Douglas PARTNERS

GROUNDED EXPERTISE

Remediation Action Plan

Randwick High School Upgrade

Avoca Street, Randwick

Prepared for NSW Department of Education

Project 224455.00

4 August 2025

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

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

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Remediation Action Plan
Randwick High School Upgrade
Avoca Street, Randwick

1. Introduction

Douglas Partners Pty Ltd (Douglas) has prepared this remediation action plan (RAP) associated with proposed upgrade works at Randwick High School at Avoca Street, Randwick (the School site). The RAP was commissioned by RPS Group on behalf of NSW Department of Education and was undertaken in accordance with Douglas' proposal 224455.00.P.002.Rev1 dated 22 April 2025.

A detailed site investigation (DSI, Douglas 2024a) was conducted at the school site (nominated areas labelled for ease of reference as Area A and Area B). The proposed works targeted by the DSI comprised a cohort building at Area A and a two-storey administration / learning building and associated green space at Area B. The information related to Area B (herein referred to interchangeably as "the site") was used to inform this RAP and is also discussed in Section 6.

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).

This RAP has been prepared to support the Review of Environmental Factors (REF) being prepared on behalf of the NSW Department of Education (DoE) for the proposed administration Building and lecture theatre at Randwick High School (the activity).

The purpose of the REF is to assess the potential environmental impacts of the activity prescribed by State Environmental Planning Policy (Transport and Infrastructure) 2021 (T&I SEPP) as "development permitted without consent" on land carried out by or on behalf of a public authority (NSW DoE) under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act). The activity is to be undertaken pursuant to Chapter 3, Part 3.4, Clause 3.37 of the T&I SEPP.

The purposes of this report, 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 likely that the preferred 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. Refer to Section 10 for further discussion.

It is also noted that the Ecological Assessment report for the project also did not identify any ecological based triggers for Category 1 remediation works.

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.

The site layout at the time of preparing the DSI report is shown on Drawing R.003.D.001, Appendix A. This report must be read in conjunction with all appendices including the notes provided in Appendix A.

2. Proposed development

The proposed activity includes the following:

- Tree removal;
- Demolition of the ground slab and servicing associated with former Block A South;
- Reconfiguration of existing staff carparks;
- Construction of a combined administration (ground floor) and permanent classroom building (first floor);
- Construction of a lecture theatre;
- New pedestrian pathway connections providing access to Block C and H;
- Service connections; and
- Site landscaping works.

An extract of the proposed Site Plan is provided at Figure 1.

Figure 1: Extract of proposed Site Plan (Bennett and Trimble, 2025)

3. Scope of work

The scope of work to achieve the objective 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 at the site;
- Define the anticipated extent of remediation;
- Assess potentially suitable remediation options 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;

- Discuss options with the client to confirm the remediation approach to management and/or remediation to render the site suitable, from a contamination perspective, for the proposed 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

Randwick High School is located at Avoca Street, Randwick. The school comprises two addresses: 298 Avoca Street, Randwick and Part 90-98E Rainbow Street, Randwick. The real property descriptions are Lot 1 DP 121453 and Part Lot 1738 DP48455.

The School site is largely rectangular in shape with vehicular access provided from Rainbow Street in the south and Barker Street in the north. Pedestrian access is provided from the abovementioned roads, Avoca Street to the east and Fennelly Street to the west.

The School site is zoned SP2 Educational Establishment in accordance with Randwick Local Environmental Plan 2012.

An aerial image of the school site is provided in Figure 2.

School address	298 Avoca Street, Randwick and Part 90-98E Rainbow Street, Randwick
School legal description	Lot 1 DP 121453 and Part Lot 1738 DP48455
Area	Total school ground occupies approximately 74,000 m^2 Site: approximately 4,000 m^2
Zoning	Zone SP2 Infrastructure (Educational Establishment)
Local Council Area	Randwick Council

Current use	High school
Surrounding uses (from the site)	North – Randwick High School buildings East – Concrete tennis courts, grass areas and school structure South – Rainbow Street West – Randwick High School buildings

The boundary of the site (labelled as Area B) for the purpose of this RAP is shown on Drawing R.003.D.001, Appendix A and Figure 3 below.

Figure 2: Aerial image of the School site (Randwick High School – REF Preamble, 2025)

Figure 3: The site (Area B) (in dotted green line, refer to Drawing R.003.D.001 for full legends)

5. Environmental setting

Topography	The regional topography of the Randwick High School site slopes gently from about RL 50 m Australian Height Datum (AHD) in the north-east to about RL 38 m (AHD) in south-west. The site has surface levels between about RL 40 AHD in the north to RL 38 AHD in the south.
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 Tuggerah soil landscape. The Tuggerah soil landscape is an aeolian soil landscape and is characterised by topography of gently undulating to rolling coastal dune hills, with local relief to 20 m and slope gradients of 1% to 10%. Soils in the Tuggerah soil landscape is typically non-cohesive and highly permeable with high water tables.
Geology	Reference to the Sydney 1:100 000 Geological Series Map indicates that the site is underlain by coastal deposits (transgressive dunes) of the Quaternary period. The deposits are marine deposited and aeolian-reworked fine to coarse grained quartz lithic sand with abundant carbonate, and sporadic humic debris in stabilised dunes. Hawkesbury sandstone is mapped in localised areas to the west and south-east of the school, which is the geological unit beneath the coastal deposits. Hawkesbury sandstone, of the Triassic period,

	comprises medium to coarse grained quartz sandstone with minor shale and laminite lenses.
Acid sulfate soils	Reference to the 1:25 000 Acid Sulfate Soils (ASS) Risk map indicates that the school is in an area of no known occurrence of acid sulfate soils. The nearest mapped occurrences of ASS are in Maroubra Bay, Eastlakes, and Eastgardens, which are over 2 km away from the school. The high elevation and expected geology at the school suggests that the presence of acid sulphate soils is unlikely. However, nearby investigations have encountered potential acid sulfate soils within deeper peaty layers closer to the rock surface in some areas.
Surface water and groundwater	The school slopes towards the south-west, with surface run off likely to collect in stormwater drains across the school, off site or filtering through open gras areas. The closest course is the Botany Dams which is 1.75 km to the south-west of the school. The Botany Dams then feeds into the Mill Stream, the Model Yacht Pond, the Mill Pond and into Botany Bay. There were six registered groundwater bores within 200 m to the west of the site. The search showed that the intended purpose of all bores was associated with monitoring, with the standing water of 5.20 m bgl. Water seepage was encountered during the recent geotechnical investigation (Douglas, 2024b) within Area B at depths between 2.4 m (RL 36.4 m) in BH102, 3.5 m (R 35 m) in BH103, and 3.5 m (RL 35.1 m) in BH104.

6. Summary of previous investigations

6.1 Previous reports

The following previous reports are relevant to this RAP:

- Douglas *Report on Preliminary Site Investigation (Contamination) PSI – Randwick Boys High School and Randwick Girls High School Upgrade, 320-346 Avoca Street, Randwick NSW 2031*. Ref: 224455.00.R.001.Rev0, dated 22 September 2023 (Douglas, 2023); and
- Douglas *Report on Detailed Site Investigation Contamination, Randwick Boys High School and Randwick Girls High School Upgrade, Rainbow Street, Randwick NSW*. Ref: 224455.00.R.002.Rev1, dated 30 August 2024 (Douglas, 2024a).

6.1.1 Douglas (2023)

The PSI was undertaken based on 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 historical aerial photographs and historical title deeds show that the school was possibly used as a hospital prior to 1933, however the earliest available aerial photograph (1942) showed the site to be vacant, which suggests that a hospital use is unlikely. The school was acquired by the

Minister for Education in 1941 and began construction and use as a school *circa* 1960. The school development was progressive, including various arrangements of buildings, sports fields and sports courts, with significant changes to the layout *circa* 1961, 1971, 1986 and 1994.

The region surrounding the school had historically been urban residential, at least since 1942. The land to the west of the school comprised horse stabling and training facilities (Inglis) until around 2018 when the land was sold and gradually developed into medium rise residential (Newmarket development).

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

The 7-Eleven service station on Barker Street, located about 250 m west north-west of the site, was recorded as a notified site to the EPA under Section 58 of the CLM Act. The service station was declared contaminated with petroleum hydrocarbons including benzene, toluene, ethyl benzene, xylenes and naphthalene resulting from commercial activities of the service station. The 7-Eleven service station currently regulated under the CLM Act and requires ongoing monitoring of groundwater hydraulically downgradient of the source for a period of time. The flow path of the plume from this off-site source has not been tracked to cross the western boundary of the school.

The PSI suggested intrusive soil investigation and sampling to further assess the potential for the above sources of contamination or the associated potential contaminants, to exist in soils within the site.

6.1.2 **Douglas (2024a)**

The DSI was prepared by Douglas for proposed upgrade works at Area A (optional) and Area B (the site) within the school, both shown on Drawing R.003.D.001 in Appendix A.

Douglas conducted intrusive soil sampling and testing (a total of ten borehole BH101 to BH110), in conjunction with a geotechnical investigation, targeting the site. The borehole locations are shown on Drawing R.003.D.002 in Appendix A.

As shown in Table H1, Appendix B, the analytical results for contaminants tested in all samples were below the adopted site assessment criteria (SAC) with the exception of:

- Benzo(a)pyrene TEQ in samples BH109/0.1-0.2 m with concentrations of 3.7 mg/kg exceeded health investigation level ‘HIL C’ criteria of 3 mg/kg; and
- Benzo(a)pyrene (BaP) in samples BH109/0.1-0.2 m with concentration of 2.4 mg/kg exceeded the ecological screening level ‘ESL C’ criteria of 0.7 mg/kg.

Asbestos was recorded in the same sample as follow:

- Amosite asbestos was confirmed by laboratory analysis in soil samples collected at BH109/0.1-0.2 m in 0.0002 g of loose fibre bundles.

BH109 is located within the proposed green space area. The elevated PAH and asbestos in BH109 was detected in a layer of fill, directly below the concrete pavement.

It is noted that the B(a)P ESL is a low reliability value. Higher reliability screening levels have been published in CRC CARE *Risk-based Management and Remediation Guidance for Benzo(a)pyrene* (CRC CARE, 2017). The high reliability value of 33 mg/kg (or ranging from 21 mg/kg to 135 mg/kg) for fresh B(a)P suggests that the concentrations of B(a)P detected at the site are unlikely to pose an unacceptable risk to terrestrial ecosystems and therefore the exceedances are not considered to be of concern or warranting remediation.

Based on the observations at the time of sampling and the reported laboratory results, the following preliminary waste classifications were provided for the fill material within the site:

- Fill soils in the vicinity of BH109 is provisionally classified as Special Waste Asbestos – General Solid Waste (GSW) (non-putrescible). Further assessment of asbestos in soils should be conducted to confirm the extent of asbestos contamination at this location; and
- Remaining fill within the remainder of the site (following the delineation of asbestos impact at BH109), GSW (non-putrescible) subject to results of subsequent investigations showing that asbestos contamination is not widespread.

Based on the findings of the DSI, Douglas recommended the following for the site:

"Area B (the site) *can be made suitable for the proposed administration / learning building and new green space subject to the following:*

- Delineation sampling and testing around BH109 to delineate the extent of asbestos [and PAH] impacted soils (following the removal of the hardstand).
- Excavation of the asbestos impacted soils at BH109 for either:
  - *Waste classification and off-site disposal to landfill; or*
  - *Relocation beneath the footprint of the proposed new building. This option will require an amendment to the asbestos register for the school to include the location and depth of asbestos impacted soil.*
- *Validation reporting on the remediation method adopted for the asbestos impacted soils; and*
- *Preparation and implementation of an unexpected finds and contingency plan to manage unexpected and contingent (e.g. asbestos) finds of contamination during civil and construction works. "*

Refer to Appendix B of this RAP for the previous summary result table and borehole logs for the investigation at the site.

7. Conceptual site model

The data collected during previous investigations generally confirmed that for certain potential contaminant sources outlined in the CSM in DSI (Douglas, 2024a), 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
On-site sources
S1: Fill: Associated with general grading and levelling CoPC (typical screen for fill from an unknown source) include metals, TRH, BTEX, PAH, PCB, OCP, phenols and asbestos **S2:** Former and current buildings / structures (hazardous building materials deterioration and spalling in previous and existing structures) CoPC include asbestos, synthetic mineral fibres (SMF), lead (in paint), zinc and PCB **S3:** Application of pesticides for building maintenance CoPC include copper, OCP, OPP

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, students and visitors] **HR2:** Construction and maintenance workers **HR3:** End users [school workers, students and visitors] **HR4:** Adjacent site users [education / residential / commercial]
Potential environmental receptors
ER1: Surface water [Botany Dam and Mill Stream] **ER2:** Groundwater **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 at the site is shown in the table below.

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

Source and CoPC	Exposure pathway	Receptor
Remediation Area 1: Asbestos and PAH impacted fill at and in the vicinity of BH109	**HP1:** Ingestion and dermal contact **HP2:** Inhalation of dust and/or vapours	**HR1:** Current site users **HR2:** Construction and maintenance workers **HR3:** End users

8. Delineation investigation

As recommended in the DSI (Douglas, 2024a), further investigation is recommended to delineate the extent of asbestos and PAH impacted soils around BH109 following the removal of the hardstand.

8.1 Delineation of impacted soils at BH109

Further assessment of the asbestos and PAH impacted soil at BH109 will comprise the following by a suitably qualified Environmental Consultant:

- Excavate four test pits in the vicinity of the original borehole location BH109, on an approximate 5 m grid as shown in light blue on Drawing R.003.D003, Appendix A;
- Excavate a test pit at the original location of BH109;
- Sample the fill at the surface and then at 0.5 m depth intervals or at signs of contamination (i.e. odours, staining and/or asbestos etc.). The test pits will be extended to 0.5 m into observed natural soils, noting that the previously identified contaminants were found in the fill;
- Conduct field sieving for asbestos containing material (ACM) in accordance with the WA DoH (2021) guidelines;
- Analyse recovered fill samples for asbestos (gravimetric AF / FA) and PAH;
- Compare the test results against the adopted RAC and SAC (refer to Section 12); and
- Assess the need for further delineation, remediation or management of the identified contamination including the previously identified asbestos and PAH in soil at BH109. Further delineation may be achieved by adopting additional test pits a further 5 m from the location to be delineated.

Note that if the Environmental Consultant determines that remediation of the contamination is required, the remediation area will be delineated on the basis of the grid of test pits undertaken, expanded as required. If it is determined that the impact extends beyond the initially proposed grid of test pits, the Environmental Consultant will either recommend extending the delineation sampling or chase out of the contaminant impact, through validation sampling and testing.

8.2 **Reporting**

At the completion of these additional investigation(s), the remediation requirements and extents should be reviewed. Depending on the significance of the remediation recommendations informed by the investigation, this RAP may need to be updated. Alternatively, if deemed appropriate by the Environmental Consultant, short reports / memoranda or a remediation works plan can reference this RAP as required, with the eventual remediation works documented as part of the site validation process.

9. Remediation extent

Whilst the results of the delineation investigation (Section 8) must be used to confirm the extent of remediation required, at this stage, the initial remediation extent based on the results of the DSI (Douglas, 2024a) comprises:

- Remediation Area 1: Fill impacted with asbestos and PAH at and in the vicinity of BH109.

It is noted however that Douglas (2024a) states that whilst no asbestos containing material (ACM) cement sheet was observed within boreholes or in any samples collected, the identification of ACM in small diameter boreholes is very difficult, and the presence of ACM in fill can be easily missed through this sampling method. Given the presence of demolition rubble logged in some of the boreholes the presence of ACM in some of the fill is possible. As such, there is a potential for asbestos in other soils within the works area, and the potential is commonly greater in historical school sites.

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.

It is noted that under the current Randwick Council Contaminated Land Policy (1999), Section 4.10 it states that:

> *No contaminated soil shall be encapsulated or capped on the site that contains concentrations of contaminants that are above the soil investigation levels for urban development sites in NSW for the range of land uses permissible on the subject site.*

Whilst the references by Council in this section of the Policy are now outdated, it appears that the intention is to not permit containment and capping of contaminated soils under the policy. Recent conversations with Council suggest that Council now considers such a remediation strategy on its merit on a case-by-case basis. If this option is considered at some point in the planning or construction process, discussions with Council are recommended to seek feedback and endorsement if possible.

11. Remediation plan

11.1 Rationale for selection

Based on the existing data for the site, the technically viable remediation options comprise:

- Option 1: Excavation of the asbestos and PAH impacted soil, preparation of a waste classification report for the excavated soils, and off-site landfill disposal under that classification.
- Option 2: Relocate the asbestos and PAH impacted fill beneath the footprint of the proposed new building, capped with the proposed building hardstand (e.g. concrete slab), and, if required, managed in the long term under a long-term environmental management plan (LTEMP). In addition, this option will require an amendment to the asbestos register for the school to include the location and depth of asbestos impacted soil. This option, as stated in Section 10, is subject to Council endorsement.

The preferred remediation is Option 1, excavation and landfill disposal.

Option 2 is considered as a contingency option should the delineation investigations or subsequent civil works identify a quantity of asbestos impacted soils that would make Option 2 most economically viable. As stated previously, this option will require Council endorsement before consideration.

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.

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 or refurbished. The Asbestos Register and Management Plan for the school 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 DSI (Douglas, 2024a) reported the asbestos finds comprising loose fibre bundles in the Remediation Area 1. As such, Douglas recommends that the asbestos Remediation Contractor must be licensed for Class A asbestos removal. A licenced asbestos assessor must undertake air quality monitoring for all work requiring a Class A asbestos removal licence.

The licensed asbestos Remediation Contractor must give written notice to SafeWork NSW at least five days before remediation work commences.

Air quality monitoring for airborne asbestos fibres using the Membrane Filter Method in accordance with the *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres* (NOHSC: 3003, April 2005) is to be conducted prior to commencement of works (baseline) and on a daily basis when works involving the excavation, transport or placement of asbestos impacted and potentially impacted soils / materials (i.e. any excavations in Remediation Area 1) are being conducted. The Environmental Consultant or an occupational hygienist is to conduct the air quality monitoring or manage the works through an experienced contractor.

The client will be notified by the Environmental Consultant of any laboratory detections of airborne asbestos fibres during the course of the works. In the event of detections, the Remediation Contractor should make appropriate modifications to works methods, as required.

11.3 Remediation Actions – Excavation and Disposal (Option 1 - preferred)

As noted in Section 1, Remediation Option 1 is considered likely to be Category 2 under the SEPP. A 30-day notification period is required by Council prior to commencement.

Prior to commencement of excavation work, a waste classification assessment will take place for the material to be excavated and removed from the Remediation Area 1. The Environmental Consultant may complete a waste classification assessment using data presented in the DSI (Douglas, 2024a) and the delineation investigation report 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.

11.3.1 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 Remediation Area 1, engage the Environmental Consultant to be present to witness the remedial excavation works. As noted earlier, further delineation of the remediation extent can take place as part of the waste classification process;
- Excavate the delineated impacted fill from Remediation Area 1;

- 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 is removed, the base and side walls 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.

11.4 Remediation Actions – Cap and Contain (Option 2 - Contingency)

Remediation Option 2 is only a contingency option under this RAP. In strict accordance with the SEPP and Council's contaminated land policy of 1999, this option would most likely be Category 1 remediation works. However, given the discussions presented in Section 10, should circumstances arise that require further consideration of this option, it is recommended that Council be provided with a copy of this RAP, plus a copy of the delineation report, and any other documents supporting the remediation approach for their consideration. This may not need to be in the form of a DA, however further discussions with Council at the time would be necessary.

11.4.1 Remediation sequence

In designing the remediation sequence for Option 2, the following items must be considered:

- 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 the Remediation Area 1 is proposed to be cut and relocated, these soils must only be placed in locations and at depths (i.e. beneath the proposed new building) such that the design cap can be formed above to achieve design levels; and
- The proposed new building ground floor slab and footings are considered to be 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.

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

- Undertake civil works to form the final design ground levels, allowing for the subsequent construction of the capping layers (refer Section 11.4.2);
- Relocate and cover the fill across the footprint of the proposed new building 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 (proposed new building ground floor slab) 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.

11.4.2 Capping designs

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.). This section only provides preliminary capping designs at this stage as the final design details for the proposed development are not known.

Where the impacted fill is placed beneath new buildings, the hard cap will comprise the new hardstand (e.g. concrete slab) across the new proposed building footprint. There is no recommended minimum thickness. However, the thickness should be designed for long term durability and be constructed on top of the marker layer.

Where the impacted fill is placed in an area of soft fall, turf or landscaping, the cap will comprise a minimum total combined thickness of 500 mm of validated soil, landscaping materials and/or soft fall. Should this option be adopted, the capping design will form part of a remediation works plan prepared after completion of the delineation investigation and determination of the placement location and depth.

As stated previously, this option will be subject to a LTEMP. As built drawings are to be provided to the Environmental Consultant for inclusion in the LTEMP, if such a plan is required.

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 the DSI (Douglas, 2024a), protective of human health and ecology. The following table provides a summary of the RAC.

Table 4: Remediation acceptance criteria

Item	Remediation acceptance criteria
Excavation and disposal (preferred): Identified contaminants comprise asbestos	SAC as per Section 12.2 and Appendix D

Item	Remediation acceptance criteria
Cap and contain (contingency): Identified contaminants comprise asbestos	The cap must meet the design requirements outlined in Section 11.4, and/or to be documented in a remediation works plan, with inspections, approvals and documentation as outlined in the same section and / or referenced in other sections.

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 E) and assessed using the SAC in Appendix D. The SAC are the same as the Tier 1 SAC adopted for the DSI (Douglas, 2024a).

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 public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. The derivation of the SAC is included in Appendix D and the adopted SAC are listed in the summary analytical results tables for the previous investigation listed in Section 6 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) for;
  - Waste classification sampling and testing (surplus soils and contaminated soil for Option 1); and
  - Collecting validation / characterisation samples for materials to be re-used on site.
- Clearances (as required) by the licensed asbestos assessor.

- Surveying by the Surveyor comprising:
  - Survey of the extent and levels of the top of the marker layer (Option 2); and
  - Survey of the extent and levels of the top of the capping layer (Option 2).
- Laboratory analysis of validation samples at a NATA accredited laboratory for:
  - The CoPC relevant to the remediation area;
  - The CoPC relevant to the assessment of unexpected finds of potential contamination;
  - Check sampling for imported materials; 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

The frequency of inspections for Option 2 are discussed in Section 11.4.

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 fill.

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 all results are below the RAC.

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); and
- NSW EPA *Waste Classification Guidelines, Part 4: Acid Sulfate Soils* (NSW EPA, 2014c).

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, and incorporating previous test results as relevant.

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).

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), or compliant with a NSW EPA Resource Recovery Order, 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;
- It has 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 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 VENM and / or 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 materials proposed for importation must be sampled at a target frequency of one sample per 25 m^3, with a minimum of three samples per load, unless advised otherwise by the Environmental Consultant. 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 E.

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):

- 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 within 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;
- Imported materials records: records for any soil imported onto the site within 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);
- Surveys pre- and post-installation of geotextile marker layer and clean fill cap (Remediation Contractor – option 2);
- Airborne asbestos monitoring records (in the event that asbestos works are undertaken) (Remediation Contractor); and
- Interim / final visual and sampling clearances for any asbestos related works (in the event that asbestos works are undertaken) (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 (i.e. school upgrade).

18.2.1 LTEMP (Option 2 Remediation Only)

If any contaminated soils are retained on site as part of the development works (e.g. for remediation option 2), at concentrations exceeding the RAC, upon completing the remediation works and the validation report, a LTEMP must be prepared to include the following items:

- Details the extent of contaminated soils that are present at the site;
- A description of the expected conditions at the site;
- Details the remediation works completed at the site;
- The management and maintenance protocols for the soil capping system;
- The management protocols for areas not subject to capping;
- The protocols for future works below the capping layer (if required);
- The hazards associated with the contaminated soil capped at the site and the corresponding management controls; and
- The responsibilities of the appropriate parties to the LTEMP.

The LTEMP must be reasonably legally enforceable (by the consent authority). The LTEMP would be prepared following the completion of the remediation works and the preparation of the validation report.

The obligation for ensuring that the LTEMP is implemented and enforced will be the responsibility of the current site owner(s). The day-to-day operation of the LTEMP would be the responsibility of the current site owner(s). The Principal will incorporate the LTEMP within an environmental management framework and used to provide public notification.

19. Conclusions

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

For the environmental impacts, the extent and nature of potential impacts as currently identified are low and will not have significant impact on the locality, community and/or the environment subject to implementation of this RAP. Potential impacts can be appropriately mitigated or managed to ensure that there is minimal impact on the locality, community and/or the environment. Such measures should be documented in a CEMP developed by the contractor undertaking works with reference to the SMP in Appendix G.

20. References

CRC CARE. (2017). *Risk-based Management and Remediation Guidance for Benzo(a)pyrene*. Technical Report no. 39: Cooperative Research Centre for Contamination Assessment and Remediation of the Environment.

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. (2023). *Report on Preliminary Site Investigation (Contamination) PSI – Randwick Boys High School and Randwick Girls High School Upgrade, 320-346 Avoca Street, Randwick NSW 2031. Ref: 224455.00.R.001.Rev0, dated 22 September 2023.* Douglas Partners Pty Ltd.

Douglas. (2024a). *Report on Detailed Site Investigation Contamination, Randwick Boys High School and Randwick Girls High School Upgrade, Rainbow Street, Randwick NSW. Ref: 224455.00.R.002.Rev1, dated 30 August 2024.* Douglas Partners Pty Ltd.

Douglas. (2024b). *Douglas Report on Geotechnical Investigation – Randwick Boys High School and Randwick Girls High School Upgrade – Rainbow Street, Randwick. Ref: 224455.02.R.001.Rev0, dated 17 September 2024.*

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.

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

21. Limitations

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project at Avoca Street, Randwick in line with Douglas' proposal 224455.00.P.002.Rev1 dated 22 April 2025 and acceptance received from RP Group on behalf of NSW Department of Education. The work was carried out under Douglas' Engagement Terms. This report is provided for the exclusive use of RP Group and NSW Department of Education 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 the previous DSI (Douglas, 2024a). 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

Drawings

About this Report

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	Initial Issue	28.05.2025	JZ

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

CLIENT:
School Infrastructure NSW

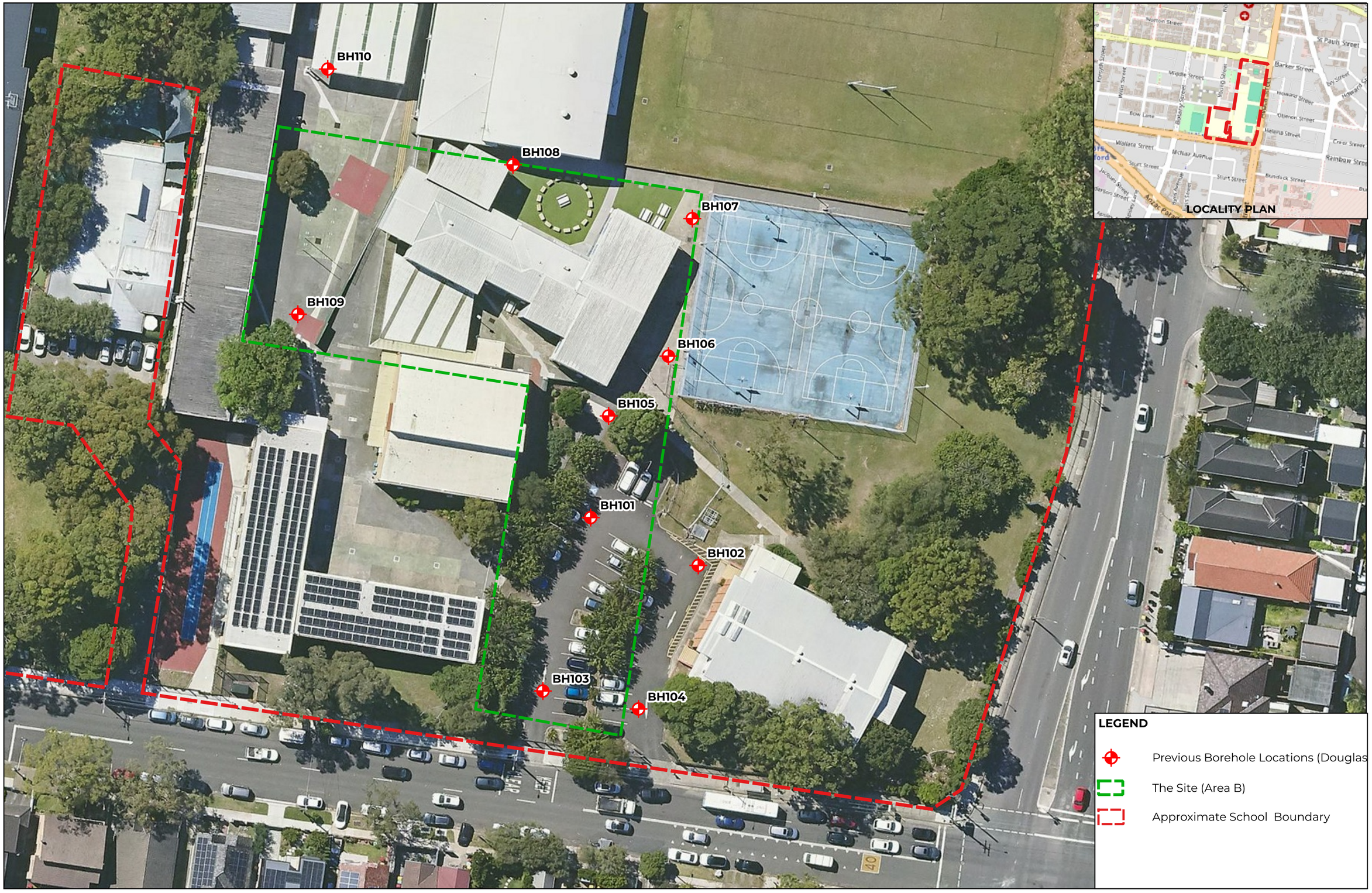
NOTE:
1: Basemap from Metromap (Dated 26.06.2024)
2: All Area Boundraies from TKD Architects, Option1 (May 2024)

COORDINATE REFERENCE SYSTEM: GDA94 / MGA zone 56

PROJECT NAME:
Randwick High School Co-Educational Facility Upgrade
PROJECT ADRESS:
Avoca Street Randwick NSW 2031

DRAWING TITLE:
School and Site Boundaries

PROJECT NO: **224455.00**
DRAWING NO: **R.003.D.001**
REVISION: **0**



REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	Initial Issue	28.05.2025	JZ

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Douglas PARTNERS
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(02)9809 0666

CLIENT:

School Infrastructure NSW

NOTE:
1: Basemap from Metromap (Dated 26.06.2024)
2: All Area Boundraies from TKD Architects, Option1 (May 2024)

COORDINATE REFERENCE SYSTEM: GDA94 / MGA zone 56

PROJECT NAME:

Randwick High School Co-Educational Facility Upgrade

PROJECT ADRESS:

Avoca Street Randwick NSW 2031

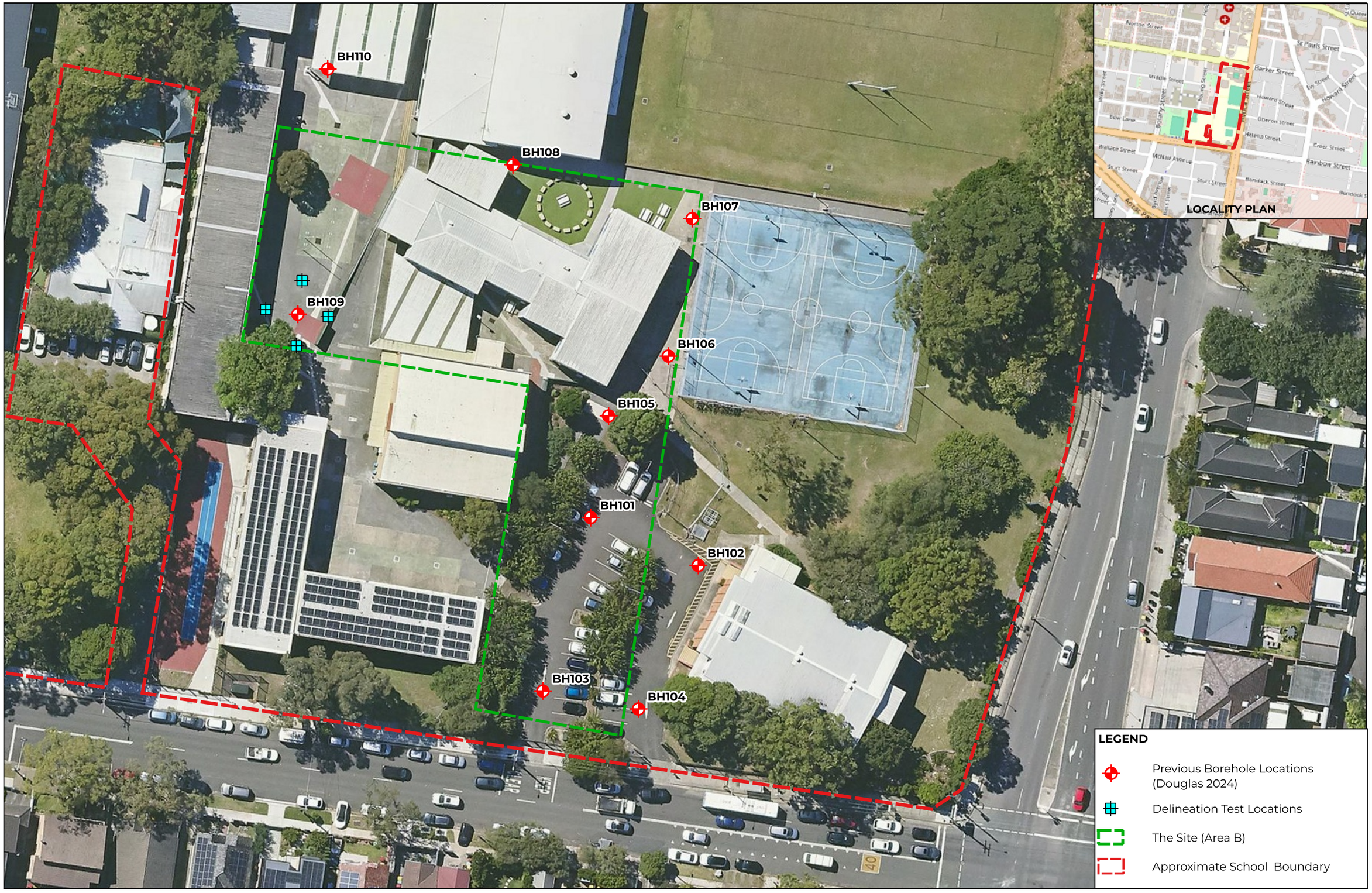
DRAWING TITLE:

Previous Test Locations At The Site

PROJECT NO: **224455.00**

DRAWING NO: **R.003.D.002**

REVISION: **0**



REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	Initial Issue	25.07.2025	JZ

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CLIENT:
School Infrastructure NSW

NOTE:
1: Basemap from Metromap (Dated 26.06.2024)
2: All Area Boundraies from TKD Architects, Option1 (May 2024)

COORDINATE REFERENCE SYSTEM: GDA94 / MGA zone 56

PROJECT NAME:
Randwick High School Co-Educational Facility Upgrade

PROJECT ADRESS:
Avoca Street Randwick NSW 2031

DRAWING TITLE:
Previous Test Locations And Delineation Test Locations at The Site

PROJECT NO: **224455.00**
DRAWING NO: **R.003.D.003**
REVISION: **0**

About this Report

November 2023

Introduction

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

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

Copyright

Borehole and Test Pit Logs

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

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

Groundwater

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

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

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

Reports

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

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

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

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

continued next page

About this Report

Site Anomalies

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

Information for Contractual Purposes

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

Site Inspection

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

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Appendix B

Summary Result Table

Borehole Logs from Previous Report(s)

Table H1: Summary of Laboratory Results – Priority metals, Priority PAH, PAH, Priority TRH, TRH, BTEX, Priority phenols, Priority OCP, OCP, Priority OPP, OPP, PCB, Asbestos (FA/AF), Asbestos, Other, pH, EC and CEC, Additional PhysChem

				Priority metals								Priority PAH				Priority TRH						BTEX				Priority phenols
				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)	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total Phenolics
			PQL	4	0.4	1	1	1	0.1	1	1	1	0.05	0.5	0.05	25	50	25	50	100	100	0.2	0.5	1	1	5
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	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
DSI - Douglas 2024																										
BH101	0.5 - 0.6 m	FILL	18/07/24	4	<0.4	2	7	32	<0.1	<1	12	<1	0.4	<0.5	2.9	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<5
				300 100	90 -	300 410	17,000 130	600 1100	80 -	1,200 50	30,000 380	NL 170	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2,800	NL 50	NL 85	NL 70	NL 105	120 -
BH102	0.2 - 0.3 m	FILL	17/07/24	<4	<0.4	1	3	7	<0.1	<1	14	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<5
				300 100	90 -	300 410	17,000 130	600 1100	80 -	1,200 50	30,000 380	NL 170	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2,800	NL 50	NL 85	NL 70	NL 105	120 -
BH103	0.5 - 0.7 m	FILL	17/07/24	<4	<0.4	3	5	13	<0.1	2	18	<1	0.09	<0.5	0.09	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-
				300 100	90 -	300 410	17,000 130	600 1100	80 -	1,200 50	30,000 380	NL 170	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2,800	NL 50	NL 85	NL 70	NL 105	- -
BH104	0.5 - 0.6 m	FILL	18/07/24	<4	<0.4	8	9	15	<0.1	4	24	<1	0.06	<0.5	0.06	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<5
				300 100	90 -	300 410	17,000 130	600 1100	80 -	1,200 50	30,000 380	NL 170	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2,800	NL 50	NL 85	NL 70	NL 105	120 -
BH105	0.5 - 0.6 m	FILL	18/07/24	<4	<0.4	5	39	27	<0.1	2	32	<1	0.3	<0.5	2.7	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-
				300 100	90 -	300 410	17,000 130	600 1100	80 -	1,200 50	30,000 380	NL 170	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2,800	NL 50	NL 85	NL 70	NL 105	- -
BD1/20240719	0.5 - 0.6 m	FILL	18/07/2024	5	<0.4	2	8	31	<0.1	1	20	<1	0.3	<0.5	2.4	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-
				300 100	90 -	300 410	17,000 130	600 1100	80 -	1,200 50	30,000 380	NL 170	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2,800	NL 50	NL 85	NL 70	NL 105	- -
BH106	0.5 - 0.6 m	FILL	19/07/24	<4	<0.4	<1	1	<1	<0.1	<1	2	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<5
				300 100	90 -	300 410	17,000 130	600 1100	80 -	1,200 50	30,000 380	NL 170	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2,800	NL 50	NL 85	NL 70	NL 105	120 -
BH107	0.1 - 0.2 m	FILL	18/07/24	<4	<0.4	<1	2	1	<0.1	<1	3	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-
				300 100	90 -	300 410	17,000 130	600 1100	80 -	1,200 50	30,000 380	NL 170	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2,800	NL 50	NL 85	NL 70	NL 105	- -
BH108	0.5 - 0.6 m	FILL	19/07/24	<4	<0.4	3	10	21	0.3	1	33	<1	0.1	<0.5	0.76	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<5
				300 100	90 -	300 410	17,000 130	600 1100	80 -	1,200 50	30,000 380	NL 170	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2,800	NL 50	NL 85	NL 70	NL 105	120 -
BH109	0.1 - 0.2 m	FILL	19/07/24	<4	<0.4	2	19	73	0.4	1	88	<1	**2.4**	**3.7**	18	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<5
				300 100	90 -	300 410	17,000 130	600 1100	80 -	1,200 50	30,000 380	NL 170	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2,800	NL 50	NL 85	NL 70	NL 105	120 -
BH109	0.5 - 0.6 m	FILL	19/07/2024	<4	<0.4	<1	1	6	<0.1	<1	5	<1	0.06	<0.5	0.2	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-
				300 100	90 -	300 410	17,000 130	600 1100	80 -	1,200 50	30,000 380	NL 170	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2,800	NL 50	NL 85	NL 70	NL 105	- -
BH110	0.5 - 0.6 m	FILL	19/07/24	<4	<0.4	<1	3	6	<0.1	<1	6	<1	0.08	<0.5	0.08	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<5
				300 100	90 -	300 410	17,000 130	600 1100	80 -	1,200 50	30,000 380	NL 170	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2,800	NL 50	NL 85	NL 70	NL 105	120 -
DSIC - Douglas 2023																										
BH01	0 - 0.1 m	FILL	29/09/23	<4	<0.4	5	7	16	<0.1	2	32	<0.1	0.2	<0.5	1.5	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<5
				300 100	90 -	300 410	17000 130	600 1100	80 -	1200 50	30000 380	NL 370	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2800	NL 50	NL 85	NL 70	NL 105	120 -
BD01/20230929	0 - 0.1 m	FILL	29/09/23	<4	<1	8	7	19	<0.1	2	42	<0.5	<0.5	<0.5	<0.5	<10	<50	<10	<50	<100	<100	<0.2	<0.5	<0.5	<0.5	-
				300 100	90 -	300 410	17000 130	600 1100	80 -	1200 50	30000 380	NL 370	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2800	NL 50	NL 85	NL 70	NL 105	- -
BH02	0 - 0.1 m	FILL	29/09/23	<4	<0.4	28	19	40	<0.1	4	51	<0.1	**2.5**	**3.6**	22	<25	<50	<25	<50	150	<100	<0.2	<0.5	<1	<1	<5
				300 100	90 -	300 410	17000 130	600 1100	80 -	1200 50	30000 380	NL 370	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2800	NL 50	NL 85	NL 70	NL 105	120 -
BH02	0.9 - 1 m	FILL	29/09/23	<4	<0.4	2	10	17	<0.1	<1	24	<0.1	**1.8**	2.5	13	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-
				300 100	90 -	300 410	17000 130	600 1100	80 -	1200 50	30000 380	NL 370	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2800	NL 50	NL 85	NL 70	NL 105	- -
BH03	0.4 - 0.5 m	FILL	26/09/2023	<4	<0.4	7	33	42	<0.1	6	120	<0.1	1.1	1.5	10	<25	<50	<25	<50	140	<100	<0.2	<0.5	<1	<1	<5
				300 100	90 -	300 410	17000 130	600 1100	80 -	1200 50	30000 380	NL 370	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2800	NL 50	NL 85	NL 70	NL 105	120 -
BD01/20230926	0.4 - 0.5 m	FILL	26/09/2023	<4	<0.4	8	30	34	0.1	5	100	<0.1	0.85	1.2	6.8	<25	<50	<25	<50	150	<100	<0.2	<0.5	<1	<1	
				300 100	90 -	300 410	17000 130	600 1100	80 -	1200 50	30000 380	NL 370	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2800	NL 50	NL 85	NL 70	NL 105	120 -
BH03	0.9 - 1 m	FILL	26/09/2023	<4	<0.4	3	13	38	<0.1	2	64	<0.1	**2.4**	**3.2**	15	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-
				300 100	90 -	300 410	17000 130	600 1100	80 -	1200 50	30000 380	NL 370	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2800	NL 50	NL 85	NL 70	NL 105	- -
BH04	0 - 0.1 m	FILL	26/09/2023	<4	<0.4	55	38	37	<0.1	7	140	<0.1	0.52	0.7	4.7	<25	<50	<25	<50	190	<100	<0.2	<0.5	<1	<1	<5
				300 100	90 -	300 410	17000 130	600 1100	80 -	1200 50	30000 380	NL 370	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2800	NL 50	NL 85	NL 70	NL 105	120 -
BH05	0 - 0.1 m	FILL	29/09/23	<4	<0.4	7	22	55	0.2	4	97	<0.1	**3.6**	**5.2**	30	<25	<50	<25	<50	**320**	160	<0.2	<0.5	<1	<1	<5
				300 100	90 -	300 410	17000 130	600 1100	80 -	1200 50	30000 380	NL 370	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2800	NL 50	NL 85	NL 70	NL 105	120 -
BH06	0 - 0.1 m	FILL	29/09/23	<4	<0.4	44	14	35	<0.1	3	42	<0.1	**1.6**	2.2	12	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<5
				300 100	90 -	300 410	17000 130	600 1100	80 -	1200 50	30000 380	NL 370	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2800	NL 50	NL 85	NL 70	NL 105	120 -
BH06	0.9 - 1 m	FILL	29/09/23	<4	<0.4	5	19	53	<0.1	4	60	<0.1	**4**	**5.6**	34	<25	<50	<25	<50	**310**	150	<0.2	<0.5	<1	<1	-
				300 100	90 -	300 410	17000 130	600 1100	80 -	1200 50	30000 380	NL 370	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2800	NL 50	NL 85	NL 70	NL 105	- -
BH07	0.4 - 0.5 m	FILL	28/09/2023	<4	<0.4	5	24	59	0.1	3	55	<0.1	**9.8**	**14**	76	<25	<50	<25	<50	**590**	250	<0.2	<0.5	<1	<1	<5
				300 100	90 -	300 410	17000 130	600 1100	80 -	1200 50	30000 380	NL 370	- 0.7	3 -	300 -	- -	- 120	NL 180	NL -	- 300	- 2800	NL 50	NL 85	NL 70	NL 105	120 -

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 Recreational C including public open space

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

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

Table H1: Summary of Laboratory Results – Priority metals, Priority PAH, PAH, Priority TRH, TRH, BTEX, Priority phenols, Priority OCP, OCP, Priority OPP, OPP, PCB, Asbestos (FA/AF), Asbestos, Other, pH, EC and CEC, Additional PhysChem

				Priority OCP										Priority OPP	PCB	Asbestos (FA/AF)				Asbestos, Other					Additional PhysChem					
				DDT+DDE+DDD [c]	Aldrin + Dieldrin	Total Chlordane	Total Endosulfan	Endrin	Heptachlor	Hexachlorobenzene	Methoxychlor	Mirex		Chlorpyriphos	Total PCB	Asb_Sample_mass	ACM >7mm Estimation	FA and AF Estimation	FA and AF Estimation	Asbestos ID in soil >0.1g/kg	Asbestos ID in soil <0.1g/kg	Trace Analysis (NEPC)	Total Asbestos#1	Asbestos Summary	Moisture	Exchangeable Ca	Exchangeable K	Exchangeable Mg	Exchangeable Na	
			PQL	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	0.1	1000	0.1	0.1	0.1	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	g	g	g	%(w/w)	-	-	-	g/kg		mg/kg	cmol/kg	cmol/kg	cmol/kg	cmol/kg	
DSI - Douglas 2024																														
BH101	0.5 - 0.6 m	FILL	18/07/24	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	883.58	-	-	<0.001	NAD	NAD	NAD	<0.1	-	46,000	-	-	-	-	
				400 180	10 -	70 -	340 -	20 -	10 -	10 -	400 -	20 -		250 -	1 -	- -	- -	- -	0.001 -						- -	- -	- -	- -	- -	
BH102	0.2 - 0.3 m	FILL	17/07/24	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	390.33	-	-	<0.001	NAD	NAD	NAD	<0.1	-	25,000	-	-	-	-	
				400 180	10 -	70 -	340 -	20 -	10 -	10 -	400 -	20 -		250 -	1 -	- -	- -	- -	0.001 -						- -	- -	- -	- -	- -	
BH103	0.5 - 0.7 m	FILL	17/07/24	-	-	-	-	-	-	-	-	-		-	-	652.03	-	-	<0.001	NAD	NAD	NAD	<0.1	-	14,000	-	-	-	-	
				- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -	- -	- -	- -	0.001 -						- -	- -	- -	- -	- -	
BH104	0.5 - 0.6 m	FILL	18/07/24	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	687.65	-	-	<0.001	NAD	NAD	NAD	<0.1	-	39,000	14	0.2	0.1	<0.1	
				400 180	10 -	70 -	340 -	20 -	10 -	10 -	400 -	20 -		250 -	1 -	- -	- -	- -	0.001 -						- -	- -	- -	- -	- -	
BH105	0.5 - 0.6 m	FILL	18/07/24	-	-	-	-	-	-	-	-	-		-	-	788	-	-	<0.001	NAD	NAD	NAD	<0.1	-	48,000	-	-	-	-	
				- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -	- -	- -	- -	0.001 -						- -	- -	- -	- -	- -	
BD1/20240719	0.5 - 0.6 m	FILL	18/07/2024	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	42,000	-	-	-	-	
				- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -	- -	- -	- -	- -						- -	- -	- -	- -	- -	
BH106	0.5 - 0.6 m	FILL	19/07/24	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	945.5	-	-	<0.001	NAD	NAD	NAD	<0.1	-	25,000	-	-	-	-	
				400 180	10 -	70 -	340 -	20 -	10 -	10 -	400 -	20 -		250 -	1 -	- -	- -	- -	0.001 -						- -	- -	- -	- -	- -	
BH107	0.1 - 0.2 m	FILL	18/07/24	-	-	-	-	-	-	-	-	-		-	-	967.36	-	-	<0.001	NAD	NAD	NAD	<0.1	-	61,000	-	-	-	-	
				- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -	- -	- -	- -	0.001 -						- -	- -	- -	- -	- -	
BH108	0.5 - 0.6 m	FILL	19/07/24	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	861.03	-	-	<0.001	NAD	NAD	NAD	<0.1	-	90,000	-	-	-	-	
				400 180	10 -	70 -	340 -	20 -	10 -	10 -	400 -	20 -		250 -	1 -	- -	- -	- -	0.001 -						- -	- -	- -	- -	- -	
BH109	0.1 - 0.2 m	FILL	19/07/24	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	848.28	-	0.0002	<0.001	NAD	**Detected**	NAD	<0.1	**Detected**	89,000	-	-	-	-	
				400 180	10 -	70 -	340 -	20 -	10 -	10 -	400 -	20 -		250 -	1 -	- -	- -	- -	0.001 -						- -	- -	- -	- -	- -	
BH109	0.5 - 0.6 m	FILL	19/07/2024	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	40,000	-	-	-	-	
				- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -	- -	- -	- -	- -						- -	- -	- -	- -	- -	
BH110	0.5 - 0.6 m	FILL	19/07/24	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	801.83	-	-	<0.001	NAD	NAD	NAD	<0.1	-	44,000	0.3	<0.1	<0.1	<0.1	
				400 180	10 -	70 -	340 -	20 -	10 -	10 -	400 -	20 -		250 -	1 -	- -	- -	- -	0.001 -						- -	- -	- -	- -	- -	
DSIC - Douglas 2023																														
BH01	0 - 0.1 m	FILL	29/09/23	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	-	-	-	-	-	-	-	-	ND						
				400 640	10 -	70 -	340 -	20 -	10 -	10 -	400 -	20 -		250 -	1 -	- -	- -	- -	- -											
BD01/20230929	0 - 0.1 m	FILL	29/09/23	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-						
				- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -	- -	- -	- -	- -											
BH02	0 - 0.1 m	FILL	29/09/23	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	-	-	-	-	-	-	-	-	ND						
				400 640	10 -	70 -	340 -	20 -	10 -	10 -	400 -	20 -		250 -	1 -	- -	- -	- -	- -											
BH02	0.9 - 1 m	FILL	29/09/23	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	ND						
				- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -	- -	- -	- -	- -											
BH03	0.4 - 0.5 m	FILL	26/09/2023	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	-	-	-	-	-	-	-	-	ND						
				400 640	10 -	70 -	340 -	20 -	10 -	10 -	400 -	20 -		250 -	1 -	- -	- -	- -	- -											
BD01/20230926	0.4 - 0.5 m	FILL	26/09/2023	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-						
				- -	- -	- -	- -	- -	- -	- -	- -	- -		250 -	1 -	- -	- -	- -	- -											
BH03	0.9 - 1 m	FILL	26/09/2023	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	ND						
				- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -	- -	- -	- -	- -											
BH04	0 - 0.1 m	FILL	26/09/2023	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	-	-	-	-	-	-	-	-	ND						
				400 640	10 -	70 -	340 -	20 -	10 -	10 -	400 -	20 -		250 -	1 -	- -	- -	- -	- -											
BH05	0 - 0.1 m	FILL	29/09/23	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	-	-	-	-	-	-	-	-	ND						
				400 640	10 -	70 -	340 -	20 -	10 -	10 -	400 -	20 -		250 -	1 -	- -	- -	- -	- -											
BH06	0 - 0.1 m	FILL	29/09/23	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	-	-	-	-	-	-	-	-	ND						
				400 640	10 -	70 -	340 -	20 -	10 -	10 -	400 -	20 -		250 -	1 -	- -	- -	- -	- -											
BH06	0.9 - 1 m	FILL	29/09/23	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	ND						
				- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -	- -	- -	- -	- -											
BH07	0.4 - 0.5 m	FILL	28/09/2023	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	-	-	-	-	-	-	-	-	ND						
				400 640	10 -	70 -	340 -	20 -	10 -	10 -	400 -	20 -		250 -	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 Recreational C including public open space

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

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

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Randwick Boys and Girls School Upgrade
LOCATION: Avoca Street, Randwick, NSW 2031

SURFACE LEVEL: 38.5 AHD
COORDINATE: E:337180.0, N:6244755.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH101
PROJECT No: 224455.02
DATE: 18/07/24
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	RESULTS AND REMARKS
18/07/24 No free groundwater observed		0.04	ASPHALT: 40mm thick										
			FILL / ROADBASE GRAVEL; angular to sub-angular, cement stabilised gravel aggregate.		FILL	ND	ND						
		0.28	FILL / SAND, trace glass, trace gravel: pale brown; fine; sandstone and concrete gravel.		FILL	(MD)			A/ES		0.30	PID	<1ppm
									A/ES		0.40		
											0.50	PID	<1ppm
	38								A/ES		0.60		
		0.80	SAND (SP): yellow-brown; fine.			(D)							
		1	From 1.10m: orange-brown						A/ES		0.90	PID	<1ppm
											1.00		
	37		From 1.60m: dark brown						A/ES		1.50	PID	<1ppm
											1.60		
		2					D		A/ES		1.90	PID	<1ppm
											2.00		
	36		From 2.40m: yellow brown		AEO	D						SPT	6,11,10 N=21
		3									3		
	35						M						
		4									4	SPT	7,13/50 Double bouncing
	34		Borehole discontinued at 4.20m depth. Refusal on inferred weathered sandstone bedrock.										

DCP 7/150

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: DT to 0.28m, AD/T to 4.2m
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
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: Randwick Boys and Girls School Upgrade
LOCATION: Avoca Street, Randwick, NSW 2031

SURFACE LEVEL: 38.8 AHD
COORDINATE: E:337198.0, N:6244747.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH102
PROJECT No: 224455.02
DATE: 17/07/24
SHEET: 1 of 2

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
	38	0.04	ASPHALT: 40mm thick		FILL	ND	ND		A/ES		0.20	PID	<1ppm
		0.30	FILL / ROADBASE GRAVEL; angular to sub-angular, aggregate (basalt gravel).		FILL				A/ES		0.50	PID	<1ppm
		0.60	FILL / SAND, trace gravel: pale brown; fine; sandstone and concrete gravel.								0.90	PID	<1ppm
	37	1	SAND (SP): yellow-brown; fine.				D		A		1.00	PID	<1ppm
▼ 17/07/24		2			AEO	L					2	SPT	3,4,7 N=11
	36	3					M				3		
	35	4									4	SPT	10,7/50 double bouncing
		4.20	Continued as rock										
	34	5									5		
	33	6									6		
	32	7									7		
	31	8									8		
	30	9									9		
	29												

DCP 0/150 — 5 — 10 — 15

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: DT to 0.3m, AD/T to 4.2m, NMLC to 7.57m
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
CASING: HW to 4m

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Randwick Boys and Girls School Upgrade
LOCATION: Avoca Street, Randwick, NSW 2031

SURFACE LEVEL: 38.8 AHD
COORDINATE: E:337198.0, N:6244747.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH102
PROJECT No: 224455.02
DATE: 17/07/24
SHEET: 2 of 2

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
▼ 17/07/24	38	0													0				
	37	1													1				
	36	2													2				
	35	3													3				
	34	4	Continued from soil												4				
			SANDSTONE: orange-brown, pale grey, fine to coarse grained. Hawksbury Sandstone		MW	4.20													
					HW	4.80													
	33	5			MW	4.95	M								5	PLT	PL(A)=1MPa		
					HW	5.30													
		6				5.50		98	100		5.59m: B, 0°, IR, SN Fe, RF				6	PLT	PL(A)=1.9MPa		
	32	7			SW to MW	6.00	H	100	100		6.61m: B, 5°, IR, SN Fe, RF 6.64m: B, 0°, PR, SN Fe, RF 6.84m: B, 0°, PR, SN Fe, RF 7.27m: B, 10°, IR, SN Fe, RF				7	PLT	PL(A)=1.7MPa		
	31	8	Borehole discontinued at 7.57m depth. Target depth reached.													PLT	PL(A)=1.7MPa		
	30	9																	
	29																		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: Bobcat
METHOD: DT to 0.3m, AD/T to 4.2m, NMLC to 7.57m
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
CASING: HW to 4m

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

CORE PHOTO LOG

CLIENT: School Infrastructure NSW
PROJECT: Randwick Boys and Girls School Upgrade
LOCATION: Avoca Street, Randwick, NSW 2031

SURFACE LEVEL: 38.8 AHD
COORDINATE: E:337198.0, N:6244747.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH102
PROJECT No: 224455.02
DATE: 17/07/24
SHEET: 1 of 1

4.20-7.57 m depth

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Randwick Boys and Girls School Upgrade
LOCATION: Avoca Street, Randwick, NSW 2031

SURFACE LEVEL: 38.5 AHD
COORDINATE: E:337172.0, N:6244726.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH103
PROJECT No: 224455.02
DATE: 17/06/24
SHEET: 1 of 2

CONDITIONS ENCOUNTERED								SAMPLE			TESTING AND REMARKS			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[^]/ DENSITY.[^]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL / WELL PIPE
	38	0.04	ASPHALT: 40mm thick		FILL	ND	ND							
		0.30	FILL / ROADBASE GRAVEL; angular to sub-angular, aggregate (basalt gravel).						* A/ES		0.15	PID	0.6ppm	Backfill
			FILL / SAND, trace gravel: pale brown; fine; sandstone and concrete gravel.		FILL				A/ES		0.30			
		0.80	SAND (SP): pale grey; fine.		AEO	VL	D		A/ES		0.50	PID	1.3ppm	Bentonite
	37	1.50	Silty SAND (SM): dark brown; fine.						A/ES		0.70			
			From 2.50m: dark brown organic silt								0.80	PID	<1ppm	
	36		From 3.10m: brown grading to pale brown		AEO	L	M				1.00			
07/06/24	35		From 3.50m: saturated								1.50	PID	<1ppm	Gravel
		5.10	Continued as rock								1.70			
	34											SPT	25/130	
	33													
	32											SPT	4,7,13 N=20	
	31													
	30													
	29													

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
OPERATOR: Ground Test
LOGGED: JAL
METHOD: DT to 0.15m, AD/T to 5.1m, NMLC to 9.8m
CASING: HW to 4m
REMARKS: *Field replicate BD1/20240717 taken at 0.15-0.3m.

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Randwick Boys and Girls School Upgrade
LOCATION: Avoca Street, Randwick, NSW 2031

SURFACE LEVEL: 38.5 AHD
COORDINATE: E:337172.0, N:6244726.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH103
PROJECT No: 224455.02
DATE: 17/06/24
SHEET: 2 of 2

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TEST TYPE	TESTING RESULTS AND REMARKS	BACKFILL	WELL PIPE
07/06/24	38	0	Continued from soil												0			Backfill	
	37	1	SANDSTONE: orange-brown, pale grey, fine to coarse grained. Hawksbury Sandstone		FR	5.10									1			Bentonite	
	36	2			SW	5.50	M	100	-						2				
	35	3													3				
	34	4			MW	6.75									4			Gravel	
	33	5				7.00									5	PLT	PL(A)=0.3MPa		
	32	6													6				
	31	7									7.13m: B, 5°, PR, VNR Clay, RF				7	PLT	PL(A)=0.6MPa		
	30	8			SW		H	100	-		7.78m: B, 10°, CU, VNR Clay, RF 7.91m: B, 5°, IR, VNR Clay, RF				8	PLT	PL(A)=1.1MPa		
	29	9	Borehole discontinued at 9.80m depth. Target depth reached.												9	PLT	PL(A)=1.7MPa		
																PLT	PL(A)=1.5MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: Bobcat
METHOD: DT to 0.15m, AD/T to 5.1m, NMLC to 9.8m
REMARKS: *Field replicate BD1/20240717 taken at 0.15-0.3m.

OPERATOR: Ground Test

LOGGED: JAL
CASING: HW to 4m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Douglas PARTNERS

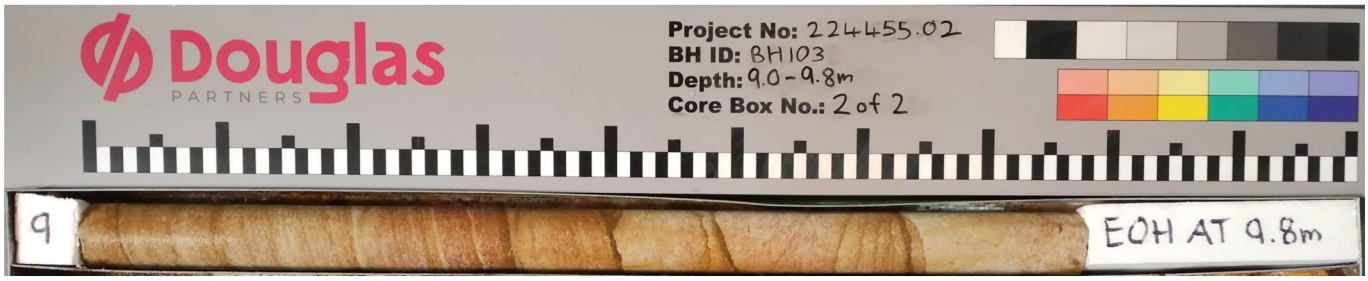
CORE PHOTO LOG

CLIENT: School Infrastructure NSW
PROJECT: Randwick Boys and Girls School Upgrade
LOCATION: Avoca Street, Randwick, NSW 2031

SURFACE LEVEL: 38.5 AHD
COORDINATE: E:337172.0, N:6244726.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH103
PROJECT No: 224455.02
DATE: 17/06/24
SHEET: 1 of 1

5.10-9.00 m depth



9.00-9.80 m depth

Douglas PARTNERS

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Randwick Boys and Girls School Upgrade
LOCATION: Avoca Street, Randwick, NSW 2031

SURFACE LEVEL: 38.5 AHD
COORDINATE: E:337188.0, N:6244723.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH104
PROJECT No: 224455.02
DATE: 18/07/24
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
	38	0.04	ASPHALT: 40mm thick										
			FILL / ROADBASE GRAVEL; angular to sub-angular, cement stabilised gravel aggregates.		FILL	ND	ND						
		0.30	FILL / SAND, trace gravel: pale brown; fine; sandstone and concrete gravel.		FILL	VL			A/ES		0.30	PID	1.7ppm
											0.40		
									A/ES		0.50	PID	1.5ppm
											0.60		
		0.70	SAND (SP): yellow-brown; fine.										
	37	1	1.30m: orange-brown						A/ES		0.90	PID	1.1ppm
											1.00		
									A/ES		1.50	PID	1.2ppm
											1.60		
	36	2			AEO	D	D		A/ES		1.90	PID	<1ppm
											2.00		
18/07/24	35	3	From 3.50m: saturated								3		
	34	4									4	SPT	4,11,16 N=27
			Borehole discontinued at 5.00m depth. Refusal .										

DCP 150 — PID — 5 — 10 — 15

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: DT to 0.3m, AD/T to 5.0m
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Randwick Boys and Girls School Upgrade
LOCATION: Avoca Street, Randwick, NSW 2031

SURFACE LEVEL: 38.7 AHD
COORDINATE: E:337183.0, N:6244772.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH105
PROJECT No: 224455.02
DATE: 18/07/24
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
18/07/24 No free groundwater observed	38	0.12	CONCRETE: 120mm thick; 40%, fine to coarse, sub-angular to angular gravel; aggregate; grey cement mix		FILL	ND	ND		A/ES		0.20	PID	<1ppm
		0.30	FILL / ROADBASE GRAVEL; angular to sub-angular, cement stabilised gravel aggregates.								0.30		
			FILL / SAND, trace gravel: pale brown; fine; sandstone and concrete gravel.		FILL	(D)			A/ES		0.50	PID	<1ppm
								*,			0.60		
		0.80	SAND (SP): yellow-brown; fine.						A/ES		0.90	PID	1.2ppm
	37	1									1.00		
							D		A/ES		1.50	PID	1.4ppm
											1.60		
					AEO	D			A/ES		1.90	PID	<1ppm
	36	2									2.00		
												SPT	7,10,12 N=22
		3	Borehole discontinued at 3.00m depth. Target depth reached.										
	35	4											
	34												

PID P9/150 — 0 5 10 15

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: DT to 0.3m, AD/T to 5.0m
REMARKS: *Field replicate BD1-20240718 taken at 0.5-0.6m.

OPERATOR: Ground Test
LOGGED: JAL
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: Randwick Boys and Girls School Upgrade
LOCATION: Avoca Street, Randwick, NSW 2031

SURFACE LEVEL: 39.0 AHD
COORDINATE: E:337193.0, N:6244782.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH106
PROJECT No: 224455.02
DATE: 18/07/24
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
19/07/24 No free groundwater observed		0.12	CONCRETE: 120mm; 40%, fine to coarse, sub-angular to angular gravel; aggregate; grey cement mix			ND			A/ES		0.10	PID	<1ppm
			FILL / SAND, trace gravel: pale brown; fine; igneous gravel.		FILL	(MD)	ND				0.20		
		0.70	SAND (SP): yellow-brown; fine.			D			A/ES		0.50	PID	<1ppm
	38	1			AEO	MD	D				0.60		
									A/ES		0.90	PID	<1ppm
											1.00		
									A/ES		1.50	PID	<1ppm
											1.60		
		1.80	Silty SAND (SM): dark brown and yellow; fine.						A/ES		1.90	PID	<1ppm
	37	2			AEO	L to MD	M				2.00		
	36	3	Borehole discontinued at 3.00m depth. Target depth reached.									SPT	3,4,5 N=9
	35	4											

DCP9/150

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: DT to 0.12m, HA to 1.0m, AD/T to 3.0m
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
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: Randwick Boys and Girls School Upgrade
LOCATION: Avoca Street, Randwick, NSW 2031

SURFACE LEVEL: 38.2 AHD
COORDINATE: E:337197.0, N:6244805.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH107
PROJECT No: 224455.02
DATE: 18/07/24
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
18/07/24 No free groundwater observed	38	0.12	CONCRETE: 120mm thick; 40%, fine to coarse, sub-angular to angular gravel; aggregate; grey cement mix			ND	ND		A/ES		0.10	PID	<1ppm
			FILL / SAND, trace glass, trace gravel: pale brown; fine; sandstone and concrete gravel.		FILL						0.20		
		0.50	SAND (SP): yellow-brown; fine.						A/ES		0.50	PID	<1ppm
											0.60		
		1							A/ES		0.90	PID	<1ppm
	37				AEO						1.00		
												SPT	7,9,6 N=15
						MD	D		A/ES		1.50	PID	<1ppm
		1.70	Silty SAND (SM): orange-brown, yellow; fine.								1.60		
		2							A/ES		1.90	PID	<1ppm
	36				AEO						2.00		
												SPT	3,5,7 N=12
		3	Borehole discontinued at 3.00m depth. Target depth reached.										
	35												
		4											
	34												

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: DT to 0.12m, AD/T to 3.0m
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Randwick Boys and Girls School Upgrade
LOCATION: Avoca Street, Randwick, NSW 2031

SURFACE LEVEL: 38.4 AHD
COORDINATE: E:337167.0, N:6244814.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH108
PROJECT No: 224455.02
DATE: 18/07/24
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 TEST TYPE	TESTING RESULTS AND REMARKS
19/07/24 No free groundwater observed	38	0.12	CONCRETE: 120mm thick; 30%, fine to coarse, sub-angular to angular gravel; aggregate; grey cement mix			ND	ND				0.20	PID	1.1ppm
			FILL / SAND, trace gravel: pale brown; fine; sandstone and concrete gravel.		FILL	(MD)			A/ES		0.30		
									A/ES		0.50	PID	1.3ppm
		0.80	Silty SAND (SM): dark brown and yellow; fine.								0.60		
	37	1				MD			A/ES		0.90	PID	<1ppm
											1.00		
			From 1.80m: yellow-brown		AEO		D		A/ES		1.50	PID	<1ppm
	36	2				(MD)					1.60		
									A/ES		1.90	PID	<1ppm
											2.00		
						MD						SPT	5,10,10 N=20
	35	3	Borehole discontinued at 3.00m depth. Target depth reached.										
	34	4											

DCP9/150

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: DT to 0.12m, HA to 1.0m, AD/T to 3.0m
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Randwick Boys and Girls School Upgrade
LOCATION: Avoca Street, Randwick, NSW 2031

SURFACE LEVEL: 38.7 AHD
COORDINATE: E:337131.0, N:6244789.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH109
PROJECT No: 224455.02
DATE: 18/07/24
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
19/07/24 No free groundwater observed	38.7 / 0.00	CONCRETE: 150mm thick			ND	ND		A/ES		0.10	PID	<1ppm
	38.55 / 0.15	FILL / SAND, trace gravel: pale brown; fine; sandstone and concrete gravel.		FILL	(MD)	D		A/ES		0.20		
	38.1 / 0.60	SAND (SP): yellow-brown; fine.		AEO				A/ES		0.50	PID	<1ppm
	37.7 / 1.00	Borehole discontinued at 1.00m depth. Borehole collapse.			MD					0.60		
										0.90	PID	<1ppm
										1.00		

DCP9/150

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

PLANT: Hand Tools
METHOD: HA to 1.0m
REMARKS:

OPERATOR: JAL

LOGGED: JAL
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Soil Log

Douglas PARTNERS

BOREHOLE LOG

CLIENT: School Infrastructure NSW
PROJECT: Randwick Boys and Girls School Upgrade
LOCATION: Avoca Street, Randwick, NSW 2031

SURFACE LEVEL: 38.2 AHD
COORDINATE: E:337136.0, N:6244830.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH110
PROJECT No: 224455.02
DATE: 18/07/24
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*]	DENSITY.[*]	MOISTURE	REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	SAMPLE DEPTH (m)	TESTING AND REMARKS: TEST TYPE	TESTING AND REMARKS: RESULTS AND REMARKS
18/07/24 No free groundwater observed	38	0.20	CONCRETE: 200mm thick; 50%, fine to coarse, sub-angular to angular gravel; aggregate; grey cement mix			ND		ND						
			FILL / SAND, trace gravel: pale brown; fine; sandstone and concrete gravel.		FILL	(L)				A/ES		0.20	PID	<1ppm
												0.30		
										A/ES		0.50	PID	1.1ppm
		0.60	SAND (SP): yellow-brown; fine.									0.60		
		1								A/ES		0.90	PID	1.3ppm
	37											1.00		
													SPT	5,3,3 N=6
										A/ES		1.50	PID	1.6ppm
					AEO	L		D				1.60		
		2								A/ES		1.90	PID	<1ppm
	36											2.00		
													SPT	5,6,4 N=10
		3	Borehole discontinued at 3.00m depth. Target depth reached.											
	35													
		4												
	34													

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: DT to 0.2m, AD/T to 3.0m
REMARKS:

OPERATOR: Ground Test

LOGGED: JAL
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.

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Soil Descriptions

Terminology
Symbols
Abbreviations

November 2023

Introduction

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

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

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

Particle size designation and Behaviour Model

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

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

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

[1] – refer grain size subdivision descriptions below

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

Component proportions

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

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

[1] As defined in AS1726-2017 6.1.4.4

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

Composite Materials

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

Classification

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

Soil Name

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

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

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

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

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

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

Identification of minor components

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

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

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

Soil Composition

Plasticity

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

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

Grain Size

Type		Particle size (mm)
Gravel	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
Estuarine	Deposited in coastal estuaries	EST
Marine	Deposited in a marine environment	MAR
Lacustrine	Deposited in freshwater lakes	LAC
Aeolian	Carried and deposited by wind	AEO
Colluvial	Soil and rock debris transported down slopes by gravity	COL
Slopewash	Thin layers of soil and rock debris gradually and slowly deposited by gravity and possibly water	SW
Topsoil	Mantle of surface soil, often with high levels of organic material	TOP
Fill	Any material which has been moved by man	FILL
Littoral	Deposited on the lake or seashore	LIT
Unidentifiable	Not able to be identified	UID

Cobbles and Boulders

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

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

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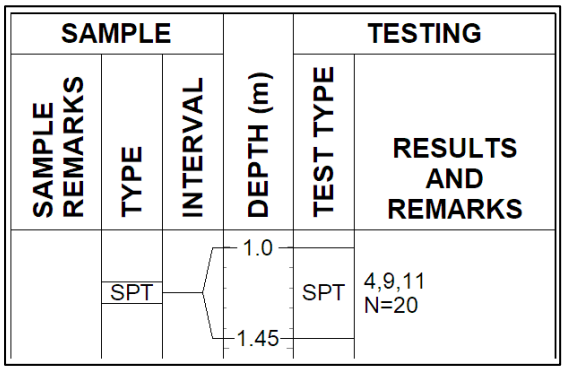
Sampling and Testing

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
Driven Tube sample	DT
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
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)	DCP9/150
Perth sand penetrometer, followed by blow count penetration increment in mm (flat tip, generally in accordance with AS1289.6.3.3)	PSP/150
Dynamic probe super heavy, followed by blow count penetration increment in mm	DPSH/100

Groundwater Observations

	water seepage/inflow
	water seepage/outflow
	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

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 7 of the RAP); and
- Render the site suitable, from a contamination perspective, for the proposed development (refer to Section 2 of the RAP).

This remediation options assessment applies to Remediation Area 1 (at and in the vicinity of BH109) which has been found to impacted by asbestos 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

Friable asbestos impacted fill has been identified at BH109 within Area B. The asbestos impacted area falls within the area of proposed green space area at Area B and presents a risk to workers and students. As such, the asbestos contamination must be remediated / managed to mitigate the risk. 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).

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:

- Excavation and off-site landfill disposal.
- Consolidation and isolation (cap and contain).

It is noted, however, that under the current Randwick Council Contaminated Land Policy (1999), Section 4.10 it states that:

- *No contaminated soil shall be encapsulated or capped on the site that contains concentrations of contaminants that are above the soil investigation levels for urban development sites in NSW for the range of land uses permissible on the subject site.*

Whilst the references by Council in this section of the Policy are now outdated, it appears that the intention is to not permit containment and capping of contaminated soils under the policy. If this option is identified as preferred, discussions with Council are recommended to ascertain their current position, if Council consent is required.

3.2.1 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 proposed development at Remediation Area 1 is to be green space area. The volumes of the asbestos impacted soils will depend on the DGI proposed in the RAP.

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.

In summary, this option can be a solution for the currently known asbestos and PAH contamination.

3.2.2 Consolidation and isolation (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 (e.g. concrete slab) and/or burial at a specified depth.

Benefits of this remediation option include:

- Minimal disturbance of soil;
- No or minimal physical remediation or off-site disposal;
- A more sustainable solution; and
- Potentially lower cost and time delays, and greater confidence of outcomes.

Constraints associated with the option include:

- On-going management responsibility under a long-term environmental management plan (LTEMP);
- Recording of the LTEMP on the S10.7 Certificate (or similar recording means) will be necessary which may have implications for property value; and
- Contaminants which leach would require a base liner or other method to managing the leaching.

This option can be a solution for the currently known asbestos and PAH contamination. This option would require available space at depth (accounting for final design levels that need to accommodate a minimum capping thickness) for placement / retention of the impacted material, and the excavation and management of the contaminated material removed prior to capping.

It is noted that under the current Randwick Council Contaminated Land Policy (1999), Section 4.10 it states that:

> *No contaminated soil shall be encapsulated or capped on the site that contains concentrations of contaminants that are above the soil investigation levels for urban development sites in NSW for the range of land uses permissible on the subject site.*

Whilst the references in this section are now outdated, it appears that the intention is to not permit containment and capping of contaminated soils under the policy. If this option is identified as preferred following the DGI, discussions with Council are recommended to ascertain their current position, if Council consent is required.

4. Summary of remediation strategy

Based on the outcome of the options assessment and discussion with School Infrastructure NSW, two remediation options have been identified for the works at the site:

- Option 1: Excavation of all asbestos impacted fill from the remediation area (or to a further delineated extent), preparation of a waste classification report for the excavated soils, and off-site landfill disposal under that classification; and/or
- Option 2: Relocate to the footprint of the proposed new building (or landscape areas), capped with a physical barrier, and managed if required in the long term under a long-term environmental management plan (LTEMP).

5. 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

Remediation Assessment 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 proposed development of the site (Area B) comprises demolition of Building A which is located within the RBHS campus and construction of a two-storey administration building and lecture learning building, refurbishment of other buildings and development of a new green space area. No basement levels are proposed for the new proposed development plan.

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

- Land use: residential (which includes primary schools):
  - Corresponding to land use category 'C', public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. It does not include undeveloped public open space (such as urban bushland and reserves) which should be subject to a site-specific assessment where appropriate.
- Soil type: sand.

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-C
Metals	
Arsenic	300
Cadmium	90
Chromium (VI)	300
Copper	17 000
Lead	600
Mercury (inorganic)	80
Nickel	1200
Zinc	30 000
PAH	
B(a)P TEQ	3
Total PAH	300
Phenols	
Phenol	40 000
Pentachlorophenol	120
OCP	
DDT+DDE+DDD	400
Aldrin and dieldrin	10
Chlordane	70
Endosulfan	340
Endrin	20
Heptachlor	10
HCB	10
Methoxychlor	400
OPP	
Chlorpyrifos	250
PCB	
PCB	1

Table 2: Health screening levels (mg/kg)

Contaminant	HSL-C	HSL-C
SAND	**0 m to <1 m**	**1 m to <2 m**
Benzene	NL	NL
Toluene	NL	NL
Ethylbenzene	NL	NL
Xylenes	NL	NL
Naphthalene	NL	NL
TRH F1	NL	NL
TRH F2	NL	NL

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'.

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-C	DC HSL-IMW
Benzene	120	1100
Toluene	18 000	120 000
Ethylbenzene	5300	85 000
Xylenes	15 000	130 000
Naphthalene	1900	29 000
TRH F1	5100	82 000
TRH F2	3800	62 000
TRH F3	5300	85 000
TRH F4	7400	120 000

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

2.2 Asbestos in soil

A detailed asbestos assessment was undertaken during the recent DSI (Douglas 2024). 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-C
ACM	0.02%
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" (>2 years)	
pH	8	Average of measurement pH values
CEC	5.68 $cmol_c/kg$	Average of measurement CEC value
Clay content	10%	Conservative value used as initial screen
Traffic volumes	high	Site is located in an urban residential / commercial area
State / Territory	NSW	

Table 6: Ecological investigation levels (mg/kg)

Contaminant	EIL-A-B-C
Metals	
Arsenic	100
Copper	130
Nickel	50
Chromium III	410
Lead	1100
Zinc	380

Contaminant	EIL-A-B-C
PAH	
Naphthalene	170
OCP	
DDT	180

Notes: 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 E

Contingency Plan and Unexpected Finds 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 10) 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) 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 F

Data Quality Objectives

1. Data quality objectives

The objective of the validation plan is to assess the results of validation testing against the remediation acceptance criteria (RAC) stated within Section 12, 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.

Table 1: Data quality objectives

Step	Summary
1: State the problem	The site requires remediation and validation of remediation in order to render it suitable for open space land use. 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 7).
2: Identify the decisions / goal of the study	The CSM identifies the contaminants of potential concern (CoPC) and the likely impacted media. The key CoPC impacting the site are: • Asbestos. The validation sampling results will be compared against the RAC. The preferred remediation contingency options as outlined in the RAP is: • Option 1: Relocate, cap and contain the contaminated soil; and • Option 2: Excavation and disposal of contaminated soils. The success of the remediation and subsequent validation will be based on a comparison of the analytical results for all CoPC to the adopted RAC and, if necessary, compared to the 95% upper confidence limit (UCL) of the arithmetic mean (95% UCL) concentrations.
3: Identify the information inputs	Relevant inputs to the decision include: • The CSM, identifying the CoPC and affected media; • Analysis 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; • Assessments of aggregates, soil, etc imported as part of the permanent remediation works (if any); and • A photoionisation detector (PID) to screen soils on site for VOC. PID readings will be used to inform sample selection for laboratory analysis.

Step	Summary
4: Define the study boundaries	The lateral boundaries of Area B within the site are shown on Drawing 1, Appendix A. 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 to compare all analytical results with the RAC. Initial comparisons will be with individual results then, where appropriate, summary statistics (including mean, standard deviation and 95% UCL), to further assess potential risks posed by the site contamination. Quality control results 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 is included in Section 16.
6: Specify the performance or acceptance criteria	Baseline condition: Contaminants at the site and/or statistical analysis of data exceed the RAC and pose a potentially unacceptable risk to receptors (null hypothesis). Alternative condition: Contaminants at the site and statistical analysis of data complies with the RAC and therefore, do not pose a potentially unacceptable risk to receptors (alternative hypothesis). Unless conclusive information from the collected data is sufficient to reject the null hypothesis, it will be 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 include the following: • Sampling frequencies in accordance with Section 123.4; • Analysis for the CoPC at NATA accredited laboratories using NATA endorsed methods where possible; and • Adequately experienced environmental scientists / engineers conducting field work and sample analysis interpretation.

2. 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.

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;
    - Surveys pre- and post-installation of geotextile marker layer and clean fill cap;
    - Airborne asbestos monitoring records (in the event that asbestos works are undertaken); and
    - Interim / final visual and sampling clearances for any asbestos related works (in the event that asbestos works are undertaken).
- 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 Asbestos contractor

The Asbestos Contractor will be responsible for undertaking all asbestos work involving any asbestos impacted fill and will hold a Class A licence for the removal of asbestos (issued by SafeWork NSW), on the basis that the asbestos identified at the site to date has included both friable and bonded asbestos.

The Asbestos Contractor can be the same entity as the Remediation Contractor.

2.5 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.

2.6 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.

2.7 Licenced Asbestos Assessor

A Licenced Asbestos Assessor will be required to be engaged independently of the Asbestos Contractor to undertake the following:

- Review and approve documentation prepared by the Asbestos Contractor;
- Prepare any WHS plans and advice required by the Remediation Contractor;

- Undertake airborne asbestos monitoring;
- Undertake clearance inspections;
- Provide advice and recommendations arising from monitoring and/or inspections; and
- Notify the client with the results of any assessments and any observed non-conformances.

2.8 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 run-off 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;
- Stockpiles shall be lightly conditioned by sprinkler or covered by geotextile or similar cover to prevent dust generation (if remaining overnight);
- Stockpiles impacted, or potentially impacted, with asbestos must be covered by geotextile or similar cover to prevent dust generation;
- 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).

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

8.3 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.

8.4 Chemical contamination hazards

Chemical compounds or substances that may be present in the soils at the site include the key CoPC 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.