	<0.2	<0.5	<1	<1	<0.05	-	<0.05	-	-	-	-	-	-	ND
BH11	0 - 0.1 m	28/09/23	14	<0.4	28	50	-	<0.1	3	<25	170	<0.2	<0.5	<1	<1	<0.05	-	<0.05	-	<5	<0.1	<0.1	<0.1	<0.1	ND
BH12	0 - 0.1 m	28/09/23	12	1	35	630	0.1	0.2	15	<25	300	<0.2	<0.5	<1	<1	<0.05	-	0.1	-	<5	<0.1	<0.1	<0.1	<0.1	ND
BH12	0.4 - 0.5 m	28/09/23	12	<0.4	32	86	-	<0.1	2	<25	<50	<0.2	<0.5	<1	<1	<0.05	-	<0.05	-	-	-	-	-	-	ND
BH03	0.1 - 0.2 m	27/09/23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
BH10	0 - 0.1 m	28/09/23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Waste Classification Criteria [f]																									
CT1			100	20	100	100	-	4	40	-	10000	10	288	600	1000	0.8	-	200	-	288	60	<50	4	<50	-
SCC1			500	100	1900	1500	-	50	1050	-	10000	18	518	1080	1800	10	-	200	-	518	108	<50	7.5	<50	-
TCLP1			-	-	-	-	5	-	-	-	-	-	-	-	-	-	0.04	-	-	-	-	-	-	-	-	-
CT2			400	80	400	400	-	16	160	-	40000	40	1152	2400	4000	3.2	-	800	-	1152	240	<50	16	<50	-
SCC2			2000	400	7600	6000	-	200	4200	-	40000	72	2073	4320	7200	23	-	800	-	2073	432	<50	30	<50	-
TCLP2			-	-	-	-	20	-	-	-	-	-	-	-	-	-	0.16	-	-	-	-	-	-	-	-	-

CT1 exceedance TCLP1 and/or SCC1 exceedance CT2 exceedance TCLP2 and/or SCC2 exceedance Asbestos detection

- = Not tested, No criteria or Not applicable AD = Asbestos detected NAD = No Asbestos detected

Notes:

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

b Total chromium used as initial screen for chromium(VI).

c Total recoverable hydrocarbons (TRH) used as an initial screen for total petroleum hydrocarbons (TPH)

d Criteria for scheduled chemicals used as an initial screen

e Criteria for Chlorpyrifos used as initial screen

f All criteria are in the same units as the reported results

PQL Practical quantitation limit

CT1 NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values of specific contaminant concentration (SCC) for classification without TCLP: General solid waste

SCC1 NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste

TCLP1 NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste

CT2 NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values of specific contaminant concentration (SCC) for classification without TCLP: Restricted solid waste

SCC2 NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste

TCLP2 NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Proposed Multi-Purpose Medium Hall
LOCATION: 38-54 and 66 Eton Street, Sutherland

SURFACE LEVEL: 112.4 AHD
EASTING: 320800.2
NORTHING: 6232529.2
DIP/AZIMUTH: 90°/--

BORE No: BH01
PROJECT No: 224456.00
DATE: 27/9/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
112	0.1	ASPHALTIC CONCRETE			0.1				
		FILL/ Gravelly SAND: fine to coarse, grey to dark grey, fine to medium angular igneous gravel, dry, apparently well compacted		E	0.2				
	0.35	FILL/ SAND: fine to medium, dark grey, with clay nodules, moist		E*	0.5				
	0.6	CLAY CI-CH: medium to high plasticity, red-brown and pale grey, w<PL, stiff, residual			0.6				
				E	0.9				
	1	Below 1.0m: very stiff			1.0				1
111				S			3,7,10 N = 17		
					1.45				
	2								2
110	2.4	SHALE: dark grey and orange-brown, very low strength, highly weathered, Hawkesbury Sandstone			2.5				
		Below 2.6m: low strength		S			10,25/100 refusal		
	2.75	Bore discontinued at 2.75m Refusal			2.75				
	3								3
109									
	4								4
108									

RIG: Comacchio 205 **DRILLER:** DB **LOGGED:** TM **CASING:** Uncased
TYPE OF BORING: Solid flight auger to 2.5m
WATER OBSERVATIONS: No free groundwater observed
REMARKS: *BD01/20230927TM Taken from 0.5-0.6m

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Proposed Multi-Purpose Medium Hall
LOCATION: 38-54 and 66 Eton Street, Sutherland

SURFACE LEVEL: 112.8 AHD
EASTING: 320819
NORTHING: 6232525.6
DIP/AZIMUTH: 90°/--

BORE No: BH02
PROJECT No: 224456.00
DATE: 27/9/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.1	ASPHALTIC CONCRETE			0.1				
	0.2	FILL/ CLAY: medium plasticity, red-brown and brown, trace fine to medium angular igneous gravel, w<PL		E	0.2				
		CLAY CI-CH: medium to high plasticity, red-brown and pale grey, w<PL, stiff, residual							
				E	0.5				
					0.6				
112									
				E	0.9				
	1	Below 1.0m: very stiff to hard			1.0				1
				S			6,12,15 N = 27		
					1.45				
111									
	2								2
	2.3	SHALE: dark grey and orange-brown, very low strength, highly weathered, Hawkesbury Sandstone							
					2.5				
		Below 2.7m: low strength		S			12,25,20/100 refusal		
110	2.9				2.9				
		Bore discontinued at 2.9m Refusal							
	3								3
109									
	4								4
108									

RIG: Comacchio 205 **DRILLER:** DB **LOGGED:** TM **CASING:** Uncased

TYPE OF BORING: Solid flight auger to 2.5m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Proposed Multi-Purpose Medium Hall
LOCATION: 38-54 and 66 Eton Street, Sutherland

SURFACE LEVEL: 112.3 AHD
EASTING: 320805.7
NORTHING: 6232519.7
DIP/AZIMUTH: 90°/--

BORE No: BH03
PROJECT No: 224456.00
DATE: 27/9/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
112	0.1	ASPHALTIC CONCRETE			0.1				
		FILL/ Gravelly SAND: fine to medium, dark grey, fine to medium angular igneous gravel, dry, apparently well compacted		E	0.2				
	0.3	CLAY CI-CH: medium to high plasticity, red-brown and pale grey, w<PL, stiff, residual		E	0.4				
				U	0.5				
					0.7				
				E	0.9				
	1	Below 1.0m: very stiff to hard			1.0				1
111				S			6,14,16 N = 30		
					1.45				
	2								2
110	2.3	SHALE: dark grey and orange-brown, very low strength, highly weathered, Hawkesbury Sandstone							
	2.55	Below 2.5m: low strength		S	2.5 2.55		10/50 refusal		
		Bore discontinued at 2.55m Refusal							
	3								3
109									
	4								4
108									

RIG: Comacchio 205 **DRILLER:** DB **LOGGED:** TM **CASING:** Uncased
TYPE OF BORING: Solid flight auger to 2.5m
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Proposed Multi-Purpose Medium Hall
LOCATION: 38-54 and 66 Eton Street, Sutherland

SURFACE LEVEL: 111.6 AHD
EASTING: 320795.6
NORTHING: 6232498.8
DIP/AZIMUTH: 90°/--

BORE No: BH04
PROJECT No: 224456.00
DATE: 27/9/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
111	0	FILL/ Sandy SILT: low plasticity, brow to dark grey, trace rootlets							
				E	0.1				
					0.2				
				E	0.4				
					0.5				
				E*	0.9				
	1				1.0				1
				S			2,2,6 N = 8		
	1.3	CLAY CI-CH: medium to high plasticity, red-brown and pale grey, w<PL, stiff to very stiff, residual							
					1.45				
110				E	1.5				
					1.6				
				E	1.9				
	2				2.0				2
					2.5				
109				S			11,20,25/100 refusal		
	2.8	SHALE: dark grey and orange-brown, low strength, highly weathered, Hawkesbury Sandstone							
	2.9	Bore discontinued at 2.9m Refusal			2.9				
	3								3
108									
	4								4
107									

RIG: Comacchio 205 **DRILLER:** DB **LOGGED:** TM **CASING:** Uncased

TYPE OF BORING: Solid flight auger to 2.5m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *BD02/20230927TM Taken from 0.9-1.0m

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Proposed Multi-Purpose Medium Hall
LOCATION: 38-54 and 66 Eton Street, Sutherland

SURFACE LEVEL: 111.7 AHD
EASTING: 320807.2
NORTHING: 6232493.5
DIP/AZIMUTH: 90°/--

BORE No: BH05
PROJECT No: 224456.00
DATE: 27/9/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
111	0.0	FILL/ Sandy SILT: low plasticity, brown to dark grey, trace rootlets		E	0.0–0.1				
				E	0.4–0.5				
	0.6	CLAY CI-CH: medium to high plasticity, red-brown and pale grey, w<PL, very stiff, residual		E	0.9–1.0				
	1			S	1.45		6,8,10 N = 18		
110	2								
	2.5	SHALE: dark grey and orange-brown, low strength, highly weathered, Hawkesbury Sandstone		S	2.5–2.55		10/50 refusal		
109	2.55	Bore discontinued at 2.55m Refusal							
	3								
108	4								
107									

RIG: Comacchio 205 **DRILLER:** DB **LOGGED:** TM **CASING:** Uncased
TYPE OF BORING: Solid flight auger to 2.5m
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Proposed Multi-Purpose Medium Hall
LOCATION: 38-54 and 66 Eton Street, Sutherland

SURFACE LEVEL: 110.7 AHD
EASTING: 320826.7
NORTHING: 6232448.5
DIP/AZIMUTH: 90°/--

BORE No: BH06
PROJECT No: 224456.00
DATE: 27/9/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
110	0.0	FILL/ SAND: medium, grey-brown, with clay, trace tile fragments, moist		E	0.0–0.1				
	0.2	CLAY CI-CH: medium to high plasticity, red-brown and pale grey, w<PL, stiff, residual		E	0.4–0.5				
	1	Below 1.0m: very stiff		E	0.9–1.0				
				S	1.0–1.45		7,10,15 N = 25		
109	2								
	2.3	SHALE: dark grey and orange-brown, very low strength, highly weathered, Hawkesbury Sandstone		S	2.5		10,27,10/50 refusal		
108		Below 2.7m: low strength							
	2.85	Bore discontinued at 2.85m Refusal			2.85				
107	3								
	4								
106									

RIG: Comacchio 205 **DRILLER:** DB **LOGGED:** TM **CASING:** Uncased

TYPE OF BORING: Solid flight auger to 2.5m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Proposed Multi-Purpose Medium Hall
LOCATION: 38-54 and 66 Eton Street, Sutherland

SURFACE LEVEL: 111.5 AHD
EASTING: 320845.5
NORTHING: 6232450.5
DIP/AZIMUTH: 90°/--

BORE No: BH07
PROJECT No: 224456.00
DATE: 28/9/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
111	0.0			E	0.0–0.1				
	0.15	FILL/ SAND: fine to medium, brown, trace silt and rootlets, moist							
		FILL/ CLAY: medium plasticity, brown, trace fine igneous gravel, w<PL		E*	0.4–0.5				
	0.7	CLAY CI-CH: medium to high plasticity, red-brown and pale grey, w<PL, stiff, residual		E	0.9–1.0				
110	1			U	1.4				
		Below 1.4m: very stiff							
	2								
	2.3	SHALE: dark grey and orange-brown, very low strength, highly weathered, Hawkesbury Sandstone		S	2.5		11,30 refusal		
109		Below 2.7m: low strength							
	2.8	Bore discontinued at 2.8m Refusal			2.8				
	3								
108									
	4								
107									

RIG: Explora **DRILLER:** DB **LOGGED:** TM **CASING:** Uncased

TYPE OF BORING: Solid flight auger to 2.5m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *BD03/20230928TM Taken from 0.4-0.5m

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Proposed Multi-Purpose Medium Hall
LOCATION: 38-54 and 66 Eton Street, Sutherland

SURFACE LEVEL: 109.7 AHD
EASTING: 320824.1
NORTHING: 6232431.9
DIP/AZIMUTH: 90°/--

BORE No: BH08
PROJECT No: 224456.00
DATE: 27/9/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
109	0.0	FILL/ Gravelly SAND: fine to medium, grey to dark grey, fine to medium angular to sub-angular igneous gravel, dry		E	0.0 0.1				
	0.4	CLAY CI-CH: medium to high plasticity, red-brown and pale grey, w<PL, stiff, residual		E	0.4 0.5				
				U	0.6				
				E	0.9				
	1	Below 1.0m: very stiff to hard		S	1.0 1.45		10,12,19 N = 31		
108	2								
	2.5	SHALE: dark grey and orange-brown, low strength, highly weathered, Hawkesbury Sandstone		S	2.5		20/100 refusal		
107	2.6	Bore discontinued at 2.6m Refusal			2.6				
	3								
106	4								
105									

RIG: Comacchio 205 **DRILLER:** DB **LOGGED:** TM **CASING:** Uncased
TYPE OF BORING: Solid flight auger to 2.5m
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Proposed Multi-Purpose Medium Hall
LOCATION: 38-54 and 66 Eton Street, Sutherland

SURFACE LEVEL: 109.5 AHD
EASTING: 320838.9
NORTHING: 6232418.2
DIP/AZIMUTH: 90°/--

BORE No: BH09
PROJECT No: 224456.00
DATE: 27/9/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
109	0.0	FILL/ Sandy SILT: low plasticity, dark grey-brown, fine to medium sand, w<PL		E	0.0 0.1				
	0.4	FILL/ CLAY: medium plasticity, red-brown and brown, trace fine igneous and ironstone gravel, w<PL, generally in a firm condition, possibly reworked natural		E U E	0.4 0.5 0.9				
108	1			S	1.0 1.45		1,3,2 N = 5		1
107	1.9	CLAY CI-CH: medium to high plasticity, red-brown and pale grey, w<PL, very stiff to hard, residual		E S	1.9 2.0 2.5		10,12,17 N = 29		2 3
106	3.8	SHALE: dark grey and orange-brown, low strength, highly weathered, Hawkesbury Sandstone			2.95				
105	4.0	Bore discontinued at 4.0m Refusal							4

RIG: Comacchio 205 **DRILLER:** DB **LOGGED:** TM **CASING:** Uncased
TYPE OF BORING: Solid flight auger to 4.0m
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Proposed Multi-Purpose Medium Hall
LOCATION: 38-54 and 66 Eton Street, Sutherland

SURFACE LEVEL: 103.9 AHD
EASTING: 320793.3
NORTHING: 6232318.8
DIP/AZIMUTH: 90°/--

BORE No: BH10
PROJECT No: 224456.00
DATE: 28/9/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
103	0.0	FILL/ CLAY: low plasticity, brown, trace silt, ironstone gravel and rootlets, w<PL		E	0.0–0.1				
				E	0.4–0.5				
				U					
	0.8	CLAY CI-CH: medium to high plasticity, red-brown and pale grey, w<PL, stiff to very stiff, residual			0.8				
	1			E	0.9–1.0				1
				S			4,5,9 N = 14		
					1.45				
102	2								2
	2.1	SHALE: dark grey and orange-brown, very low strength with low strength iron indurated bands, highly weathered, Hawkesbury Sandstone							
	2.35	Below 2.3m: low to medium strength Bore discontinued at 2.35m Refusal							
101	3								3
100	4								4
99									

RIG: Explora **DRILLER:** DB **LOGGED:** TM **CASING:** Uncased
TYPE OF BORING: Solid flight auger to 2.35m
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Proposed Multi-Purpose Medium Hall
LOCATION: 38-54 and 66 Eton Street, Sutherland

SURFACE LEVEL: 103.6 AHD
EASTING: 320821.7
NORTHING: 6232315
DIP/AZIMUTH: 90°/--

BORE No: BH11
PROJECT No: 224456.00
DATE: 28/9/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
103	0.0	FILL/ CLAY: low plasticity, brown, trace silt, ironstone gravel and rootlets, w<PL		E	0.0				
					0.1				
	0.2	CLAY CI-CH: medium to high plasticity, yellow-brown and red-brown, w<PL, stiff, residual		E	0.4				
					0.5				
					0.9				
	1	Below 1.0m: very stiff		E	1.0				1
102				S			6,10,12 N = 22		
					1.45				
	2								2
	2.3	SHALE: dark grey and orange-brown, very low strength with low strength iron indurated bands, highly weathered, Hawkesbury Sandstone							
101				S	2.5		14,15/80 refusal		
					2.77				
		Below 2.9m: low strength							
	3								3
	3.1	Bore discontinued at 3.1m Refusal		A	3.0 3.1				
100									
	4								4
99									

RIG: Explora **DRILLER:** DB **LOGGED:** TM **CASING:** Uncased
TYPE OF BORING: Solid flight auger to 3.1m
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Proposed Multi-Purpose Medium Hall
LOCATION: 38-54 and 66 Eton Street, Sutherland

SURFACE LEVEL: 102.7 AHD
EASTING: 320786.2
NORTHING: 6232288
DIP/AZIMUTH: 90°/--

BORE No: BH12
PROJECT No: 224456.00
DATE: 28/9/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
102	0.0	FILL/ CLAY: low plasticity, brown, trace silt, ironstone gravel and rootlets, w<PL		E	0.0				
					0.1				
	0.35	CLAY CI-CH: medium to high plasticity, yellow-brown, w<PL, stiff, residual		E	0.4				
					0.5				
	1	Below 1.0m: very stiff		E	0.9				1
					1.0				
				S			2,7,16 N = 23		
	1.5	SHALE: dark grey with pale grey fine grained sandstone bands, very low strength with low strength iron indurated bands, highly weathered, Hawkesbury Sandstone			1.45				
101									
	2	Below 1.9m: low strength		A	1.9				2
	2.1	Bore discontinued at 2.1m Refusal			2.1				
100	3								3
99	4								4
98									

RIG: Explora **DRILLER:** DB **LOGGED:** TM **CASING:** Uncased

TYPE OF BORING: Solid flight auger to 2.1m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Proposed Multi-Purpose Medium Hall
LOCATION: 38-54 and 66 Eton Street, Sutherland, NSW 2232

SURFACE LEVEL: 112.2 AHD
COORDINATE: E:320810.7, N:6232518.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH101
PROJECT No: 224456.01
DATE: 16/07/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
	112	0.10	ASPHALTIC CONCRETE: 100 mm			NA	NA				0.10		
			FILL / Sandy SILT: brown; low plasticity; fine to medium sand.		FILL	ND	w>PL		ES		0.20		
									A/ES		0.40		
											0.50		
									ES		0.80		
		1.00	Silty CLAY (CH), with gravel: pale grey mottled red-brown; high plasticity; fine to medium, angular to sub-angular, ironstone gravel.		RS	VSt	w<PL				1.00		
	111								SPT			SPT	8,10,15 N=25
											1.45		
									ES		1.80		
	110	2									2.00		
		2.60	SILTSTONE: dark grey; inferred very low to low strength with extremely weathered and ironstone bands. Hawkesbury Sandstone			NA	NA				2.50		
			Borehole discontinued at 2.70m depth. Target depth reached.						SPT		2.70	SPT	16,25/50 (HB)
	109	3											
	108	4											

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

PLANT: Bobcat
METHOD: AD/T to 2.7 m
REMARKS: No free groundwater observed

OPERATOR: Ground Test (C.S.)

LOGGED: CSY
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Soil Log

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Proposed Multi-Purpose Medium Hall
LOCATION: 38-54 and 66 Eton Street, Sutherland, NSW 2232

SURFACE LEVEL: 112.2 AHD
COORDINATE: E:320798.3, N:6232511.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH102
PROJECT No: 224456.01
DATE: 16/07/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
	112	0.10	ASPHALTIC CONCRETE: 100 mm			NA	NA				0.10		
			FILL / Sandy SILT, trace gravel: brown and grey; low plasticity; fine to medium sand; fine to medium, ironstone gravel; trace rootlets and ash.		FILL	ND	w>PL		A/ES		0.20		
									A		0.40		
		0.70									0.50		
			Silty CLAY (CI), trace gravel: red-brown mottled brown; medium plasticity; fine, ironstone gravel; trace roots.			St - VSt	w>PL		ES		0.80		
	111	1									1.00		
									SPT			SPT	3,5,9 N=14 400kPa
			1.30m: becoming pale grey		RS								600kPa
											1.45	PP	
						VSt	w=PL to w<PL					PP	
	110	2							ES		1.80		
											2.00		
		2.50									2.50		
			SILTSTONE: dark grey; inferred very low to low strength with extremely weathered and ironstone bands. Hawkesbury Sandstone			NA	NA		SPT			SPT	9,15,25/100 (HB)
											2.90		
	109	3	Borehole discontinued at 2.90m depth. Target depth reached.										
	108	4											

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

PLANT: Bobcat
METHOD: AD/T to 2.9 m
REMARKS: No free groundwater observed

OPERATOR: Ground Test (C.S.)

LOGGED: CSY
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Proposed Multi-Purpose Medium Hall
LOCATION: 38-54 and 66 Eton Street, Sutherland, NSW 2232

SURFACE LEVEL: 111.9 AHD
COORDINATE: E:320792.9, N:6232501.6
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH103
PROJECT No: 224456.01
DATE: 16/07/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
		0.00	FILL / Sandy SILT, trace gravel: dark brown; low plasticity; fine to medium sand; fine, sandstone gravel; with wood fragment and rootlets.		FILL	ND	w>PL		ES		0.10		
									ES		0.40 0.50		
		0.70	FILL / Silty CLAY, trace gravel: red-brown mottled brown; medium to high plasticity; fine, ironstone gravel; trace rootlets.		FILL possibly RS	ND	w>PL		ES		0.80		
	111	1									1.00		
		1.20	Silty CLAY (CH), trace gravel: pale grey mottled red-brown; high plasticity; fine, ironstone gravel; trace rootlets.		RS	St - VSt	w=PL		SPT		1.45	SPT	4,6,6 N=12 540-580kPa
												PP	
	110	2							A		1.80 2.00		
		2.40			XWM	H	w<PL		SPT		2.50	SPT	12,19,24 N=43
	109	3.00	SILTSTONE: dark grey; inferred very low strength with extremely weathered and ironstone bands. Hawkesbury Sandstone			NA	NA				2.95		
	108	4											
			Borehole discontinued at 4.00m depth. Target depth reached.										
	107												

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

PLANT: Bobcat
METHOD: AD/T to 4.0 m
REMARKS: No free groundwater observed

OPERATOR: Ground Test (C.S.)

LOGGED: CSY
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Proposed Multi-Purpose Medium Hall
LOCATION: 38-54 and 66 Eton Street, Sutherland, NSW 2232

SURFACE LEVEL: 112.1 AHD
COORDINATE: E:320805.6, N:6232503.6
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH104
PROJECT No: 224456.01
DATE: 16/07/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
						NA	NA						
	112	0.05	ASHPALTIC CONCRETE: 50 mm								0.05		
			FILL / Sandy SILT, trace gravel: brown; low plasticity; fine to medium sand; fine, ironstone gravel; trace rootlets.		FILL	ND	w>PL		A/ES		0.20		
											0.40		
									ES		0.50		
		0.60	Silty CLAY (CH), trace gravel: red-brown; high plasticity; fine, ironstone gravel; trace rootlets.										
		1									1.00		
	111						w=PL		SPT			SPT	5,6,10 N=16
													600-kPa
											1.45	PP	
					RS	St - VSt			ES		1.50		
		2	2.00m: becoming pale grey								2.00		
	110								ES		2.20		
							w<PL						
											2.50		
									SPT			SPT	9,15,21 N=36
		2.80	SILTSTONE: dark grey; inferred very low strength with extremely weathered and ironstone bands. Hawkesbury Sandstone			NA	NA				2.95		
		3	Borehole discontinued at 3.00m depth. Target depth reached.										
	109												
		4											
	108												

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

PLANT: Bobcat
METHOD: AD/T to 3.0 m
REMARKS: No free groundwater observed

OPERATOR: Ground Test (C.S.)

LOGGED: CSY
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Proposed Multi-Purpose Medium Hall
LOCATION: 38-54 and 66 Eton Street, Sutherland, NSW 2232

SURFACE LEVEL: 112.1 AHD
COORDINATE: E:320808.7, N:6232503.2
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH105
PROJECT No: 224456.01
DATE: 16/07/24
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TESTING AND REMARKS: TEST TYPE	TESTING AND REMARKS: RESULTS AND REMARKS
	112	0.10	ASPHALTIC CONCRETE: 100 mm			NA	NA				0.10		
			FILL / Silty SAND, trace gravel: brown; fine to medium; low plasticity silt; fine, ironstone gravel; trace plaster and root fibers.		FILL				ES		0.20		
		0.30	FILL / Silty CLAY, with sand, trace gravel: brown and red-brown; low to medium plasticity; fine to medium sand; fine to medium, igneous and ironstone gravel; trace root fibers, possibly reworked natural.		FILL possibly RS	ND	M		ES		0.40		
		0.60	Silty CLAY (CH), trace gravel: red-brown; high plasticity; fine, ironstone gravel; trace roots.								0.50		
									A/ES		0.80		
	111	1	1.20m: becoming pale grey		RS	VSt - H	w=PL				1.00		
									SPT			SPT	5,9,9 N=18
											1.45	PP	500-kPa
		1.70	Silty Gravelly CLAY (CI): pale grey mottled red-brown; medium plasticity; fine to medium, siltstone and ironstone gravel.						A		1.80		
	110	2			XWM		w<PL				2.00		
											2.50		
		2.70	SILTSTONE: dark grey; inferred very low to low strength with extremely weathered and ironstone bands. Hawkesbury Sandstone						SPT			SPT	6,17,18/100 (HB)
											2.90		
	109	3				NA	NA		A		3.00		
											3.20		
		4											
	108		Borehole discontinued at 4.00m depth. Target depth reached.										

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

PLANT: Bobcat
METHOD: AD/T to 4.0 m
REMARKS: No free groundwater observed

OPERATOR: Ground Test (C.S.)

LOGGED: CSY
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Terminology, Symbols and Abbreviations

November 2023

Introduction to Terminology, Symbols and Abbreviations

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

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

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

Abbreviation Codes

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

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

Data Integrity Codes

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

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

Graphic Symbols

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

intentionally blank

Soil Descriptions

Terminology
Symbols
Abbreviations

March 2024

Introduction

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

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

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

Particle size designation and Behaviour Model

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

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

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

[1] – refer grain size subdivision descriptions below

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

Component proportions

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

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

[1] As defined in AS1726-2017 6.1.4.4

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

Composite Materials

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

Soil Descriptions

Classification

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

Soil Name

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

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

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

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

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

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

Identification of minor components

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

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

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

Soil Composition

Plasticity

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

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

Grain Size

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

Grading

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

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

Soil Condition

Moisture

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

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

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

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

Consistency/Density/Compaction/Cementation/Extremely Weathered Material

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

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

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

Consistency (fine grained soils)

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

Relative Density (coarse grained soils)

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

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

Compaction (anthropogenically modified soil)

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

Cementation (natural and anthropogenic)

Cementation Term	Abbreviation Code
Moderately cemented	MOD
Weakly cemented	WEK

Extremely Weathered Material

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

Soil Origin

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

Cobbles and Boulders

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

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

intentionally blank

Rock Strength

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

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

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

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

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

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

Degree of Weathering

The degree of weathering of rock is classified as follows:

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

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

Degree of Alteration

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

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

Degree of Fracturing

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

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

Rock Quality Designation

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

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

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

Stratification Spacing

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

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

Defect Descriptions

Defect Type

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

Rock Defect Orientation

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

Rock Defect Coating

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

Rock Defect Infill

Term	Abbreviation Code
Calcite	CA
Carbonaceous	CBS
Clay	CLAY
Iron oxide	FE
Manganese	MN
Pyrite	Py
Secondary material	MS
Silt	M
Quartz	Qz
Unidentified material	MU

Rock Defect Shape/Planarity

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

Rock Defect Roughness

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

Defect Orientation

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

intentionally blank

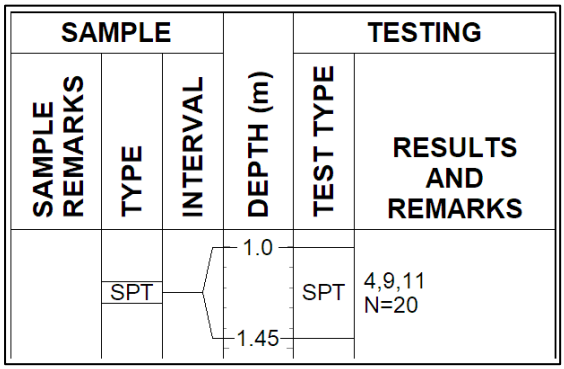
Sampling, Testing and Excavation Methodology

Terminology
Symbols
Abbreviations

March 2024

Sampling and Testing

A record of samples retained, and field testing performed is usually shown on a Douglas Partners' log with samples appearing to the left of a depth scale, and selected field and laboratory testing (including results, where relevant) appearing to the right of the scale, as illustrated below:



Sampling

The type or intended purpose for which a sample was taken is indicated by the following abbreviation codes.

Sample Type	Code
Auger sample	A
Acid Sulfate sample	ASS
Bulk sample	B
Core sample	C
Disturbed sample	D
Environmental sample	ES
Gas sample	G
Piston sample	P
Sample from SPT test	SPT
Undisturbed tube sample	U[1]
Water sample	W
Material Sample	MT
Core sample for unconfined compressive strength testing	UCS

[1] – numeric suffixes indicate tube diameter/width in mm

The above codes only indicate that a sample was retained, and not that testing was scheduled or performed.

Field and Laboratory Testing

A record that field and laboratory testing was performed is indicated by the following abbreviation codes.

Test Type	Code
Pocket penetrometer (kPa)	PP
Photo ionisation detector (ppm)	PID
Standard Penetration Test x/y =x blows for y mm penetration HB = hammer bouncing HW = fell under weight of hammer	SPT
Shear vane (kPa)	V
Unconfined compressive strength, (MPa)	UCS

Field and laboratory testing (continued)

Test Type	Code
Point load test, (MPa), axial (A), diametric (D), irregular (I)	PLT(_)
Dynamic cone penetrometer, followed by blow count penetration increment in mm (cone tip, generally in accordance with AS1289.6.3.2)	DCP/150
Perth sand penetrometer, followed by blow count penetration increment in mm (flat tip, generally in accordance with AS1289.6.3.3)	PSP/150

Groundwater Observations

▷	seepage/inflow
▽	standing or observed water level
NFGWO	no free groundwater observed
OBS	observations obscured by drilling fluids

Drilling or Excavation Methods/Tools

The drilling/excavation methods used to perform the investigation may be shown either in a dedicated column down the left-hand edge of the log, or stated in the log footer. In some circumstances abbreviation codes may be used.

Method	Abbreviation Code
Direct Push	DP
Solid flight auger. Suffixes: /T = tungsten carbide tip, /V = v-shaped tip	AD[1]
Air Track	AT
Diatube	DT[1]
Hand auger	HA[1]
Hand tools (unspecified)	HAND
Existing exposure	X
Hollow flight auger	HSA[1]
HQ coring	HQ3
HMLC series coring	HMLC
NMLC series coring	NMLC
NQ coring	NQ3
PQ coring	PQ3
Predrilled	PD
Push tube	PT[1]
Ripping tyne/ripper	R
Rock roller	RR[1]
Rock breaker/hydraulic hammer	EH
Sonic drilling	SON[1]
Mud/blade bucket	MB[1]
Toothed bucket	TB[1]
Vibrocore	VC[1]
Vacuum excavation	VE
Wash bore (unspecified bit type)	WB[1]

[1] – numeric suffixes indicate tool diameter/width in mm

Douglas PARTNERS

Appendix C

Remediation Options Assessment and Evaluation

1. Introduction

The following key guidelines and technical reports were consulted in the preparation of this remediation options assessment:

- NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM])* (NEPC, 2013); and
- CRC CARE *Remediation Action Plan: Development - Guideline on Performing Remediation Options Assessment* (CRC CARE, 2019a).

The first stage of developing a remediation strategy is to establish clear and measurable remediation objectives and remediation criteria (clean-up levels). These will form the requirements against which remediation options are assessed.

The next stage of the remediation options assessment is to select technology and management options, or combinations of options, that have the potential to reduce contaminant concentrations and / or apply management controls as necessary so that the remediation objectives are achieved, and no unacceptable risk is posed by the contamination in the context of the current and proposed site use. Where several viable options have been identified, an assessment of each of the options will be required to determine which option will most adequately and sustainably meet the remediation objectives (CRC CARE, 2019a).

The remediation objectives are to:

- Address potentially unacceptable risks to relevant environmental values from contamination (refer to the CSM in Section 8); and
- Render the site suitable, from a contamination perspective, for the proposed development (refer to Section 2).

This remediation options assessment applies to Remediation Area 1 (the whole site) which has been found to impacted by heavy metal (i.e. lead and zinc), PAH (i.e. B(a)P and B(a)P TEQ) and / or TRH (i.e. F3 (>C16-C34)) in fill.

2. Hierarchy of remediation options

NEPC (2013) stipulates the preferred hierarchy of options for site clean-up (remediation) and / or management which is outlined as follows:

- On-site treatment of the contamination so that it is destroyed, or the associated risk is reduced to an acceptable level; and
- Off-site treatment of excavated soil, so that the contamination is destroyed, or the associated risk is reduced to an acceptable level, after which soil is returned to the site.

or, if these two options are not practicable;

- Consolidation and isolation of the soil on site by containment with a properly designed barrier; and

- Removal of contaminated material to an approved site or facility, followed, where necessary, by replacement with appropriate material.

or,

- Where the assessment indicates remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy.

3. Remediation options assessment

3.1 Introduction

Elevated heavy metal, PAH and / or TRH has been identified in fill which require remediation across the site.

The following key guidelines have therefore been consulted:

- CRC CARE Technology Guide: Soil - Excavation (CRC CARE, 2019b);
- CRC CARE Technology Guide: Soil - Containment (CRC CARE, 2019c); and
- WA DoH Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (WA DoH, 2021).

3.2 Remediation options

Given the straightforward nature of the contamination issues at the site and the necessary earthworks (final landform) as part of the proposed development, only two options for the soil contamination have been considered, as follows:

- On-site management (cap and contain); and
- Excavation and off-site landfill disposal.

The following key guidelines have therefore been consulted:

- CRC CARE *Technology Guide: Soil - Excavation* (CRC CARE, 2019b);
- CRC CARE *Technology Guide: Soil - Containment* (CRC CARE, 2019c);
- WA DoH *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia* (WA DoH, 2021); and
- WorkCover NSW *Managing Asbestos in or on Soil* (WorkCover NSW, 2014).

When deciding which option to choose, the sustainability (environmental, economic and social) of each option should be considered, in terms of achieving an appropriate balance between the benefits and effects of undertaking the option. In cases where no readily available or economically feasible method is available for remediation, it may be possible to adopt appropriate regulatory controls or develop other forms of remediation (NEPC, 2013).

3.2.1 On-site management (cap and contain)

Consolidation and isolation (capping and containment) involves the capping of material with contaminant concentrations above the adopted RAC, either *in-situ* or in a specific location nominated by the client. Capping comprises covering the impacted soil with a geotextile fabric, an engineered capping layer and / or burial at a specified depth.

This option is considered to be viable given the following:

- Physical, non-leaching contamination (e.g. lead and low-level PAH, and potentially asbestos after demolition); and
- Generally low-level contamination.

Benefits of this remediation option include:

- Potentially minimal disturbance of soil;
- No movement of contaminated soils on public roads;
- A more sustainable solution; and
- Potentially lower cost and time delays.

Constraints associated with the option include:

- Requires available space (vertically and laterally) within the site to accommodate the impacted soils;
- On-going management responsibility of the long-term environmental management plan (LTEMP);
- The LTEMP must be legally enforceable, options to achieve this include recording of the LTEMP on the S10.7 certificate (or similar recording means) which may have implications for property value; and
- Contaminants which leach would require a base liner, and impermeable cap or other method to managing the leachate.

Given that the proposal development involves minimal excavation of near surface soils and the site or the site will be covered by hardstand, and that the elevated metal, PAH and / or TRH are not significantly leachable contaminants or at low level, this option is considered feasible.

3.2.2 Excavation and off-site disposal

Off-site disposal is technically a straightforward option for impacted soil and could be completed in a relatively short time scale prior to development of the site. The option would remove from the site maintenance and risk legacy associated with impacted soils.

The impacted fill is estimated to a depth of up to 1.3 m bgl across the site. The proposed development involves some filling to achieve design building platform levels. As such, there is unlikely to be significant volumes of surplus soil, if any. It is more likely that excavated soil (e.g. piles, OSD, services) would be relocated beneath the building slab.

This option results in further filling of landfills which are largely reaching capacity (hence not following principals of sustainability).

The removal of material to landfill would involve a formal waste classification(s) and transport of contaminated material to an EPA licensed landfill. Tracking and disposal records would need to be retained for inclusion in the site validation report.

Whilst this option is technically feasible, this option is considered as a contingency only for surplus soils that may be generated and are not reusable within the site.

4. References

CRC CARE. (2019a). *Remediation Action Plan: Development - Guideline on Performing Remediation Options Assessment*. National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

CRC CARE. (2019b). *Technology Guide: Soil - Excavation*. National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

CRC CARE. (2019c). *Technology Guide: Soil - Containment*. National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

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

WorkCover NSW. (2014). *Managing Asbestos in or on Soil*. March 2014: WorkCover NSW, NSW Government.

Appendix D

Contingency Plan and Unexpected Find Protocol

1. General

Where the site conditions are found to be different than that anticipated during the remediation works, the proposed remediation approach may not be appropriate for the contamination encountered. In such cases the Environmental Consultant is to re-assess the contamination and remediation approach. Where necessary the Environmental Consultant will prepare an addendum to, or revision of, this RAP.

2. Contingency plan

This contingency plan has been developed to provide guidance on processes to follow if contamination (or indicators of contamination), other than that included in the remediation strategy, (Section 11) is encountered during the remediation works. Any such finds shall be surveyed and the location documented.

Although the site has been subject to previous investigation(s), there remains a potential for soil contamination to be present between sampled locations. In the event that signs of soil contamination, other than that included in the remediation strategy, are encountered during remediation e.g. evidence of asbestos containing material (ACM), petroleum, or other chemical odours which weren't previously identified the following protocols will apply:

- The Site Manager is to be notified and the affected area closed off by the use of barrier tape and warning signs;
- The Environmental Consultant is to be notified to inspect the area and assess the significance of the potential contamination and determine extent of remediation works (if deemed necessary) to be undertaken. An assessment report and management plan detailing this information will be compiled by the Environmental Consultant and provided to the Principal's Representative;
- The assessment results together with a suitable management plan shall be provided by the Principal's Representative to the Consent Authority (if required by the development consent);
- The agreed management / remedial strategy, based on the RAP and relevant guidelines (e.g. WA DoH (2021), for asbestos issues), shall be implemented; and
- All details of the assessment and remedial works are to be included in the site validation report.

3. Unexpected finds protocol

This unexpected finds protocol (UFP) has been developed to provide guidance on processes to follow if any unexpected find is encountered during the remediation or future civil and construction works. Any unexpected finds should be surveyed and the location documented.

All site personnel are to be inducted into their responsibilities under this (UFP), which should be included or referenced in the Remediation Contractors Environmental Management Plan.

All site personnel are required to report unexpected signs of environmental concern to the Site Manager if observed during the course of their works e.g. presence of potential unexploded ordinance, unnatural staining, potential contamination sources (such as buried drums or tanks) or chemical spills.

Should signs of concern be observed, the Site Manager, as soon as practical, will:

- Stop work in the affected area and ensure the area is barricaded to prevent unauthorised access;
- Notify authorities needed to obtain emergency response for any health or environmental concerns (e.g. fire brigade);
- Notify the Principal's Representative of the occurrence;
- Notify any of the authorities that the Remediation Contractor is legally / contractually required to notify (e.g. EPA, Council); and
- Notify the Environmental Consultant.

The Principal's Representative is to notify any of the authorities which the Principal is legally / contractually required to notify (e.g. EPA, Council). Where appropriate the Principals Representative will also implement appropriate community consultation in accordance with the Communications Plan (refer to Section 17).

The Environmental Consultant will assess the extent and significance of the find and develop an investigation, remediation or management approach using (where possible) the principles and procedures already outlined in the RAP.

4. References

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

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

Appendix E

Remediation Acceptance Criteria / Site Assessment Criteria

1. Introduction

1.1 Guidelines

The following key guidelines were consulted for deriving the remediation acceptance criteria (RAC) / site assessment criteria (SAC):

- NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013); and
- CRC CARE *Health screening levels for petroleum hydrocarbons in soil and groundwater* (CRC CARE, 2011).

1.2 General

The RAC / SAC applied to any contingency or unexpected finds scenarios during site remediation are informed by the CSM which identified human and environmental receptors to potential contamination at the site. Analytical results are assessed (as a Tier 1 assessment) against the SAC comprising primarily the investigation and screening levels of Schedule B1 of NEPC (2013).

The following inputs are relevant to the selection and / or derivation of the SAC:

The proposed development comprises construction of a multi-purpose medium hall including toilets and a canteen.

- Land use: residential (which includes primary schools):
    - Corresponding to land use category 'A', residential with garden / accessible soil (home grown produce <10% fruit and vegetable intake, (no poultry)), also includes children's day care centres, preschools and primary schools.
- Soil type: The fill encountered across the three proposed Option 1 area consisted of CLAY and SAND overlaying by natural CLAY. For the purpose of this investigation SAND was selected as the soil type as it informs the most stringent criteria.

2. Soils

2.1 Health investigation and screening levels

The generic health investigation levels (HIL) and health screening levels (HSL) are considered to be appropriate for the assessment of human health risk via all relevant pathways of exposure associated with contamination at the site. The adopted soil HIL and HSL for the contaminants of concern are in Table 1 and Table 2.

Table 1: Health investigation levels (mg/kg)

Contaminant	HIL-A
Metals	
Arsenic	100
Cadmium	20
Chromium (VI)	100
Copper	6000
Lead	300
Mercury (inorganic)	40
Nickel	400
Zinc	7400
PAH	
B(a)P TEQ	3
Total PAH	300
Phenols	
Pentachlorophenol	100
Phenol	3000
OCP	
DDT+DDE+DDD	240
Aldrin and dieldrin	6
Chlordane	50
Endosulfan	270
Endrin	10
Heptachlor	6
HCB	10
Methoxychlor	300
OPP	
Chlorpyrifos	160
PCB	
PCB	1

Table 2: Health screening levels (mg/kg)

Contaminant	HSL-A&B	HSL-A&B	HSL-A&B
SAND	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**
Benzene	0.5	0.5	0.5
Toluene	160	220	310
Ethylbenzene	55	NL	NL
Xylenes	40	60	95
Naphthalene	3	NL	NL
TRH F1	45	70	110
TRH F2	110	240	440

Notes: TRH F1 is TRH C_6-C_{10} minus BTEX
TRH F2 is TRH >C_{10}-C_{16} minus naphthalene
The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would results in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'

Note that various depths to contamination are listed in Table 2. This is due to the potential depths between receptors (i.e. at ground or basement level) and the contaminant sources (e.g. fill and groundwater). Only the most conservative criteria are presented on the results tables in Appendix F.

The HSL for direct contact derived from CRC CARE (2011) are in Table 3.

Table 3: Health screening levels for direct contact (mg/kg)

Contaminant	DC HSL-A	DC HSL-IMW
Benzene	100	1100
Toluene	14 000	120 000
Ethylbenzene	4500	85 000
Xylenes	12 000	130 000
Naphthalene	1400	29 000
TRH F1	4400	82 000
TRH F2	3300	62 000
TRH F3	4500	85 000
TRH F4	6300	120 000

Notes: TRH F1 is TRH C_6-C_{10} minus BTEX
TRH F2 is TRH >C_{10}-C_{16} minus naphthalene
IMW intrusive maintenance worker

2.2 Asbestos in soil

The HSL for asbestos in soil are based on likely exposure levels for different scenarios published in NEPC (2013) for the following forms of asbestos:

- Bonded asbestos containing material (ACM); and
- Fibrous asbestos and asbestos fines (FA and AF).

The HSL are in Table 4.

Table 4: Health screening levels for asbestos

Form of asbestos	HSL-A
ACM	0.01%
FA and AF	0.001%
FA and AF and ACM	No visible asbestos for surface soil *

Notes: Surface soils defined as top 10 cm.
* Based on site observations at the sampling points and the analytical results of surface samples.

2.3 Ecological investigation levels

Ecological investigation levels (EIL) and added contaminant limits (ACL), where appropriate, have been derived in NEPC (2013) for arsenic, copper, chromium (III), nickel, lead, zinc, DDT and naphthalene. The adopted EIL, derived using the interactive (excel) calculation spreadsheet on the NEPM toolbox website are shown in Table 6, with inputs into their derivation shown in Table 5.

Table 5: Inputs to the derivation of the ecological investigation levels

Variable	Input	Rationale
Age of contaminants	"Aged"	Soils on site are > 2 years
pH	5.7	-
CEC	5.8 $cmol_c/kg$	-
Clay content	10%	Variable soil in some fill locations, conservative value of clay adopted
Traffic volumes	high	-
State / Territory	NSW	-

Table 6: Ecological investigation levels (mg/kg)

Contaminant	EIL-A-B-C
Metals	
Arsenic	100
Copper	140
Nickel	50
Chromium III	410
Lead	1100
Zinc	350
PAH	
Naphthalene	170
OCP	
DDT	180

EIL-A-B-C urban residential and public open space

2.4 Ecological screening levels

Ecological screening levels (ESL) are used to assess the risk of selected petroleum hydrocarbon compounds, BTEX and benzo(a)pyrene to terrestrial ecosystems. The adopted ESL are shown in Table 7.

Table 7: Ecological screening levels (mg/kg)

Contaminant	Soil Type	ESL-A-B-C
Benzene	Coarse	50
Toluene	Coarse	85
Ethylbenzene	Coarse	70
Xylenes	Coarse	105
TRH F1	Coarse/ Fine	180*
TRH F2	Coarse/ Fine	120*
TRH F3	Coarse	300
TRH F4	Coarse	2800
B(a)P	Coarse	0.7

Notes: ESL are of low reliability except where indicated by * which indicates that the ESL is of moderate reliability
TRH F1 is TRH C_6-C_{10} minus BTEX
TRH F2 is TRH >C_{10}-C_{16} including naphthalene
ESL-A-B-C urban residential and public open space

2.5 Management limits

In addition to appropriate consideration and application of the HSL and ESL, there are additional considerations which reflect the nature and properties of petroleum hydrocarbons, including:

- Formation of observable light non-aqueous phase liquids (LNAPL);
- Fire and explosion hazards; and
- Effects on buried infrastructure e.g. penetration of, or damage to, in-ground services.

The adopted management limits are in Table 8.

Table 8: Management limits (mg/kg)

Contaminant	Soil type	ML-A-B-C
TRH F1	Coarse	700
TRH F2	Coarse	1000
TRH F3	Coarse	2500
TRH F4	Coarse	10 000

Notes: TRH F1 is TRH C_6-C_{10} including BTEX
TRH F2 is TRH >C_{10}-C_{16} including naphthalene
ML-A-B-C residential, parkland and public open space

3. References

CRC CARE. (2011). *Health screening levels for petroleum hydrocarbons in soil and groundwater.* Parts 1 to 3, Technical Report No. 10: Cooperative Research Centre for Contamination Assessment and Remediation of the Environment.

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM].* Australian Government Publishing Services Canberra: National Environment Protection Council.

Appendix F

Data Quality Objectives

1. Introduction

The objective of the validation plan is to assess whether the capping layer has been constructed in accordance with the RAP, assess the resultant suitability of the site for the intended land use, and to provide information on any environmental impacts which may have resulted from the works.

The validation assessment will be conducted with reference to the seven step data quality objectives process (DQO) as outlined in NEPC (2013), described below. The DQO in NEPC (2013) is in turn, based on the DQO process outlined in USEPA (2006), and associated guidelines.

2. Data quality objectives

Table 1: Data quality objectives – validation plan (cap and contain)

Step	Summary
1: State the problem	The site requires remediation and validation in order to render it suitable for the proposed school upgrades. The objective of the validation plan is to confirm the successful implementation of this remediation action plan. A conceptual site model (CSM) for the proposed development has been prepared (Section 8).
2: Identify the decisions / goal of the study	The decision is to determine the site is suitable for the proposed school updates following remediation of the site. The CSM identifies contamination at the site which posed potentially unacceptable risks to human health or the environment. The remediation strategy required the placement of a marker layer above the fill which was confirmed to contain elevated heavy metal, PAH and / or TRH. The decision is to establish whether the capping layer has been placed in general accordance with the RAP and whether the site has been remediated in general accordance with the RAP.

Step	Summary
3: Identify the information inputs	Relevant inputs to the decision include: • The CSM identifying CoPC and affected media; • Results analysed for the relevant CoPC using NATA accredited laboratories and methods, where possible; • Field and laboratory QA / QC data to assess the suitability of the environmental data for the validation assessment; • Results compared with the RAC; • Inspections of the maker layer prior to capping works; • Assessments of aggregates, soil, etc imported as part of the capping; • Inspections of the capping; • Review of the survey of the installed capping; • An enforceable long term environmental management plan (LTEMP) has been prepared for implementation during use of the land for the purposes of primary school land use; and • Details of the proposed development.
4: Define the study boundaries	The lateral boundaries of the site are shown on Drawing 1, Appendix A1. The vertical boundaries are to the extent of contamination impact as determined from the site history assessment, site observations and previous investigations used to inform the RAP.
5: Develop the analytical approach (or decision rule)	The decision rule is the construction of the capping to at least the minimum thicknesses included in Section 11.3. Quality control results, where applicable, are to be assessed according to their relative percent difference (RPD) values. For field and laboratory duplicate results, RPDs should generally be below 30%; for field blanks, results should be at or less than the limits of reporting (NEPC, 2013). The field and laboratory quality assurance assessment are included in Section 16.
6: Specify the performance or acceptance criteria	Baseline condition: The capping has not been constructed in accordance with this RAP (null hypothesis). Alternative condition: The capping has been constructed in accordance with this RAP (alternative hypothesis). Unless conclusive information from the collected data is sufficient to reject the null hypothesis, it is assumed that the baseline condition is true.
7: Optimise the design for obtaining data	Sampling design and procedures to be implemented to optimise data collection for achieving the DQO, where applicable, include the following: • Sampling frequencies in accordance with Section 13; • Analysis for the CoPC at NATA accredited laboratories using NATA endorsed methods will be used to perform laboratory analysis whenever possible; • Adequately experienced environmental scientists / engineers will conduct field work and sample analysis interpretation; • Visual inspections of the cap construction by the Environmental Consultant in accordance with Section 13; and • Registered survey of the capping layer in accordance with Section 13.

3. References

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

USEPA. (2006). *Guidance on systematic planning using the data quality objectives process, EPA QA/G-4*. Washington DC.: United States Environmental Protection Agency, Office of Environmental Information.

Appendix G

Site Management Plan

1. Introduction

This general site management plan (SMP) has been developed to minimise potentially adverse impacts on the environment, and worker and public health as a result of the proposed remediation works.

The Remediation Contractor must have in place a construction environmental management plan (CEMP) (or similar) which is specific to the equipment used for the remediation and the proposed methods to be adopted by the Remediation Contractor. This SMP has been prepared to augment the Remediation Contractor's CEMP and contains general details for aspects of the work, as per reporting requirements for a remediation action plan (RAP) under NSW EPA *Guidelines for Consultants Reporting on Contaminated Land* (NSW EPA, 2020).

Apart from the management principles outlined in this SMP, the Remediation Contractor must also ensure compliance with all relevant environmental legislation and regulations, including (but not limited to) the following:

- Contaminated Land Management Act 1997 NSW (CLM Act);
- Protection of the Environment Operations Act 1997 NSW (POEO Act);
- Protection of the Environment Legislation Amendment Act 2011 NSW;
- Protection of the Environment Operations Amendment (Scheduled Activities and Waste) Regulation 2008 NSW;
- Environmentally Hazardous Chemicals Act 1985 NSW;
- Environmental Offences and Penalties Act 1989 NSW;
- Pesticide Act 1999 NSW and Pesticides Regulation 2017; and
- Work Health and Safety Act 2017 NSW (WHS Act) and Work Health and Safety Regulations 2017 NSW.

2. Roles and responsibilities

2.1 Principal

The Principal is responsible for the environmental performance of the proposed remediation works, including implementation of acceptable environmental controls during remediation works. The Principal will retain the overall responsibility for ensuring this RAP is appropriately implemented. The Principal is to nominate a representative (the Principal's Representative), who is responsible for overseeing the implementation of this RAP. The actual implementation of the RAP will, however, be conducted by the Principal Contractor on behalf of the Principal.

The Principal is responsible for providing appropriate information to the Contractor to allow them to safely plan the required works. This includes the asbestos register for the site and this RAP.

The Principal is also responsible for implementing an appropriate communications plan.

2.2 Remediation contractor

The Remediation Contractor will be the party responsible for daily implementation of this RAP and shall fulfil the responsibilities of the Remediation Contractor as defined by SafeWork NSW. It is noted that the Remediation Contractor may appoint appropriately qualified sub-contractors or sub-consultants to assist in fulfilling the requirements of the procedures. The Remediation Contractor will appoint a Site Manager.

In addition to the implementation of the RAP it will be the Remediation Contractors responsibility to:

- Obtain / ensure relevant sub-contractors obtain specific related approvals as necessary to implement the earthworks including permits for removal of asbestos-containing material, SafeWork NSW notification etc.;
- Develop or request and review any site plans to manage the works to be conducted;
- Ensure that all remediation works and other related activities are undertaken in accordance with this RAP;
- Maintain all site records related to the implementation of this RAP including but not limited to:
    - Tracking of all movement of soil within the site and off-site from cradle to grave;
    - Transportation Record: comprising a record of all truckloads of soil (including aggregate) entering the site, including truck identification (e.g. registration number), date, time, source site, load characteristics (e.g. type of material, i.e. quarried aggregate, etc.), approximate volume, use (e.g. general site raising, service trenches, etc.);
    - Disposal dockets: for any soil disposed off-site including transportation records, spoil source, spoil disposal location, receipt provided by the receiving waste facility / site;
    - Imported materials records: records for any soil imported onto the site, including source site, classification reports, inspection records of soil upon receipt at site and transportation records;
    - Records relating to any unexpected finds and contingency plans implemented;
    - Photographic records by all contractors and consultants of the works undertaken within their purview of responsibilities; and
    - Surveys pre- and post-installation of geotextile marker layer and clean fill cap.
- Ensure sufficient information is provided to engage or direct all required parties, including sub-contractors, to implement the requirements of the RAP other than those that are the direct responsibility of the Remediation Contractor;
- Manage the implementation of any recommendation made by those parties in relation to work undertaken in accordance with the RAP;
- Inform, if appropriate, the relevant regulatory authorities of any non-conformances with the procedures and requirements of the RAP in accordance with the procedures outlined in this document;
- Retain records of any contingency actions;
- On completion of the project, to review the RAP records for completeness and update as necessary; and

- Recommend any modification to general documentation which would further improve the environmental outcomes of this RAP.

2.3 Surveyor

The project surveyor will be a registered surveyor engaged by the Remediation Contractor to undertake surveying works as required by this RAP.

2.4 Sub-contractors

All sub-contractors will be inducted onto the site, informed of their responsibilities in relation to this RAP and sign their agreement to abide by the RAP requirements. Where necessary, sub-contractors will also be trained in accordance with the requirements of this document. All sub-contractors must conduct their operations in accordance with the RAP as well as all applicable regulatory requirements.

2.5 Environmental consultant

The Environmental Consultant will provide advice on implementing the RAP. The Environmental Consultant will be responsible for:

- Undertake any required assessments where applicable (e.g. waste classification, validation);
- Provide advice and recommendations arising from monitoring and/or inspections, including unexpected finds; and
- Notify the Client with any results of assessments, and any observed non-conformances.

2.6 Site workers

All workers on the site are responsible for observing the requirements of this RAP and other management plans. These responsibilities include the following:

- Being inducted on the site and advised of the general nature of the remediation / environmental issues at the site;
- Being aware of the requirements of this plan;
- Wearing appropriate personal protective equipment (PPE) as required by this plan;
- Only entering restricted areas when permitted; and
- Requesting clarification when unclear of requirements of this or any other plans (e.g. safe work method statements (SWMS)).

3. Water management

3.1 Stormwater

Stormwater must be managed during the remediation works such that potential adverse impacts from surface runoff (e.g. cross contamination, mobilisation of contaminants in soil particles, etc.) are appropriately mitigated. Accordingly, the Remediation Contractor will take appropriate measures which may include:

- Construction, where necessary, of stormwater diversion channels, bunding and linear drainage sumps with catch pits in and around the remediation areas to divert stormwater from the contaminated areas;
- Provision of appropriately located sediment traps including geotextiles; and
- Discharge of excess water in excavations / low points on a regular basis to limit the potential for flooding.

3.2 Dewatering of excavations

Any runoff or seepage water accumulated in site excavations that requires removal must initially be sampled and tested for suspended solids, pH and any contaminants of potential concern (CoPC) as identified by the Environmental Consultant. The options for management of excavation pump-out water, dependent upon the test results, are for disposal of the water as follows:

- Discharge to stormwater with prior approval from Council. Provided the test results comply with relevant ANZG *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018), or any other compliance requirements stipulated by Council. The Environmental Consultant must consider the most appropriate criteria to be used; or
- Discharge to sewer, as industrial trade wastewater, with prior approval from Sydney Water. This option would require the analysis of a larger list of analytes, and compliance with the Sydney Water acceptance standards; or
- Pumping by a liquid waste contractor for removal of the water off-site, in accordance with regulatory requirements.

Note that, depending on the type and scale of the dewatering required, a permit (water use approval) may need to be obtained through NSW Water.

4. Soil management plan

The Remediation Contractor will develop a plan to mitigate cross contamination as part of the CEMP to be implemented throughout the works.

4.1 Stockpiling of contaminated material

Contaminated material shall be excavated and stockpiled at a suitably segregated location(s) away from sensitive areas (e.g. water bodies, drainage lines, stormwater pits, etc.) and ongoing excavations, and in a manner that will not cause nuisance to the neighbouring properties. Soil stockpiles are to be managed as follows:

- An impermeable membrane such as plastic sheeting should be provided at the surface by the Remediation Contractor prior to stockpiling. Plastic sheeting should be taped at joins, as necessary;
- All stockpiles of contaminated material shall be surrounded by star pickets and marking tape or other suitable material to clearly delineate their boundaries;
- Stockpiles shall be lightly conditioned by sprinkler or covered by geotextile or similar cover to prevent dust generation;
- Stockpiles impacted, or potentially impacted, with asbestos must be covered by geotextile;
- Measures should be taken by the Remediation Contractor to prevent the migration of stockpile materials (i.e. perimeter bunds, hay bales, silt fences, etc.); and
- A record of stockpile locations (stockpile register), dimensions, descriptions, environmental controls, etc. should be maintained by the Remediation Contractor.

All movement of soil within the site and off-site is to be tracked by the Remediation Contractor, from cradle to grave. Copies of tracking records must be provided to the Environmental Consultant.

4.2 Stockpiling imported material

Imported material shall be stockpiled at a suitably segregated location(s) away from sensitive areas (e.g., water bodies, drainage lines, stormwater pits, etc.) and ongoing excavations, and in a manner that will not cause nuisance to the neighbouring properties. Soil stockpiles are to be managed as follows:

- Imported material should not be stockpiled within un-remediated areas of the site. If this is unavoidable an impermeable membrane such as plastic sheeting should be provided at the surface by the Remediation Contractor prior to stockpiling. Plastic sheeting should be taped at joins, as necessary;
- All stockpiles of contaminated material shall be surrounded by star pickets and marking tape or other suitable material to clearly delineate their boundaries;
- Stockpiles shall be lightly conditioned by sprinkler or covered by geotextile or similar cover to prevent dust generation; and
- A record of stockpile locations (stockpile register), dimensions, descriptions, environmental controls, etc. should be maintained by the Remediation Contractor.

All movement of soil within the site is to be tracked by the Remediation Contractor, from cradle to grave. Copies of tracking records must be provided to the Environmental Consultant.

4.3 Transport of material off-site and on to site

Transport of contaminated material from the site and imported material to the site shall be via a clearly delineated haul route(s) and this route shall be used exclusively for entry and egress of vehicles used to transport contaminated materials within and away from the site, and onto and within the site. The proposed transport route(s) (to be determined by the Remediation Contractor) will be notified to Council and truck dispatch shall be logged and recorded by the Remediation Contractor for each load leaving or arriving the site. A record of the truck dispatch will be provided to the Environmental Consultant.

All haulage routes for trucks transporting soil, materials, equipment or machinery to and from the site should be selected to meet the following objectives:

- Comply with all road traffic rules;
- Minimise noise, vibration and dust to adjacent premises; and
- Use State roads and minimise use of local roads as far as practicable.

The remediation work will be conducted such that all vehicles:

- Conduct deliveries of soil, materials, equipment or machinery only during the specified hours of remediation;
- Have securely covered loads to prevent any dust or odour emissions during transportation; and
- Exit the site in a forward direction.

In addition, measures will be implemented to ensure no contaminated material is spilled onto public roadways or tracked off-site on vehicle wheels. Roadways will be kept clean throughout the remediation works and will be broomed, if necessary, to achieve a clean environment.

All loads will be securely covered and may be lightly wetted, if required, to ensure that no materials or dust are dropped or deposited outside or within the site. Prior to exiting the site each truck should be inspected by Remediation Contractor personnel and either noted as clean (wheels and chassis) or broomed prior to leaving the site. Any soil spilled onto surrounding streets will be cleaned by mechanical or hand methods, on a daily basis.

Removal of waste materials from the site shall only be carried out contractors holding the appropriate license(s), consent or approvals to dispose the waste materials according to the waste classification and with the appropriate approvals obtained from the EPA, were required.

Materials imported onto the site shall only be carried out contractors holding the appropriate license(s), consent or approvals to transport the materials with the appropriate approvals obtained from the EPA, were required.

All movement of soil within the site is to be tracked by the Remediation Contractor, from cradle to grave. Copies of tracking records must be provided to the Environmental Consultant.

5. Noise and vibration control plan

All equipment and machinery should be operated in an efficient manner to minimise the emission of noise. The use of any plant and / or machinery should not cause unacceptable vibrations to nearby properties and should meet Council requirements.

6. Dust control plan

Dust emissions must be confined within the site boundary as far as is practicable. The following example dust control procedures could be employed to comply with this requirement, as necessary:

- Erection of dust screens around the perimeter of the site (as applicable);
- Securely covering all loads entering or exiting the site;
- Use of water sprays across the site to suppress dust;
- Covering of all stockpiles of contaminated soil remaining on site more than 24 hours;
- Include wheel wash (if applicable); and
- Keeping excavation and stockpile surfaces moist.

Regular checking of the fugitive dust issues is to be undertaken. Remedial measures are to be undertaken to rectify any cases of excessive dust.

7. Odour control plan

No odours should be detected at any boundary of the site during remediation works by an authorised Council Officer relying solely on sense of smell. The following example procedures could be employed to comply with this requirement as necessary:

- Use of appropriate covering techniques such as plastic sheeting, polythene or geotextile membranes to cover excavation faces or stockpiles;
- Fine spray of water and / or hydrocarbon mitigating agent on impacted areas / stockpiles or loads to lightly condition the material;
- If required, restrict uncovered stockpiles to appropriate sizes to minimise odour generation;
- Ceasing works during periods of inclement weather such as high winds or heavy rain;
- Regular checking of the fugitive dust and odour issues to ensure compliance. Undertake immediate remediation measures to rectify any cases of excessive dust or odour (e.g. use of misting sprays or odour masking agent); and
- Adequate maintenance of equipment and machinery to minimise exhaust emissions.

8. Work health and safety plan

8.1 General

It is the Remediation Contractor's responsibility to devise a SWMS[1] (or series thereof, for various respective tasks) and to implement proper controls that enable the personnel undertaking the remediation to work in a safe environment. This RAP and SMP does not relieve the Remediation Contractor or other contractors of their ultimate responsibility for occupational health and safety of their workforce and to prevent contamination of areas outside the 'remediation' workspace. This RAP and SMP sets out general procedures and the minimum standards and guidelines for remediation that will need to be used in preparing the safe work method statement.

This work health safety plan (WHSP) has been prepared with refence to CRC CARE *Remediation Action Plan: Implementation - Guideline on Health and Safety* (CRC CARE, 2019). The requirements of this WHSP must be incorporated into the Remediation Contractor's SWMS.

All site work must be undertaken in a controlled and safe manner with due regard to potential hazards, training and safe work practices. To attain this the SWMS developed by the Remediation Contractor must comply with policies specified in the Work Health and Safety Regulation 2011.

All appropriate permits, licences and notifications required for the remediation activities must be obtained prior to the commencement of remediation works.

8.2 Site access

Appropriate fencing and signage must be installed around and within the site to prevent unauthorised access and restrict access to remediation areas and / or deep excavations. Access restrictions and administrative arrangements for management of entry of workers or related personnel on site is the responsibility of the Remediation Contractor.

Any existing pits or unstable areas on site that may generate potential safety, or operational risk should be demarcated and taped off, with appropriate rectification action undertaken (e.g. backfilling of pits).

8.3 Personnel and responsibilities

Before undertaking works on site, all personnel will be made aware of the officer responsible for implementing WHS procedures. All personnel must read and understand this WHSP and over-arching SWMS prior to commencing site works and sign a statement to that effect. Contractors employed at the site will be responsible for ensuring that their employees are aware of, and comply with, the requirements of this WHSP and Remediation Contractor's SWMS.

[1] Either a SWMS or construction environmental management plan (CEMP), or other equivalent document incorporating health and safety aspects of the proposed remedial works.

8.4 Chemical contamination hazards

Chemical compounds or substances that may be present in the soils at the site include the key CoPC heavy metals, TRH, BTEX, PAH, and, given the presence of fill, asbestos. There is also a lower probability of other contaminants being present.

The risks associated with the identified contaminants to site personnel and workers involved in the remediation are considered to be low due to the concentrations within groundwater and soil vapour and limited exposure durations. These risks are associated with:

- Ingestion of contaminated soil and / or water;
- Dermal contact with contaminated soil and / or water; and
- Inhalation of dusts or vapours of the CoPC.

If asbestos is encountered in fill, this risk evaluation should be revised.

Personnel will endeavour, wherever possible, to avoid direct contact with potentially contaminated material. Workers must avoid the potential exposures listed above as far as is practicable. Appropriate personal protective equipment (PPE) must be used to mitigate potential risks.

8.5 Physical hazards

The following physical hazards are associated with conditions that may be created during remediation works:

- Heat exposure;
- Excavations;
- Buried services;
- Noise;
- Dust;
- Electrical equipment;
- Heavy equipment and truck operation; and
- Asbestos.

Safe work practices must be employed to manage the physical risks identified above. For the most part these risks can be managed through appropriate demarcation, access controls and the use of appropriate PPE.

8.6 Safe work practices

The appropriate safe work practices should be clearly defined by the Remediation Contractor in their SWMS. As a minimum, all personnel on site will be required to wear the following PPE:

- Steel-capped boots (mandatory);
- High visibility clothing / vest (mandatory);
- Safety glasses or safety goggles with side shields requirements (as necessary);

- Hard hat (as necessary);
- Appropriate respiratory and protective equipment for any works involving asbestos (as necessary); and
- Hearing protection when working in the vicinity of machinery or plant equipment if noise levels exceed exposure standards (as necessary).

Each item of PPE should meet the corresponding relevant Australian Standard(s).

Specific safe work practices will be adopted when working with asbestos, in accordance with (but not limited to) the following codes of practice:

- SafeWork NSW *Code of Practice, How to Manage and Control Asbestos in the Workplace* (SafeWork NSW, 2019a);
- SafeWork *NSW Code of Practice, How to Safely Remove Asbestos* (SafeWork NSW, 2019b);
- WorkCover *NSW Managing Asbestos in or on Soil* (WorkCover NSW, 2014); and
- NOHSC *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Ed* (NOHSC, 2005).

9. Remediation schedule and hours of operation

The remediation works will be conducted within the days and hours specified in the development consent.

10. Response to incidents

The key to effective management of incidents is the timely action taken before any situation reaches a reportable or critical level. Therefore, surveillance activities are extremely important, and should be conducted for the measures prescribed herein and any other measures prescribed in any additional environmental management plan developed subsequently. During construction activities on the site, the following inspection or preventative actions should be performed by the Remediation Contractor:

- Regular inspection of works;
- Completion of routine environmental checklists and follow-up of non-compliance situations;
- Maintenance and supervision on-site; and
- An induction process for site personnel involved in the remediation works that includes relevant information on the contamination status of the site, the remediation works being undertaken, worker health and environmental protection requirements and ensures that all site personnel are familiar with the site emergency procedures.

An emergency response plan will be in place for all aspects of site works. Any emergency will be reported immediately to the site office and / or the Site Manager (and Safety Officer), and the appropriate emergency assistance should be sought. The Site Manager should be responsible for initiating an immediate emergency response using the resources available on the site. Where external assistance is required, the relevant emergency services should be contacted. A table such as that below, containing contact details for key personnel who may be involved in an

environmental emergency response should be completed and be readily available to personnel at all times. The table should be completed, and thereafter amended, as required.

The Remediation Contractor will be responsible for ensuring that site personnel are aware of the emergency services available and the appropriate contact details. A site Safety Officer should be contactable, or available, on-site during remediation and development works.

Contact details for key utilities are included in the event of needing to respond to incidents. Blank cells are 'to be confirmed' and should be completed prior to works commencing when all entities are confirmed.

Table 1: Summary of roles and contact details

Role	Personnel / contact	Phone contact details
Principal		
Principal's Representative		
Site Manager		
Remediation Contractor and Builder		
Site Office		
Environmental Consultant		
Consent Authority		
Regulator	NSW EPA (pollution line and general enquiries)	131 555
Utility Provider	Water (Sydney Water Corporation)	13 20 92
Utility Provider	Power (Ausgrid)	13 13 88
Utility Provider	Gas (Jemena Limited)	131 909
Utility Provider	Telecommunications (Telstra Corporation Limited)	13 22 03
Utility Provider	Telecommunications (Optus)	1800 505 777
Utility Provider	Telecommunications (NBN Co Limited)	1800 687 626

11. References

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

CRC CARE. (2019). *Remediation Action Plan: Implementation - Guideline on Health and Safety.* National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

NOHSC. (2005). *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Ed.* Canberra, April 2005, NOHSC:3003: National Occupational Health and Safety Commission, Commonwealth of Australia.

NSW EPA. (2020). *Guidelines for Consultants Reporting on Contaminated Land.* Contaminated Land Guidelines: NSW Environment Protection Authority.

SafeWork NSW. (2019a). *Code of Practice, How to Manage and Control Asbestos in the Workplace.* August 2019.

SafeWork NSW. (2019b). *Code of Practice, How to Safely Remove Asbestos.* August 2019: SafeWork NSW, NSW Government.

WorkCover NSW. (2014). *Managing Asbestos in or on Soil.* March 2014: WorkCover NSW, NSW Government.