
Updated Remediation Action Plan

Proposed Visitor Information Centre

17 Denison Street, Gloucester NSW

**Prepared for NSW Department of
Planning Housing and Infrastructure**

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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.

Signature

Date

Author		05 August 2025
Reviewer		05 August 2025

Executive Summary

Douglas Partners Pty Ltd (Douglas) has prepared this Updated Remediation Action Plan (RAP) for a proposed visitor information centre at 17 Denison Street, Gloucester NSW.

The site has been used for commercial / industrial purposes since at least the late 1950s which included the storage and dispensing of fuel from underground fuel storage tanks (USTs). The existing buildings have historically been used as a service station, machinery shop and tyre service centre and permanently closed in the 2010's.

Previous investigations have identified impacts to soil and groundwater primarily associated with the existing Underground Petroleum Storage System (UPSS) and infrastructure located adjacent to northern (downgradient) boundary of the site as shown on Drawing 1. Impacts were observed in soil and groundwater both on-site and off-site within Denison Street to the north. The extent of off-site impacts has not been assessed. Localised soil impacts were also identified within Stockpile A materials and a localised surface asbestos containing materials (ACM) hotspot (F1/JRK). Asbestos was also identified within filling at one test location (Pit 207) within the allowable concentration limit for the current site condition.

Remediation will be required to render the site suitable for the proposed development and will include decommissioning of the UPSS and remediation of the primary sources of contamination (i.e. impacted soils and groundwater associated with UPSS infrastructure within the site and off-site to the north), and removal of Stockpile A materials and the localised ACM hotspot.

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.

A validation assessment report will be prepared at the completion of the works. 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 visitor information centre development.

It should be noted that this RAP does not form a detailed specification for the proposed site remediation works, but rather represents a planning document which outlines the means by which site remediation can be achieved.

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Remediation Action Plan

Proposed Visitor Information Centre

17 Denison Street, Gloucester NSW

1. Introduction

Douglas Partners Pty Ltd (Douglas) has prepared this updated remediation action plan (RAP) for a proposed visitor information centre at 17 Denison Street, Gloucester NSW. The RAP was commissioned by Kaitlin Withers of NSW Department of Planning Housing and Infrastructure and was undertaken in line with Douglas' proposal 228674.02.P.001.Rev0 dated 27 February 2025.

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, 2020a); and
- CRC CARE Remediation Action Plan: Development - Guideline on Establishing Remediation Objectives (CRC CARE, 2019a).

The remediation objectives, devised with reference to 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.

The proposed development involves the construction of a visitors information centre to be managed by National Parks and MidCoast Council.

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 is shown on Drawing 1, Appendix A. This report must be read in conjunction with all appendices including the notes provided in Appendix B.

2. Proposed development

The current proposed development comprises a visitors information centre to be managed by National Parks and MidCoast Council. No development plans were available at the time of the previous investigations or preparation of this updated RAP. The extent of cut/fill earthworks for the proposed development is unknown at this stage. It is understood that existing structures and pavement will be demolished as part of site redevelopment.

3. Scope of work

The scope of work to achieve the objective is as follows:

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

4. Site description

Site Address	17 Denison Street, Gloucester
Legal Description	Lot 1 Deposited Plan 571352
Site Area	Approx. 3500 m ²
Land Zoning	Zone C3 Environmental Management
Local Council Area	Mid Coast Council
Current Use	Vacant, the site was formerly used as a fuel station / workshop
Surrounding Uses	North – Denison Street, bus shelter with associated public toilet block and Billabong Park (recreational land use) East – Billabong lane, parking spaces and commercial premises South – Industrial premises West – Unnamed unlined creek (tributary of Gloucester River), open space/sports grounds (recreational land use)

The site boundary is shown on Figure 1.



Figure 1: Overview of the site area in yellow (Source: SixMaps, image dated 24/06/2024)

General site conditions and features observed in the April 2024 inspection during the DSI and in March-April 2025 during the SDSI are shown in the site photos in Appendix C.

5. Environmental setting

Regional Topography (NSW 2m Contours)	The site is located within a region of moderately to steeply undulating terrain and is situated on a typically flat area of land to the west of the Gloucester CBD.
Site Topography (NSW 2m Contours)	Generally flat slightly sloping to the creek to the west of the site with surface elevations varying between RL92 (AHD) and RL94. Drainage is anticipated to be via overland flow into the street drainage system (to the north), and creek located to the west of the site.
Soil Landscape (NSW Soil Landscapes Central Eastern NSW)	The site is located within the alluvial soils of the Gloucester River landscape, which is characterised by “broad level alluvial plains in the Stroud-Gloucester Basin region in the north-east of the area”. Limitations include flood hazard, seasonal waterlogging and permanently high-water tables, low permeability soils of low wet bearing strength.
Geology (NSW Seamless Geology)	The site is underlain by Wards River Conglomerate which typically comprises of polymictic conglomerate, fine-grained siliceous volcanics, lithic sandstone and, thin coal beds.
Acid Sulfate Soils (ASS) (NSW ASS Risk Map)	The site is not mapped within an area of acid sulphate soil risk.

Surface Water	There are no mapped surface water bodies present on the site. The nearest off-site surface water ecological receptor would be the unnamed creek immediately adjacent the site (20 m west of the site) which flows north into the Gloucester River. The creek is ephemeral in nature.
Groundwater	A total of 8 registered groundwater bores are located within 500 m of the site. A summary of registered groundwater bores was provided in the previous DSI (Douglas, 2024a) and SDSI (Douglas, 2025).

6. Summary of previous investigations

The following previous reports were conducted at the subject site:

- Regional Geotechnical Solutions (RGS) (2022), Stage 1 & 2 Site Contamination Assessment, Proposed Visitor Centre – 17 Denison Street, Gloucester. Project RGS02423.1-AB;
- Douglas Partners Pty Ltd (Douglas) (2024), Detailed Site Investigation (Contamination) (DSI), Proposed Visitor Information Centre – 17 Denison Street, Gloucester. Project 228674.00.R.001.Rev0;
- Douglas Partners Pty Ltd (Douglas) (2025), Supplementary Detailed Site Investigation (Contamination) (SDSI), Proposed Visitor Information Centre – 17 Denison Street, Gloucester. Project 228674.02.R.001.Rev0.

The pertinent findings of the RGS 2022 report are summarised below:

- The RGS site contamination assessment conducted in December 2021 included a site history review, site inspection and subsurface investigation comprising drilling of eight bores, collection of six surface samples, installation of three groundwater wells and sampling of groundwater. Test locations are shown on Drawing 1 in Appendix A;
- The site history review indicated the site has been used for commercial / industrial purposes since at least the late 1950s which included the storage and dispensing of fuel from underground fuel storage tanks (USTs). The existing buildings have historically been used as a service station, machinery shop and tyre service centre and permanently closed in the 2010's;
- The UST's identified by RGS comprised two 4,500 L unleaded petrol USTs, one 12,000 L diesel UST and one 27,000 L unleaded petrol UST. Location of USTs is shown on Drawing 1 in Appendix A;
- The site inspection in 2021 indicated the former fuel bowzers across the northern portion of the site had been removed at some point, however the four existing USTs appear to have been left in-situ. It was unknown if the tanks had been decommissioned;
- Subsurface conditions generally comprised concrete / pavement seal and sandy gravelly clay fill materials overlying alluvial silty / sandy clay. Fill was identified in three of the eight bores (Bores 3, 6 and 8) to a maximum depth of 0.6 m. Moderate to strong hydrocarbon odours were observed in Bores 1, 2 and 7 during drilling;
- PID results indicated moderate to high hydrocarbon impact to underlying soils in the vicinity of the tank farm (i.e. PID readings 260 to 570 ppm);

- Groundwater was encountered within the three groundwater wells during gauging at depths between 1.75 m and 1.85 m below ground level. Slight / slight to moderate hydrocarbon odours and slight sheens were observed in purged groundwater from wells MW1 and MW2 (vicinity of the tank farm);
- Laboratory testing indicated TRH / BTEX concentrations in two samples (BH7/1.3-1.5 m and BH7/1.8-2.0 m) exceeded the adopted HSL for commercial / industrial land use. The samples were located at the front of the site to the east of the two former unleaded USTs. Two other surface samples (SS1 and SS2) exceeded the ecological assessment criteria for BaP;
- Concentrations of metals (cadmium, chromium, copper, lead, nickel and zinc), TRH and PAH exceeded the adopted criteria in groundwater samples from wells MW1 and MW2 (northern boundary of the site within tank farm). Metal concentrations (arsenic, cadmium, chromium, copper, lead, nickel and zinc) were also observed above the adopted criteria in well MW3 (located in the south western portion of the site adjacent former tyre centre);
- One surface sample (SS4) was collected from the existing fill Stockpile A in the western portion of the site. Laboratory testing indicated the presence of Chrysotile asbestos below the laboratory limit of reporting (LOR) of 0.1 g/kg (0.01%);
- RGS identified the following sources of contamination at the site:
 - o USTs and former service station area;
 - o Soils in the vicinity of existing structures;
 - o Equipment and scrap materials storage area;
 - o Existing fill Stockpile A;
 - o Presence of fill of unknown origin;
- The results of the subsurface investigation indicated hydrocarbon impacts to soil and groundwater within the vicinity of USTs and former petrol station infrastructure;
- RGS recommended additional investigation to confirm the extent of hydrocarbon impact to soil and groundwater and possible risks to on-site and off-site receptors, provide waste classification for Stockpile A materials in the western portion of the site as well as a HAZMAT assessment of the existing buildings.

The pertinent findings of the Douglas (2024) DSI are summarised below:

- The DSI included subsurface investigation at 28 test locations (15 boreholes, 13 test pits) and laboratory testing on soil and groundwater within the site to confirm site condition from a contamination perspective and inform potential remediation options for the site;
- The subsurface conditions encountered in the DSI are shown in the bore and test pit logs in Appendix D and were generally commensurate with the findings of the previous RGS investigation;
- Soil and groundwater test results from the DSI are provided in the laboratory summary tables in Appendix E;
- The DSI identified hydrocarbon impacts in soil and groundwater at three current test locations. These locations were in the vicinity of existing USTs associated with the former service station within the central northern portion of the site;

- Asbestos containing materials (ACM) was identified at the ground surface at one location ('F1/JRK'). Asbestos fines (AF) were also identified in soil at one of the 23 test locations (excluding Stockpile A soils) comprising asbestos fines within fill (Pit 207/0.2 m), however the concentration was below the adopted SAC;
- The results of current and previous testing on Stockpile A materials located in the western portion of the site indicated that the materials tested were classified as 'General Solid Waste (non-putrescible) (CTI and TCLP1/SCC1) – Special Waste (Asbestos) for possible disposal to a licensed landfill';
- Elevated concentrations of metals, BTEX, PAH, VOC and PFAS in groundwater were identified above the adopted SAC at some locations. Elevated TRH concentrations were also identified in groundwater in Wells 104, 105 and MW1 in the vicinity of the existing USTs in the northern portion of the site;
- The DSI concluded that the identified impacts in soil and groundwater at the site were likely to be associated with existing USTs and service station infrastructure adjacent to northern (downgradient) boundary of the site as shown on Drawing 1. It is likely that hydrocarbon impacts from the USTs have migrated off-site via groundwater to the north – north east to adjacent Denison Street due to the proximity to the site boundary and the interpreted groundwater flow direction to the north. The possible extent of off-site impacts was not assessed;
- Identified soil, groundwater and asbestos impacts will require remediation in accordance with a site-specific RAP to render the site suitable for the proposed development. The RAP would outline the proposed remediation strategy, remediation action criteria and validation requirements;
- Remediation should include decommissioning of the service station, and remediation of the primary source of contamination within the site (i.e. impacted soils and groundwater in the vicinity of UST's and service station infrastructure). Remediation would also minimise the risk for further migration of contamination. Groundwater monitoring following remediation would also be required to confirm post remediation conditions and residual risks associated with the possible off-site migration of contamination;
- Additional off-site investigation was also recommended to further assess the presence and extent of possible migration of impacts north of the site and to assess possible impacts to the neighbouring creek from historical site activities (based on anecdotal evidence during the DSI);
- Although minor asbestos impacts were identified at the test locations, the DSI noted that there is a risk of further ACM impact to be identified during remediation and redevelopment works given the widespread presence of fill. Both the RAP and contractor's construction management plans should include an unexpected finds protocol (UFP) for earthworks for the site. The UFP should outline the appropriate action should suspected contamination be observed during clearing or earthworks, such as potential asbestos containing materials.

The pertinent findings of the Douglas (2025) SDSI are summarised below:

- The SDSI was undertaken to further investigate the extent of contamination at the site, possible migration of hydrocarbon impacts north of the site, possible impacts to the adjacent creek and inform additional remediation requirements / requirements for further investigation at the site;

- The assessment comprised subsurface investigation at six test locations (Bores 301 to 306) within Denison Street, collection of sediment and surface water samples from the adjacent creek (SED1/SW1 to SED3/SW3), groundwater sampling of existing and newly installed wells on-site and off-site, laboratory testing on soil, sediment, surface water and groundwater samples and preparation of a report presenting the findings of the investigation;
- The subsurface conditions encountered in the SDSI are shown in the logs in Appendix D and were generally commensurate with the findings of the previous RGS and Douglas investigations. Douglas noted that a more permeable sandy/gravelly strata was located at depths between 1.9 m to 3.6 m in Bores 301 to 306. This material was also identified in previous test locations in the DSI (Douglas, 2024a);
- Soil, sediment, surface water and groundwater test results from the SDSI are provided in the laboratory summary tables in Appendix E;
- Soils tested were generally within the adopted human health and ecological guidelines for standard commercial / industrial land use scenario for chemical contaminants with the exception of elevated TRH concentrations in two samples (302/2 m and 306/2.5 m);
- Elevated concentrations of metals, BTEX, PAH, VOC and PFAS in groundwater were identified above the adopted SAC at most locations (including Well 106 upgradient of on-site UPSS area);
- Elevated TRH concentrations were also identified in groundwater in three wells in the vicinity of the existing USTs and service station infrastructure (Wells 104, 105 and MW1) as well as five newly installed off-site wells along Denison Street downgradient of the site (Wells 302, 303 located 6 m downgradient of the site boundary, and 304, 305 and 306 located 17 m downgradient of the site boundary);
- LNAPL (free phase impacts or slicks/emulsion) was not observed in groundwater at on-site or off-site wells during field work;
- The results of testing on surface water and sediments within the adjacent creek suggest the general absence of significant adverse impacts from site activities;
- The SDSI identified on-site and off-site impacts associated with existing USTs and service station infrastructure. Field observations and laboratory testing suggested hydrocarbon impacts have migrated off-site via a preferential flow path (i.e. underlying natural sand/gravel materials). Hydrocarbon impacts were observed both immediately adjacent to the site and further north within Bores 304, 305 and 306 located 17 m from the site boundary near the bus shelter. It is noted that an amenities building is located further north of the bus shelter. The results of testing of groundwater suggested possible vapour intrusion risks when considering the sandy underlying strata (i.e. the preferential flow path for groundwater migration);
- Douglas concluded that remediation was required to render the site suitable for the proposed development. Remediation/management of off-site impact was also required due to the migration of hydrocarbons via groundwater from the site. Remediation should include decommissioning of the service station, and remediation of the primary sources of contamination within the site (i.e. impacted soils and groundwater in the vicinity of UST's and service station infrastructure). Where practicable, remediation could also include removal of impacted soils and groundwater within the footpath / road reserve directly north of the site, subject to regulatory approval. Remediation will remove the primary source of contamination and also minimise the risk for further migration of contamination from the site;

- Off-site impacts could be managed via monitored natural attenuation (MNA) subject to appropriate design and monitoring, which is likely to require installation of additional monitoring wells downgradient of Bores 304, 305 and 306 and assessment of vapour intrusion risk associated with the amenities building;
- Douglas recommended the previous RAP be amended to include the results of the SDSI and provide procedures for the remediation/management of on-site and off-site impacts. Remediation would require further groundwater monitoring (both on-site and off-site) and assessment of off-site vapour intrusion risk and natural attenuation following removal of the primary source of contamination.

7. Conceptual site model

The data collected during previous investigations generally confirmed that for certain potential contaminant sources outlined in the CSM in Douglas (2025), 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 below.

Table 1: Summary of Potentially Complete Exposure Pathways (Proposed Commercial/Industrial Land Use)

Source and COPC	Transport Pathway	Receptor	Risk Management Action
S1: USTs and associated infrastructure: metals, TRH, BTEX, PAH (central northern portion of the site)	HP1: Ingestion and dermal contact HP2: Inhalation of dust and/or vapours	HR1: Current users [nearby residents / trespassers] HR2: Construction and maintenance workers HR3: End users [commercial land users] HR4: Adjacent site users (user of bus shelter / amenities building downgradient of the site)	Testing of soil and groundwater during the previous DSI indicated the presence of hydrocarbon impacts near and downgradient of known USTs and service station infrastructure within the site. Additional testing of soil and groundwater during the subsequent SDSI indicated the presence of hydrocarbon impacts off-site to the north into Denison Street. Hydrocarbon impacts were observed directly adjacent the site as well as within Bores 304, 305 and 306 located approximately 17 m north on the opposite side of Denison Street. USTs and service station infrastructure (i.e. pipes) should be appropriately removed and validated with reference to a site-specific remediation action plan (RAP) with reference to NSW EPA (2014c). Remediation is required for the identified hydrocarbon impacted soil and groundwater to render the site suitable for the proposed development from a contamination perspective and to address off-site impacts.
	EP1: Surface water run-off EP2: Lateral migration of groundwater providing base flow to water bodies	ER1: Surface water	
	EP3: Leaching of contaminants and vertical migration into groundwater	ER2: Groundwater	
	EP4: Inhalation, ingestion and absorption	ER3: Terrestrial ecosystems	
S2: Imported Fill: asbestos (subject to source) S6: Hazardous building materials: lead, asbestos, SMF, PCB S8: Existing Stockpile A: asbestos (subject to source)	HP1: Ingestion and dermal contact HP2: Inhalation of dust and/or vapours	ER1: Current users [nearby residents / trespassers] ER2: Construction and maintenance workers ER3: End users [commercial land users]	Testing generally indicates the absence of gross chemical contamination to soils (excluding the UST and service station infrastructure area). Chemical contaminant concentrations were within commercial/industrial land use criteria. Chemical concentrations in groundwater were found above the adopted SAC (ANZG 2018 and NEMP 2020). ACM (bonded) impacts identified at the surface at one test location. Owing to the presence of fill at the site, history of building demolition and presence of building waste within fill across the site there is a risk of further ACM to be present within upper fill materials across the site. Remediation is required for the identified ACM impacted fill to render the site suitable for the proposed development from a contamination perspective.

8. Remediation extent

The extent of remediation comprises:

- Remediation Area 1 (RA1) – UPSS Area:
 - o Comprising the former service station infrastructure (northern portion) and associated workshops / buildings (including decommissioning, removal and validation of the Underground Petroleum Storage System (UPSS) and workshop / building areas);
 - o The extent of RA1 will be further assessed following site demolition and decommissioning of the UPSS (i.e. removal of buildings, slabs, infrastructure and services including UST's, pipelines, drains and sumps etc). As stated in the DSI (Douglas, 2024a), residual contamination may also be present immediately beneath existing slabs within the workshop, refuelling areas, and within service pits/pipes based on experience with similar sites. The extent of remediation will be established at the completion of the excavation of the area during remediation.
- Remediation Area 2 (RA2) – Stockpile A:
 - o Comprising Stockpile A materials (to be appropriately removed and disposed from the site);
 - o The extent of RA2 comprises the grass covered aboveground Stockpile A adjacent to the western site boundary.
- Remediation Area 3 (RA3) – ACM Hotspot:
 - o Hotspot containing surface ACM impacts in the vicinity of F1/JRK within central portion of the site comprising a localised surface area, however, the risk of further surface impacts cannot be precluded, which will be further assessed during remediation via surface inspection/clearance, and the unexpected finds protocol during development;
 - o It is noted that based on current site conditions and absence of plans for the proposed development at this stage, identified friable asbestos (FA) impacts in Pit 207 do not require remediation due to concentrations being below the adopted SAC and the presence of overlying asphalt pavement covering the materials. If the proposed development includes alterations in site levels or removal of existing asphalt pavement, remediation of impacts at Pit 207 would be required to render the site suitable for the proposed development. Additional investigations could be undertaken to further assess the extent of asbestos impacts across the site and determine remediation requirements/options for the proposed development (refer to Section 10.3).
- Remediation Area (RA4) - Off-site Hydrocarbon Plume
 - o Hydrocarbon impacted groundwater observed off-site to the north of the site. Impacts are sourced from the existing UST infrastructure located along the northern site boundary, directly adjacent Denison Street.
 - o The extent of the off-site hydrocarbon plume has not been determined. Additional investigation to further delineate extent of hydrocarbon impacts could comprise mapping of the hydrocarbon plume via cone penetration testing (CPT) and installation of additional groundwater wells north of Wells 304 to 306.

Reference should be made to Drawing 5, Appendix A for approximate remediation areas. It is noted that remediation areas are based on current understanding of site conditions and interpolation between data points and are therefore approximate only. Remediation extent is to

be confirmed through additional investigation and/or during remediation works based on conditions encountered.

9. Remediation options assessment

The objective of the remediation options assessment and evaluation is to establish a preferred remediation strategy. The process involves canvassing various remediation options which may be viable and then ranking each option based on a number of evaluation criteria. 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 F.

10. Preferred remediation strategy

10.1 Rationale

The rationale for the selection of the preferred remediation strategy is outlined in Appendix E. The preferred remediation strategy is for:

- Remediation Area 1 (RA1) – UPSS Area:
 - o Following demolition of site structures;
 - o Decommissioning and removal of the UPSS infrastructure and services including workshop/building areas (i.e. USTs and associated pipework, building slabs, drains and sumps etc);
 - o Excavation of impacted soils, stockpiling for ex situ assessment, and then either disposal of contaminated materials to a licensed waste facility (landfill), or bioremediation via landfarming to allow disposal to a licensed facility or re-use on-site if suitable/feasible;
 - o Removal of localised impacted waters within open tank pit excavations and disposal to a licensed facility.
- Remediation Area 2 (RA2) – Stockpile A:
 - o Excavation and off-site disposal of Stockpile A materials.
- Remediation Area 3 (RA3) – ACM Hotspot:
 - o Surface inspection and clearance of site following demolition of site structures and pavements;
 - o Excavation and off-site disposal of ACM impacts in the vicinity of F1/JRK and other identified near surface asbestos impacts (if any).
- Remediation Area 4 (RA4) – Off-site Hydrocarbon Plume:
 - o Monitored natural attenuation (MNA) of off-site hydrocarbon impacts.

10.2 Sequence of remediation

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

The client / contractor should obtain all necessary approvals and notifications for the works, including NSW Government / Council approvals. An inception meeting between the client, contractor and environmental consultant is recommended to confirm responsibilities and procedures for remediation prior to commencement.

The general sequence of remediation should consider the following recommended sequence:

- Task 1: Data Gap Investigation:
 - o Soil vapour investigation to assess possible vapour intrusion risks to amenities buildings north of Denison Street.
 - o Additional subsurface investigation to assess the extent of asbestos impacts within fill materials across the site in order to confirm remediation requirements/options for the proposed development.
- Task 2: Site demolition and clearance:
- Task 3: Remediation Area 1 (RA1) – UPSS Area:
 - o Decommissioning, excavation and remediation of impacts associated with UPSS area.
- Task 4: Remediation Area 2 (RA2) – Stockpile A:
 - o Removal and disposal of Stockpile A materials.
- Task 5: Remediation Area 3 (RA3) – ACM Hotspot:
 - o Removal and disposal of near surface ACM impacts.
- Task 6: Remediation Area 4 (RA4) – Off-site hydrocarbon plume:
 - o Groundwater MNA programme.

Roles and responsibilities are outlined in the site management plan (Appendix H).

10.3 Task 1: Additional Investigations

Prior to development of the site, additional investigations are recommended comprising the following:

- Soil vapour assessment:
 - o Assess the possible vapour intrusion risks to amenities building north of Denison Street from underlying hydrocarbon impacted groundwater;
 - o The assessment will require the installation of sub-slab soil vapour pins in the amenities building downgradient of the site.
- Additional asbestos investigation (pre/post slab removal):

- o Subject to proposed development details additional assessment could be conducted to confirm the extent of asbestos impact within near surface fill materials. This could include a detailed asbestos assessment including test pits, sieving and soil testing for ACM at double/triple the minimum sampling density to confirm the presence and concentration of asbestos across the site in order to minimise unexpected finds/contingencies during remediation works.

10.4 **Task 2: Site Demolition and Clearance**

Demolition and removal of the above ground structures should be conducted in accordance with regulatory and statutory requirements by a suitably qualified contractor. It is recommended that existing concrete pavements/building slabs remain to assist with UPSS remediation (i.e. provide a low permeability surface for stockpiling and remediation of impacted soils excavated from the UPSS area. The UPSS remediation contractor should liaise with the demolition contractor to confirm which pavements/slabs should remain following demolition activities. Remaining concrete pavements/slabs should be removed following UPSS remediation. Refer to Task 2 below.

Following demolition of above ground structures a clearance inspection should be conducted by a licensed asbestos assessor (LAA) to confirm that no residual hazardous building materials (HBM) are present post remediation. Additional surface inspection and clearance should be conducted following removal of Stockpile A and the ACM hotspot (refer to Tasks 3 and 4 below).

10.5 **Task 3: Remediation Area 1 – UPSS Area**

UPSS decommissioning and remediation works should be conducted with reference to the following safety considerations in addition to the general requirements in Section 7 (NSW EPA, 2020a):

- Australian Standard AS 1940–2017, The Storage and Handling of Flammable and Combustible Liquids (AS 1940, 2017);
- Australian Standard AS 4976–2008, The Removal and Disposal of Underground Petroleum Storage Tanks (AS 4976, 2008);
- SafeWork NSW safety alert WC01188, Potential risks when removing underground storage tanks; and
- Australian Standard AS 1674.1, Safety in welding and allied processes - Fire precautions (AS 1674.1, 1997).

Given the relatively shallow depth to groundwater and proximity of UPSS infrastructure (including UST's) to the northern site boundary, it is recommended that positive excavation support is provided (i.e. shoring box or braced sheet piles) to manage the integrity of the remediation area. Impacted soils should be removed from within the site area to the extent practicable including extending the excavation area into the adjacent footpath / pavement where possible.

The general sequence of remediation should consider the following:

- Contractor to set up environmental controls (including area to receive impacted soils for remediation) and secure the site;

- Removal of the existing concrete hardstand (surface pavements only) within the approximate area of UPSS infrastructure;
- Complete a GPR survey to identify the presence/location/depth of the UPSS infrastructure (i.e. USTs and associated lines);
- Decommissioning of the UPSS infrastructure (UST's, fuel lines etc) by a suitably qualified contractor including:
 - o Pumping out of all fluids from UST's and pipework and de-gassing. Any liquid removed are to be disposed of to an appropriately licensed receiving facility;
 - o Ensure all associated pipework is disconnected and made safe so that no flammable or combustible liquids remain;
 - o Removal of a second layer of concrete pavement (possible concrete tank anchors);
 - o During any cutting or removal of UPSS infrastructure, air monitoring should be conducted to assess whether any potential flammable / explosive vapours are within or nearby the UST's/pipework (e.g., as measured by lower explosive limit (LEL) of a representative gas);
 - o Before removal, infrastructure (UST's) should be checked to ensure it can withstand lifting / transport; and
 - o Removal of UST's (e.g. using chains or lifting lugs) and pipework and appropriate off-site disposal.
- Excavation of impacted soils surrounding UPSS infrastructure (i.e. UST's, pipework, sumps etc) under full time inspection by an environmental consultant (i.e. 'chase-out' impacted soils). The excavation is to be expanded under the direction of Douglas where validation results do not meet the adopted RAC. The depth of excavation (based on the observed depth of the tanks) is anticipated to extend into natural soils (in the order of 2 m to 4 m depth). The vertical (and lateral) extent will also be informed by field observations (staining, odours and PID screening of soils);
- Where practicable, remediation could also include removal of impacted soils and groundwater within the footpath / road reserve directly north of the site, subject to regulatory approval;
- Any free liquids showing signs of petroleum impact in the excavations (e.g. sheen/odour) should be collected and pumped out by a licensed liquid waste contractor and disposed of to an appropriately licensed facility. As discussed above, active groundwater remediation is not proposed in this RAP, however, localised removal and disposal of impacted groundwater within tank pit excavations is recommended along with the removal of impacted soils within the subject site. A groundwater sample should be collected for testing from the open excavation to confirm groundwater conditions immediately prior to backfilling (refer to Section 12);
- Collection of validation soil samples required from the excavation side walls and base for laboratory analysis (as per Section 12);
- Stockpiling, segregation and management of excavated soils to allow assessment and confirmation of remediation requirements. The general stockpiling management requirements are identified in the site management plan (SMP) provided in Appendix H;

- Stockpiled soils will be sampled and tested to confirm the contamination status and waste classification. Where soils are within General Solid Waste (GSW) classification, direct off-site disposal to a licensed facility will be considered (subject to client approval);
- If testing indicates that soils exceed GSW (for landfill disposal) or the RAC (for on-site reuse) due to elevated hydrocarbons, bioremediation via landfarming should be conducted to reduce contaminant concentration to allow disposal to a licensed landfill (i.e. as GSW) or re-use on-site (within the RAC);
- Where required, bioremediation via landfarming should be conducted (subject to time constraints) with reference to the CRC CARE Bioremediation Guide (2019) (CRC CARE, 2019c) and procedures in the site management plan (SMP) provided in Appendix I;
- Excavations are to be backfilled with a suitable material under appropriate geotechnical controls (see Section 14).

Following the completion of remediation of the UPSS area (including remediation of stockpiled soils), the remaining slabs should be removed (i.e. slabs utilised for stockpiling and remediation of impacted soils). As stated in the previous DSI (Douglas, 2024a), residual contamination may also be present immediately beneath existing slabs within the workshop, refuelling areas, and within service pits / pipes based on experience with similar sites. Following removal, an assessment will be conducted by Douglas to confirm the remaining soils are suitable to remain on-site from a contamination perspective. Where impacted soils are identified (exceeding the RAC), they will be stripped, classified and appropriately disposed from the site. Stripped areas will be validated in accordance with Section 12 below.

10.6 **Task 4: Remediation Area 2 – Stockpile A**

Stockpile A materials were classified in the Douglas (2024) DSI as 'General Solid Waste (non-putrescible) (CTI and TCLP1/SCC1) – Special Waste (Asbestos)'. The materials are proposed to be excavated and disposed directly to a licensed landfill. Due to the presence of building rubble and minor asbestos materials, asbestos air monitoring is recommended during stockpile excavation, handling and disposal. Handling and disposal of the materials should be conducted in accordance with statutory and regulatory requirements.

Following removal, the remaining surface should be further assessed and validated as discussed in Section 12.

10.7 **Task 5: Remediation Area 3 – ACM Hotspot**

Impacted soils or ACM in the vicinity of F1/JRK within central portion of the site (i.e. identified hotspot) should be stripped and disposed from the site, together with Stockpile A materials. A clearance inspection should be conducted across the site following removal of all slabs / pavements and after UPSS remediation. Any identified additional surface impacts should be stripped for off-site disposal followed by validation with reference to Section 12. Soils should be classified prior to disposal as presented in Section 13.

10.8 Task 6: Remediation Area 4 – Off-Site Hydrocarbon Plume

10.8.1 Background

The residual groundwater contamination that is the focus of this remediation is the petroleum contamination (i.e. TRH and BTEX) observed both on-site and off-site to the north into Denison Street which appears to be wholly sourced from on site.

A 'weight of evidence' approach to MNA is typically formulated and several lines of evidence are required including:

- Primary lines – documented decreases in the concentration and mass of contaminants over a period of time;
- Secondary lines – the presence of geochemical and biochemical indicators that indicate the natural attenuation processes that are taking place; and
- Tertiary lines – microbiological data to support the occurrence of biodegradation.

10.8.2 Monitored Natural Attenuation of Petroleum Hydrocarbons

A key indicator for the occurrence of natural degradation is the measurement of dissolved oxygen concentrations in groundwater. The correlation between dissolved oxygen and petroleum hydrocarbon contamination is an inverse relationship. Dissolved oxygen is depleted within the area of contamination due to biodegradation of hydrocarbons. If dissolved oxygen concentrations within an area of hydrocarbon contamination are significantly depleted relative to those outside the contaminated area, this is likely evidence that aerobic natural attenuation is occurring.

Once dissolved oxygen concentrations within an area of hydrocarbon contamination have become exhausted, anaerobic conditions within the contamination area occur and different electron acceptors, if present, are utilised to metabolise the hydrocarbons. The principal anaerobic electron acceptors, based solely on thermodynamic considerations, are nitrate, ferric iron (Fe III-solid) and manganese (Mn IV-solid), sulfate and carbon dioxide (CO₂). The key natural attenuation preferred reactions are as follows:

- Aerobic Respiration: An aerobic reaction with oxygen as the electron acceptor and CO₂ as the metabolic by-product;
- Denitrification: An anaerobic reaction with nitrate as the electron acceptor and nitrogen (N₂) and CO₂ as the metabolic by-products;
- Ferric iron Reduction: An anaerobic reaction with ferric iron Fe(III) as the electron acceptor and soluble iron (ferrous) as the metabolic by-product. Manganese, as Mn(IV), can also serve as an electron acceptor, with soluble manganese, as Mn(II), produced as a metabolic by-product;
- Sulfate Reduction: An anaerobic reaction with sulfate as the electron acceptor and hydrogen sulfide as the metabolic by-product; and
- Methanogenesis: An anaerobic reaction with CO₂ as the electron acceptor and methane as the metabolic by-product.

The rate of biodegradation is both influenced by, and depends on, the redox potential of the groundwater and the availability of electron acceptors. Redox potential is a measure of the

relative tendency of a solution to accept the transfer of electrons, such that the lower the redox potential, the more reducing and anaerobic the environment. Changes in redox conditions through a site (from up-gradient to down-gradient) are a strong indicator that biodegradation is occurring within the site.

In general, natural attenuation of a hydrocarbon plume through biochemical processes will display the following trends in groundwater composition from impacted to non-impacted water:

- Increasing value - redox potential; dissolved oxygen, nitrate and sulfate concentrations; and
- Decreasing value – total organic carbon (TOC), methane and ferrous iron concentrations.

10.8.3 Data to Demonstrate Monitored Natural Attenuation

The data required to demonstrate that MNA is a feasible and preferred option is as follows:

- CPT with a specialised hydrocarbon probe and installation of additional groundwater wells downgradient of existing wells 304 to 306 to assist in plume delineation;
- Groundwater monitoring from the existing groundwater monitoring well network (including up-gradient on-site well 106), initially quarterly, and then annually for a period of at least three years subject to monitoring results for the following analytes:
 - o TRH, BTEXN, VOC, sulfate, nitrate as N, metals, ferrous iron, methane with field parameters (including dissolved oxygen) measured whilst sampling. The initial monitoring event must include analysis of hydrocarbon utilising bacteria (*Pseudomonads*);
- Tabulation of data to assess whether biodegradation is the dominant mechanism for reductions in concentrations of the CoPC; and
- Complete Mann-Kendall trend analysis on key CoPC data collected over time to confirm whether:
 - o Concentrations are stable or reducing (i.e. the plume is stable or shrinking and therefore MNA is feasible); or
 - o Concentrations are increasing (i.e. the plume is expanding and therefore a contingency remediation option may need to be implemented).

Groundwater modelling could be utilised as a decision support tool to assess the progression of MNA, if deemed necessary by the Environmental Consultant, following their review of initial MNA datasets.

A Sampling and Analysis Quality Plan (SAQP) should be prepared for the additional investigations with reference to NSW EPA requirements.

11. Assessment criteria

11.1 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 available plans as set out in this report.

In the absence of derivation of Tier 2 site specific target levels (SSTL), the RAC for contaminants in soil are the same as the Tier 1 site assessment criteria (SAC) adopted for Douglas investigations (2024a and 2025), protective of human health and ecology. The following table provides a summary of the RAC.

Table 2: Remediation acceptance criteria

Item	Contaminants of Potential Concern (CoPC) and RAC
Remediation Area 1 UPSS Area	CoPC = TRH, BTEXN, PAH, metals, VOC, asbestos and PFAS. RAC = Refer to Appendix G.
Remediation Area 2 Stockpile A	CoPC = Asbestos. RAC = Refer to Appendix G.
Remediation Area 3 ACM Hotspot	CoPC = asbestos. RAC = Refer to Appendix G.
Remediation Area 4 Off-Site Hydrocarbon Plume	CoPC = TRH, BTEXN, VOC. RAC = Refer to Appendix G. The RAC for MNA is for annual monitoring data from the MNA network to indicate that the plume is biodegrading and shrinking. This is to be demonstrated by: • Geochemical indicator parameters continuing to show that biodegradation of TRH, BTEXN and VOC remains the dominant mechanism of reduction in concentration; and • Mann-Kendall trend analysis on concentration data for wells with detectable TRH and BTEX showing the plume is stable or shrinking.

11.2 Site assessment criteria

Additional area(s) of contamination encountered beyond those outlined above during the course of the remediation and site redevelopment will be subject to the contingency plan or unexpected find protocol (Appendix I) and assessed using the SAC in Appendix G. The SAC are the same as the Tier 1 SAC adopted for Douglas previous investigations (2024a and 2025). The broader list of contaminants and their SAC are included in Appendix G.

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 commercial / industrial land use scenario. The derivation of the SAC is included in Appendix G and the adopted SAC are listed in the summary analytical results tables in Appendix E.

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) and Appendix G.

12. Validation plan

12.1 Data quality objectives

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

12.2 Validation assessment requirements

The following site validation work will be required:

- Field assessment by the Environmental Consultant comprising:
 - o Visual inspection, including taking photographs for record purposes;
 - o Collecting validation samples from excavations resulting from the removal of contaminated soils, including contaminated soil stockpile footprints (where relevant);
 - o Collection of bulk (10L) validation samples in fill for sieving for ACM if validating fill materials for asbestos;
 - o Survey of UPSS infrastructure, extent and levels of the base of the excavations and sample locations (using differential global positioning systems (dGPS) unit);
 - o Collecting validation / characterisation samples (including quality control (QC) samples) for materials to be re-used on site.
- Laboratory analysis of validation samples at a National Association of Testing Authority (NATA) accredited laboratory for:
 - o The CoPC relevant to the remediation area; and
 - o Quality control (QC) samples in accordance with Section 15;
- Comparison by the Environmental Consultant of the laboratory results with the SAC and/or RAC as appropriate (refer to Section 11); and
- Preparation by the Environmental Consultant of a validation report detailing the methods and results of the remediation works and validation assessment.

12.3 Visual inspections

All areas to be assessed and validated will first be subject to a visual inspection by the Environmental Consultant. Conditions observed will be photographed and documented.

Clearance inspections should also be conducted following demolition (as part of demolition activities) and following UPSS remediation and removal of remaining slabs / pavement as discussed above.

12.4 Validation sampling

The sampling frequency will depend on the volume or area to be assessed and the previous results. The following approximate sampling frequencies will be adopted with reference to NSW EPA (2023) but may be modified by the Environmental Consultant to take into account previous results, where applicable, and findings from the visual inspections.

UPSS remediation excavations (base <500 m²):

- Base of excavation: one sample per 25 m² or part thereof, with a minimum of three samples where the base of the excavation is fill rather than natural soils. A minimum of one sample below each UST would be collected;
- Sides of excavation: one sample per 5 to 10 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 1.0 m depth in fill. For the anticipated UPSS remediation excavation the sampling frequency for the sides of the excavation will target upper fill and near surface soils and then also the natural samples showing the greatest potential for contamination (i.e. based on PID screening and visual observations which are likely to be within the groundwater vadose zone);
- Where shallow excavations for the removal of associated pipes are necessary, validation samples will be collected at a frequency of one sample per linear 5 m of (removed) pipe.

Where possible, the contaminated soils will be stored on remaining areas of concrete pavement (hardstand) with appropriate environmental management controls in place. Where contaminated soils are proposed to be stored or treated on bare soils, the footprint of the proposed stockpile will initially be covered with plastic sheeting with appropriate environmental management controls in place and will require validation following removal of the contaminated soils.

A groundwater sample should be collected for testing from the open excavation to confirm groundwater conditions immediately prior to backfilling;

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

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

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

13. Waste disposal

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

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

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

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

For stockpiles comprising similar materials and a:

- Volume up to 200 m³: a recommended minimum frequency of one sample per 25 m³, with a minimum of three per stockpile (NSW EPA, 2022); or
- Volume greater than 200 m³: a recommended minimum frequency of one sample per 25 m³, 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 m³ which are impacted, or potentially impacted, by asbestos the Environmental Consultant shall provide guidance in accordance with NSW EPA (2022).

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

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

- Volume of material requiring off-site disposal;
- Waste classification of material requiring off-site disposal;
- Details of transporter;

- Confirmation that the receiving facility holds an environmental protection licence to receive the waste; and
- Weighbridge dockets confirming the tonnage of waste received, which must be reconciled with reasonable accuracy by the environmental consultant with respect to the volume and waste classification of each type of material leaving the site.

14. Imported material

Any soil, aggregate etc imported for the remediation works must have contaminant concentrations that meet the relevant criteria outlined in Section 11. Imported materials will only be accepted for use at the site if:

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

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

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

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

Any recycled materials proposed for importation must be sampled at a frequency of one sample per 25 m³, with a minimum of three samples per load. The recycled material will not be permitted to be used on site until the results of the inspection and laboratory analysis have been approved in writing by the Environmental Consultant.

15. Quality assurance and quality control

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

- 5% sample inter-laboratory analysis, analysed for the same suite as primary sample;

- 5% 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.

16. Management and responsibilities

16.1 Site management plan

A general site management plan for the operational phase of site remediation is included in Appendix I. 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).

16.2 Site responsibilities

The site management plan (Appendix I) 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.

16.3 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 J.

17. Validation reporting

17.1 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):

- Licences and approvals required for the remediation works (Remediation Contractor);
- Waste classification report(s) (Environmental Consultant);
- Transportation Record: comprising a record of truckloads of soil (including aggregate) entering the site, including truck identification (e.g. registration number), date, time, source site, load characteristics (e.g. type of material, i.e. quarried aggregate, etc.), approximate volume, use (e.g., general site raising, service trenches, etc.) (Remediation Contractor);
- Disposal dockets: for any soil disposed off-site including transportation records, spoil source, spoil disposal location, receipt provided by the receiving waste facility / site (Remediation Contractor). Note: A record of the building materials disposed off-site is also to be kept and provided to the Principal, on request;
- Records detailing removal of USTs and associated infrastructure as required by NSW EPA (2023);
- Imported materials records: records for any soil imported onto the site, including source site, classification reports, inspection records of soil upon receipt at site and transportation records (Remediation Contractor);
- Records relating to any unexpected finds and contingency plans implemented (Remediation Contractor);
- Laboratory certificates and chain-of-custody documentation;
- Inspections records from the Environmental Consultant;
- Photographic records by all contractors and consultants of the works undertaken within their purview of responsibilities (Remediation Contractor);
- Airborne asbestos monitoring records (Remediation Contractor); and
- Interim / final visual and sampling clearances for any asbestos related works (Remediation Contractor).

17.2 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 (commercial / industrial).

A follow up validation report shall also be prepared at the completion of the specified groundwater monitoring period under the MNA programme (i.e. in approximately four years' time). The report must make a statement on whether:

- The plume is stable or shrinking thereby validation MNA as an appropriate remedial strategy; or
- The plume is expanding and what contingency groundwater remediation is proposed.

18. Conclusions

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

The UPSS will be decommissioned, and the primary sources of contamination will be removed as part of the current RAP (i.e. impacted soils and localised groundwater associated with UPSS infrastructure within the site, Stockpile A, localised ACM hotspot and asbestos impacts where identified). MNA will be undertaken to address off-site hydrocarbon impacts downgradient of the site. If additional groundwater remediation works are required (i.e. beyond source removal during the bulk excavation works and the MNA programme), this RAP must be revised and / or an addendum to this RAP be prepared to detail the nature and extent of additional groundwater remediation works required.

Further investigations are recommended prior to site remediation to assess potential soil vapour intrusion risks to the amenities building located downgradient of the site and confirm the proposed remediation approach (i.e. MNA).

Once the proposed development details are known, this RAP should be reviewed and updated where required to ensure the remediation approach is suitable for the proposed development.

19. References

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NSW EPA. (2023). *Contamination assessment of service station sites, minimum sampling requirements*. NSW Environment Protection Authority.

20. Limitations

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project at 17 Denison Street, Gloucester NSW in line with Douglas' proposal 228674.02.P.001.Rev0 dated 27 February 2025 and Contract No. PROC12334 executed 13 March 2025. The work was carried out under Contract No. PROC12334. This report is provided for the exclusive use of Department of Planning, Housing and Infrastructure for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and/or their agents.

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

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

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

Asbestos has previously been detected by observation and by laboratory analysis, both on the surface of the site, and in fill materials at the test locations sampled and analysed. Building demolition materials, such as brick, ceramic tile, metal wire, concrete, plastic, timber, glass, pipe, rubber, were also observed in the fill and above-ground stockpile present on site, and these are considered as indicative of the possible presence of hazardous building materials (HBM), including asbestos.

Although the sampling plan adopted for this investigation is considered appropriate to achieve the stated project objectives, there are necessarily parts of the site that have not been sampled and analysed. This is either due to parts of the site being inaccessible and not available for inspection/sampling. It is therefore considered possible that HBM, including asbestos, may be present in unobserved or untested parts of the site, between and beyond sampling locations, and hence no warranty can be given that asbestos is not present.

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.

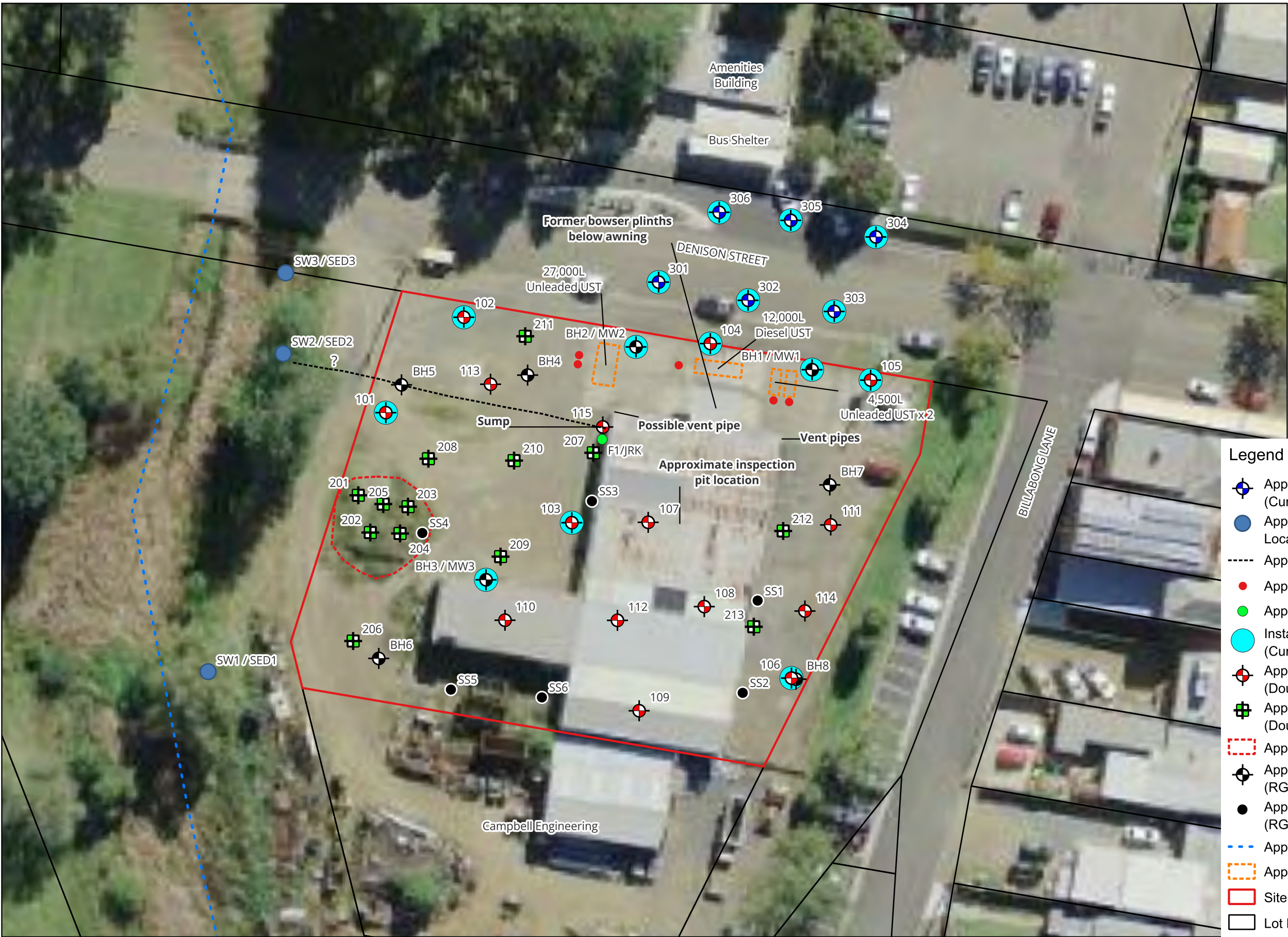
Appendix A

Drawing 1 – Test Location Plan

Drawing 2 – Groundwater Contour – 29 April 2025

Drawing 3 – Soil and Sediment Exceedances Above the Adopted Site Assessment Criteria

Drawing 4 – Groundwater and Surface Water Exceedances Above the Adopted Site Assessment Criteria



Site Location

Legend

- Approximate Borehole Locations (Current Investigation)
- Approximate Surface Water & Sediment Locations (Current Investigation)
- Approximate Drainage Line
- Approximate UST Fill Points
- Approximate Fibro Fragment
- Installed Groundwater Wells (Current and Previous Investigations)
- Approximate Bore Locations (Douglas, 2024)
- Approximate Test Pit Locations (Douglas, 2024)
- Approximate Stockpile A Extent
- Approximate Borehole Location (RGS, 2022)
- Approximate Surface Sample Location (RGS, 2022)
- Approximate Creek Alignment
- Approximate UST Locations
- Site Boundary
- Lot Boundary

0 10 20 m



NOTE:
1. Drawing adapted from aerial imagery from Sixmaps dated 05.05.2018
2. Test locations are approximate only and were located using differential GPS typically accurate to ± 0.1 m depending on satellite coverage (handheld GPS, measured off site features)



CLIENT:	NSW Department of Planning, House and Infrastructure	
OFFICE:	Newcastle	DRAWN BY: JRK
SCALE:	1:500 @A3	DATE: 04 August 2025

TITLE: **Test Location Plan**
Remediation Action Plan
17 Denison Street, Gloucester, NSW



Project:	228674.02
DRAWING No:	1
REVISION:	0

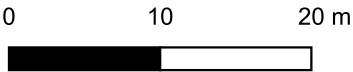


Site Location

Legend

- Inferred Groundwater Flow Direction
- Inferred Groundwater Contour (AHD) - April 2025
- Approximate Borehole Locations (Current Investigation)
- Approximate Surface Water & Sediment Locations (Current Investigation)
- Approximate Drainage Line
- Approximate UST Dip Points
- Installed Groundwater Wells (Current and Previous Investigations)
- Approximate Bore Locations (Douglas, 2024)
- Approximate Test Pit Locations (Douglas, 2024)
- Approximate Stockpile A Extent
- Approximate Borehole Location (RGS, 2022)
- Approximate Surface Sample Location (RGS, 2022)
- Approximate Creek Alignment
- Approximate UST Locations
- Site Boundary
- Lot Boundary

NOTE:
1. Drawing adapted from aerial imagery from Sixmaps dated 05.05.2018
2. Test locations are approximate only and were located using differential GPS typically accurate to ± 0.1 m depending on satellite coverage (handheld GPS, measured off site features)

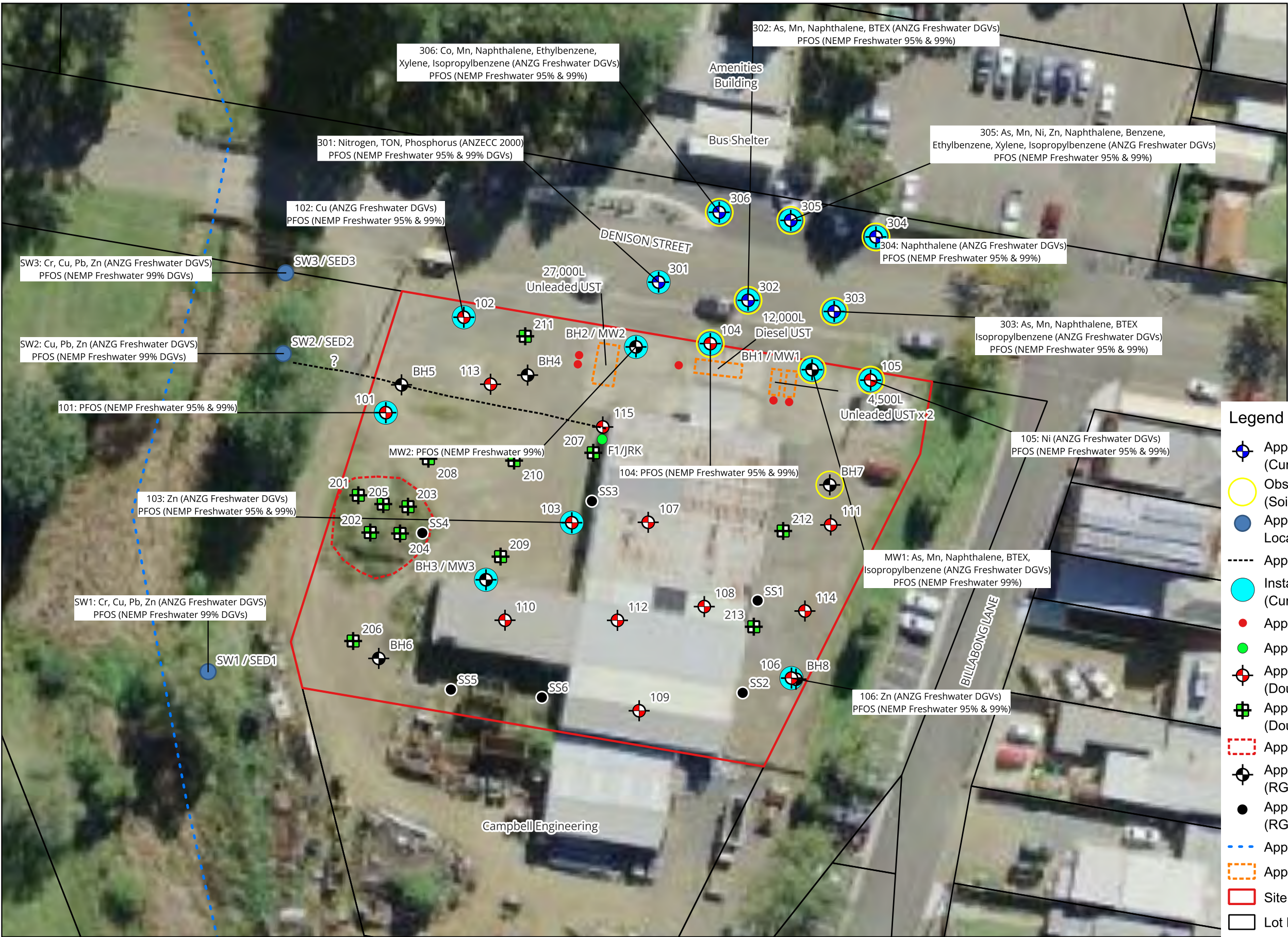


CLIENT:	NSW Department of Planning, House and Infrastructure	
OFFICE:	Newcastle	DRAWN BY: JRK
SCALE:	1:500 @A3	DATE: 04 August 2025

TITLE: **Groundwater Contour - 29 April 2025**
Remediation Action Plan
17 Denison Street, Gloucester, NSW



Project:	228674.02
DRAWING No:	2
REVISION:	0



Site Location

- Legend**
- Approximate Borehole Locations (Current Investigation)
 - Observed Hydrocarbon Impacts (Soil and Groundwater)
 - Approximate Surface Water & Sediment Locations (Current Investigation)
 - Approximate Drainage Line
 - Installed Groundwater Wells (Current and Previous Investigations)
 - Approximate UST Fill Points
 - Approximate Fibro Fragment
 - Approximate Bore Locations (Douglas, 2024)
 - Approximate Test Pit Locations (Douglas, 2024)
 - Approximate Stockpile A Extent
 - Approximate Borehole Location (RGS, 2022)
 - Approximate Surface Sample Location (RGS, 2022)
 - Approximate Creek Alignment
 - Approximate UST Locations
 - Site Boundary
 - Lot Boundary

NOTE:

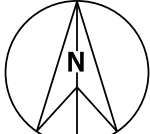
1. Drawing adapted from aerial imagery from Sixmaps dated 05.05.2018

2. Test locations are approximate only and were located using differential GPS typically accurate to ± 0.1 m depending on satellite coverage (handheld GPS, measured off site features)

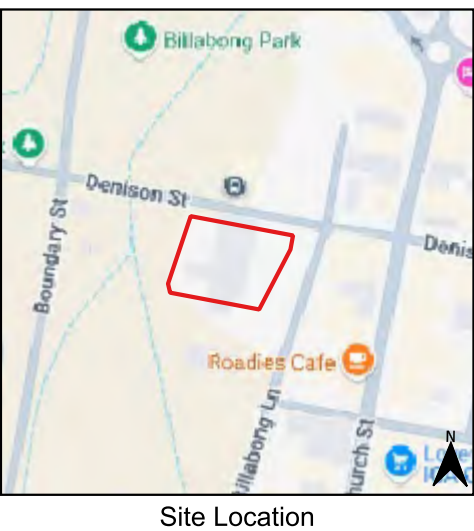


CLIENT:	NSW Department of Planning, House and Infrastructure	
OFFICE:	Newcastle	DRAWN BY: JRK
SCALE:	1:500 @A3	DATE: 04 August 2025

TITLE: **Groundwater and Surface Water Exceedances Above the Adopted Site Assessment Criteria Remediation Action Plan**
17 Denison Street, Gloucester, NSW



Project:	228674.02
DRAWING No:	4
REVISION:	0



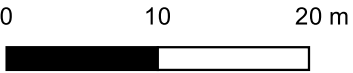
- Legend**
- Approximate Remediation Area
 - Approximate Borehole Locations (Current Investigation)
 - Observed Hydrocarbon Impacts (Soil and Groundwater)
 - Approximate Surface Water & Sediment Locations (Current Investigation)
 - Approximate Drainage Line
 - Installed Groundwater Wells (Current and Previous Investigations)
 - Approximate UST Fill Points
 - Approximate Fibro Fragment
 - Approximate Bore Locations (Douglas, 2024)
 - Approximate Test Pit Locations (Douglas, 2024)
 - Approximate Stockpile A Extent
 - Approximate Borehole Location (RGS, 2022)
 - Approximate Surface Sample Location (RGS, 2022)
 - Approximate Creek Alignment
 - Approximate UST Locations
 - Site Boundary
 - Lot Boundary

Remediation areas are based on the current understanding of site conditions and interpolation between data points and are therefore approximate only. Remediation extent to be confirmed through additional investigation and/or during remediation works based on conditions encountered.

Refer to RAP for further details

NOTE:

- Drawing adapted from aerial imagery from Sixmaps dated 05.05.2018
- Test locations are approximate only and were located using differential GPS typically accurate to ± 0.1 m depending on satellite coverage (handheld GPS, measured off site features)



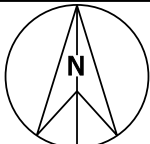
CLIENT: NSW Department of Planning, House and Infrastructure

OFFICE: Newcastle	DRAWN BY: JRK
SCALE: 1:500 @A3	DATE: 05 August 2025

TITLE: **Approximate Remediation Areas**

Remediation Action Plan

17 Denison Street, Gloucester, NSW



Project:	228674.02
DRAWING No:	5
REVISION:	0

Appendix B

About this Report

Introduction

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

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

Copyright

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

Borehole and Test Pit Logs

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

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

Groundwater

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

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather

changes. They may not be the same at the time of construction as are indicated in the report; and

- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

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

Reports

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

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

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

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

About this Report

Site Anomalies

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

Information for Contractual Purposes

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

Site Inspection

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

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Appendix C

Photoplates (Photos 1 to 23) – 18 April 2024
(228674.00)

Photoplates (Photos 1 to 12) – 31 March and 14-15
April 2025 (228674.02)



Photo 1: Looking south at the site from Denison Street (18 April 2024)



Photo 2: Looking across tank farm area in northern portion of the site (18 April 2024)

 		Site Photographs		PROJECT:	228674.00
		Proposed Visitor Information Centre		PLATE No:	1
		17 Denison Street, Gloucester		REV:	0
		CLIENT	NSW Department of Planning, Housing and Infrastructure	DATE	01/08/24



Photo 3: Fill points for two 4,500L unleaded USTs in north eastern portion of the site (18 April 2024)



Photo 4: Looking across the western portion of the site. Fill materials observed (18 April 2024)



GROUND
ED
EXPERTISE

Site Photographs

Proposed Visitor Information Centre

17 Denison Street, Gloucester

CLIENT

NSW Department of Planning,
Housing and Infrastructure

PROJECT:

228674.00

PLATE No:

2

REV:

0

DATE

01/08/24



Photo 5: Former workshop area in eastern portion of the site. Hydrocarbon staining observed at surface



Photo 6: Looking east across former workshop. Possible inspection pits observed (18 April 2024)

 		Site Photographs		PROJECT:	228674.00
		Proposed Visitor Information Centre		PLATE No:	3
		17 Denison Street, Gloucester		REV:	0
		CLIENT	NSW Department of Planning, Housing and Infrastructure	DATE	01/08/24



Photo 7: Looking across former workshop (18 April 2024)



Photo 8: Inspection pit filled with water at the time of the initial inspection (18 April 2024)

 Douglas PARTNERS  GROUNDED EXPERTISE		Site Photographs		PROJECT:	228674.00
		Proposed Visitor Information Centre		PLATE No:	4
		17 Denison Street, Gloucester		REV:	0
		CLIENT	NSW Department of Planning, Housing and Infrastructure	DATE	01/08/24



Photo 9: Former tyre workshop in western portion of the site (18 April 2024)



Photo 10: Looking west across former tyre workshop (18 April 2024)

 		Site Photographs		PROJECT:	228674.00
		Proposed Visitor Information Centre		PLATE No:	5
		17 Denison Street, Gloucester		REV:	0
		CLIENT	NSW Department of Planning, Housing and Infrastructure	DATE	01/08/24



Photo 11: Shed in south eastern corner of the site. Hydrocarbon staining observed at surface (18 April 2024)



Photo 12: Looking west across shed (18 April 2024)

 DOUGLAS PARTNERS  GROUND EXPERTISE		Site Photographs		PROJECT:	228674.00
		Proposed Visitor Information Centre		PLATE No:	6
		17 Denison Street, Gloucester		REV:	0
		CLIENT	NSW Department of Planning, Housing and Infrastructure	DATE	01/08/24



Photo 13: Looking west at the north western corner of the site (18 April 2024)



Photo 14: Bricks observed within fill materials observed at the surface across the western portion of the site

 DOUGLAS PARTNERS 		Site Photographs		PROJECT:	228674.00
		Proposed Visitor Information Centre		PLATE No:	7
		17 Denison Street, Gloucester		REV:	0
		CLIENT	NSW Department of Planning, Housing and Infrastructure	DATE	01/08/24

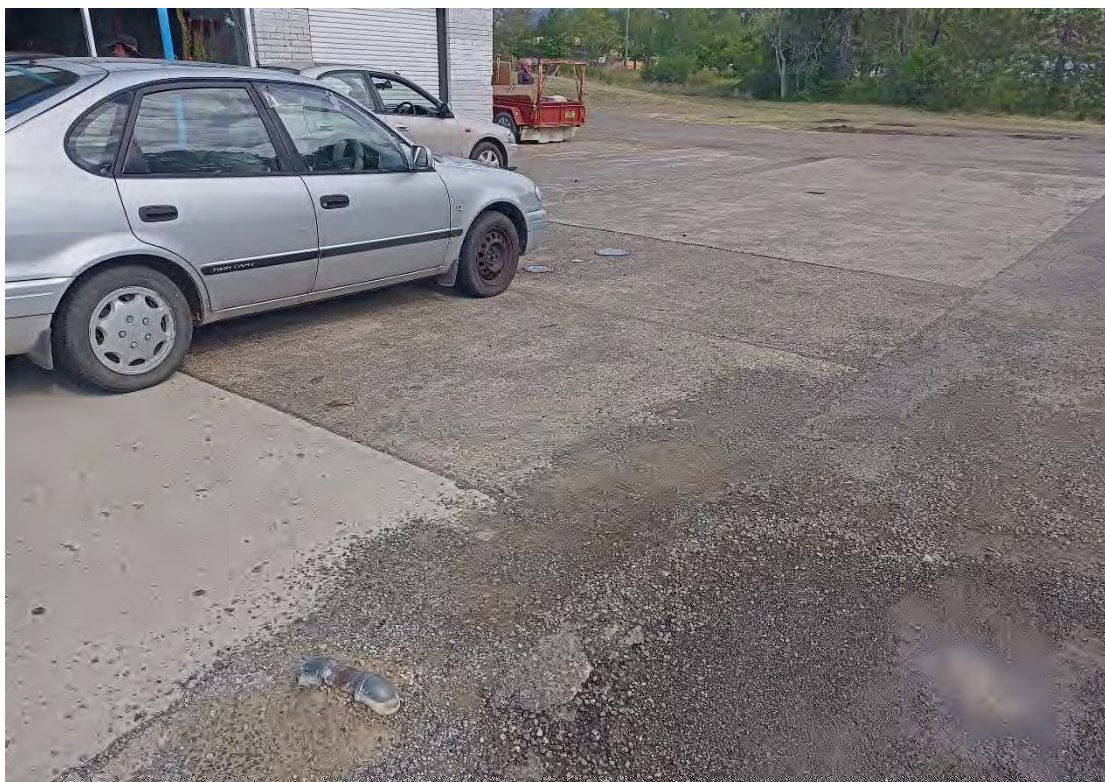


Photo 15: Looking west at Diesel and Unleaded USTs along the northern boundary of the site (18 April 2024)



Photo 16: Waste sump and possible breath point for USTs in the northern portion of the site (18 April 2024)

 Douglas PARTNERS  GROUND ED EXPERTISE		Site Photographs		PROJECT:	228674.00
		Proposed Visitor Information Centre		PLATE No:	8
		17 Denison Street, Gloucester		REV:	0
		CLIENT	NSW Department of Planning, Housing and Infrastructure	DATE	01/08/24



Photo 17: Fibro fragment F1/JRK observed at the surface in the central portion of the site (18 April 2024)



Photo 18: Former office/store area in northern most building adjacent UST farm area (18 April 2024)

 		Site Photographs		PROJECT:	228674.00
		Proposed Visitor Information Centre		PLATE No:	9
		17 Denison Street, Gloucester		REV:	0
		CLIENT	NSW Department of Planning, Housing and Infrastructure	DATE	01/08/24



Photo 19: Looking along the eastern boundary of the site (18 April 2024)



Photo 20: Stockpile A in the western portion of the site (18 April 2024)

 		Site Photographs		PROJECT:	228674.00
		Proposed Visitor Information Centre		PLATE No:	10
		17 Denison Street, Gloucester		REV:	0
		CLIENT	NSW Department of Planning, Housing and Infrastructure	DATE	01/08/24



Photo 21: Looking north west at Stockpile A. Timber and concrete observed (18 April 2024)



Photo 22: Looking across the site from the north eastern corner (6 June 2024)

 		Site Photographs		PROJECT:	228674.00
		Proposed Visitor Information Centre		PLATE No:	11
		17 Denison Street, Gloucester		REV:	0
		CLIENT	NSW Department of Planning, Housing and Infrastructure	DATE	01/08/24



Photo 23: Looking along the northern boundary of the site at tank farm (6 June 2024)



Photo 1: Looking south towards the site and UST area (31 March 2025)



Photo 2: Looking north at the amenities building and bus stop north of Denison Street (31 March 2025)

 		Site Photographs		PROJECT:	228674.02
		Proposed Visitor Information Centre		PLATE No:	1
		17 Denison Street, Gloucester		REV:	0
		CLIENT	NSW Department of Planning, Housing and Infrastructure	DATE	17/06/2025



Photo 3: Looking east along the road shoulder. Directly adjacent existing USTs (31 March 2025)



Photo 4: Car parking and bus stop on northern side of Denison Street. Bore 304 in foreground (31 March 2025)

 Douglas PARTNERS	Site Photographs		PROJECT:	228674.02
	Proposed Visitor Information Centre		PLATE No:	2
	17 Denison Street, Gloucester		REV:	0
	CLIENT	NSW Department of Planning, Housing and Infrastructure	DATE	17/06/2025



Photo 5: Former sump located adjacent workshop building at the site (31 March 2025)



Photo 6: Drainage pipe within sump leading towards the creek adjacent the site (31 March 2025)

 Douglas PARTNERS  Grounded Expertise		Site Photographs		PROJECT:	228674.02
		Proposed Visitor Information Centre		PLATE No:	3
		17 Denison Street, Gloucester		REV:	0
		CLIENT	NSW Department of Planning, Housing and Infrastructure	DATE	17/06/2025



Photo 7: Drilling Bore 301 in the road along Denison Street (14 April 2025)



Photo 8: Drilling Bore 305 on northern side of Denison Street (14 April 2025)

 Douglas PARTNERS	Site Photographs		PROJECT:	228674.02
	Proposed Visitor Information Centre		PLATE No:	4
	17 Denison Street, Gloucester		REV:	0
	CLIENT	NSW Department of Planning, Housing and Infrastructure	DATE	17/06/2025



Photo 9: Vegetation observed at sediment/surface water location 3 – looking north west (15 April 2025)



Photo 10: Looking south along the adjacent creek (15 April 2025)

 		Site Photographs		PROJECT:	228674.02
		Proposed Visitor Information Centre		PLATE No:	5
		17 Denison Street, Gloucester		REV:	0
		CLIENT	NSW Department of Planning, Housing and Infrastructure	DATE	17/06/2025



Photo 11: Looking east towards the approximate area of pipe outlet (31 March 2025)



Photo 12: Waste metal and fill materials observed in area of pipe outlet in embankment (31 March 2025)

 Douglas PARTNERS  GROUND ED EXPERTISE	Site Photographs		PROJECT:	228674.02
	Proposed Visitor Information Centre		PLATE No:	6
	17 Denison Street, Gloucester		REV:	0
	CLIENT	NSW Department of Planning, Housing and Infrastructure	DATE	17/06/2025

Appendix D

Terminology, Symbols and Abbreviations

Soil Descriptions

Borehole Logs (Bores 101 to 114) (228674.00)

Test Pit Logs (Pits 201 to 213) (228674.00)

Borehole Logs (Bores 301 to 306 and SED1 to SED3)
(228674.02)

Introduction

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Groundwater

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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

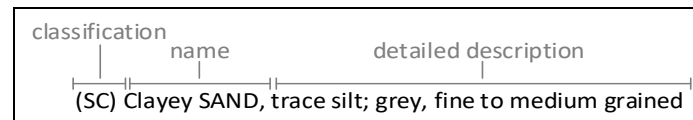
Graphic Symbols

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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Introduction

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



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

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

Particle size designation and Behaviour Model

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

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

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

¹ – refer grain size subdivision descriptions below

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

Component proportions

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

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

¹ As defined in AS1726-2017 6.1.4.4

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

Composite Materials

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

Classification

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

Soil Name

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

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

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

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

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

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

Identification of minor components

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

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

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

Soil Composition

Plasticity

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

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

Grain Size

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

Grading

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

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

Soil Condition

Moisture

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

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

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

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

Consistency/Density/Compaction/Cementation/Extremely Weathered Material

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

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

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

Consistency (fine grained soils)

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

Relative Density (coarse grained soils)

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

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

Compaction (anthropogenically modified soil)

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

Cementation (natural and anthropogenic)

Cementation Term	Abbreviation Code
Moderately cemented	MOD
Weakly cemented	WEK

Extremely Weathered Material

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

Soil Origin

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

Cobbles and Boulders

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

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

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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:

SAMPLE			DEPTH (m)	TESTING	
SAMPLE REMARKS	TYPE	INTERVAL		TEST TYPE	RESULTS AND REMARKS
	SPT		1.0 1.45	SPT	4,9,11 N=20

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

BOREHOLE LOG

CLIENT: Department of Planning Housing and Infrastructure **SURFACE LEVEL:** 91.6 AHD **LOCATION ID:** 101
PROJECT: Proposed Visitor Information Centre **COORDINATE:** E:401480.1, N:6458307.3 **PROJECT No:** 228674.00
LOCATION: 17 Denison Street, Gloucester, NSW **DATUM/GRID:** MGA2020 Zone 56 **DATE:** 11/06/24
DIP/AZIMUTH: 90°/---° **SHEET:** 1 of 1

CONDITIONS ENCOUNTERED						SAMPLE		TESTING AND REMARKS						
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*) DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
RL (m)														
Free groundwater observed at 1.7m 11/06/24	0.20	FILL / Silty CLAY (CL-CI), trace sand: brown to medium plasticity; fine to medium sand.		FILL	NA	M		ES		0.10	PID	<1ppm		
		Silty Sandy GRAVEL (GP): brown; fine to medium, sub-angular to sub-rounded; fine to medium sand.		ALV	MD	M		ES		0.50	PID	<1ppm		
								D/ES		1.00	PID	<1ppm		
								ES		1.30	PID	<1ppm		
		Silty SAND (SM): brown; fine to medium.		ALV	MD	M		ES		1.50	PID	<1ppm		
		Sandy CLAY (CL-CI), with silt: orange brown; low to medium plasticity; fine to medium sand.		ALV	F	w<PL		ES		1.80	PID	<1ppm		
		Silty Sandy CLAY (CL-CI), with gravel: grey brown; low to medium plasticity; fine to medium sand; fine to medium, sub-angular to sub-rounded gravel.						ES		2.00	PID PP	<1ppm 300-320kPa		
								ES		2.50	PID	<1ppm		
								D/ES		3.00	PID	<1ppm		
								ES		3.50	PID PP	<1ppm 310-360kPa		
								D/ES		4.00	PID PP	<1ppm 300-380kPa		
</														

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: Geoprobe **OPERATOR:** Tuck Environmental **LOGGED:** Krebs
METHOD: Dual tube **CASING:** Uncased
REMARKS: D2/SBK at 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Department of Planning Housing and Infrastructure **SURFACE LEVEL:** 91.7 AHD **LOCATION ID:** 102
PROJECT: Proposed Visitor Information Centre **COORDINATE:** E:401490.1, N:6458319.5 **PROJECT No:** 228674.00
LOCATION: 17 Denison Street, Gloucester, NSW **DATUM/GRID:** MGA2020 Zone 56 **DATE:** 11/06/24 **SHEET:** 1 of 1
DIP/AZIMUTH: 90°/---°

CONDITIONS ENCOUNTERED							SAMPLE			TESTING AND REMARKS					
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
RL (m)															
Free groundwater observed at 2.1m 11/06/24	0.25	FILL / Silty CLAY (CL-CI), with gravel, trace sand: brown; low to medium plasticity; fine to medium gravel.		FILL	NA		M		ES		0.10	PID	<1ppm	 	
		Silty Sandy CLAY (CL-CI): mottled brown orange; low to medium plasticity; fine to medium sand.							D/ES		0.50	PID	<1ppm		
									D/ES		1.00	PID PP	<1ppm 250-350kPa		
									ES		1.50	PID	<1ppm		
				ALV	St		w<PL		ES		2.00	PID PP	<1ppm 300-360kPa		
									D/ES		2.50	PID	<1ppm		
									ES		3.00	PID PP	<1ppm 310-340kPa		
									ES		3.50	PID	<1ppm		
				ALV	St		w>PL								
									D/ES		4.00	PID PP	<1ppm 300-400kPa		
	4	Borehole discontinued at 4.00m depth. Limit of investigation.													

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.

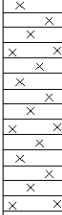
PLANT: Geoprobe **OPERATOR:** Tuck Environmental **LOGGED:** Krebs
METHOD: Dual tube **CASING:** Uncased
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Department of Planning Housing and Infrastructure **SURFACE LEVEL:** 92.1 AHD **LOCATION ID:** 103
PROJECT: Proposed Visitor Information Centre **COORDINATE:** E:401503.9, N:6458293.2 **PROJECT No:** 228674.00
LOCATION: 17 Denison Street, Gloucester, NSW **DATUM/GRID:** MGA2020 Zone 56 **DATE:** 11/06/24
DIP/AZIMUTH: 90°/---° **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	BACKFILL	WELL PIPE
Free groundwater observed at 1.75m 11/06/24	92	0.20	FILL / Clayey Gravelly SAND (SP), trace silt: orange brown; fine to medium; fine to medium, sub-angular to sub-rounded gravel.		FILL	NA	D		ES		0.10	PID	1.5ppm	 Bentonite Concrete	 50mm Class 1B PVC Casing
			FILL / SAND (SP): grey; fine to medium.		FILL	NA	M		ES		0.30	PID	1.8ppm		
	0.40	Silty CLAY (CL-Cl), with sand: brown; low to medium plasticity; fine to medium sand.		ALV	St	w<PL	ES			0.50	PID	<1ppm			
	1						D/ES			1.00	PID PP	<1ppm 300-350kPa			
							ES			1.50	PID	3.0ppm			
							ES			2.00	PID PP	4.0ppm 320-360kPa			
							D/ES			2.50	PID	3.0ppm			
	1.15	Clayey Sandy GRAVEL (GP), trace silt: brown orange; fine to medium, sub-angular to sub-rounded; fine to medium sand.		COL	St	W	D/ES			3.00	PID PP	<1ppm 310-370kPa			
	2						ES			3.50	PID	3.2ppm			
							3		ES		4.00	PID PP	3.9ppm 300-340kPa		
4								Borehole discontinued at 4.00m depth. Limit of investigation.							

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: Geoprobe **OPERATOR:** Tuck Environmental **LOGGED:** Krebs
METHOD: Dual tube **CASING:** Uncased
REMARKS: D1/SBK at 2.0m

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Department of Planning Housing and Infrastructure

PROJECT: Proposed Visitor Information Centre

LOCATION: 17 Denison Street, Gloucester, NSW

SURFACE LEVEL: 92.0 AHD

COORDINATE: E:401521.7, N:6458316.1

DATUM/GRID: MGA2020 Zone 56

DIP/AZIMUTH: 90°/---°

LOCATION ID: 104

PROJECT No: 228674.00

DATE: 11/06/24

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	BACKFILL	WELL PIPE		
Free groundwater observed at 15m 11/06/24	89.51	0.12	FILL / CONCRETE: grey.		FILL	NA	D		ES		0.10	PID	1.3ppm				
		FILL / Silty CLAY (CL-Cl), trace sand: mottled grey orange brown; low to medium plasticity; fine to medium sand; hydrocarbon staining.			NA	M				ES		0.50	PID			12ppm	
					NA	M				D/ES		1.00	PID			23ppm	
					NA	M				ES		1.50	PID			28ppm	
					NA	M				D/ES		2.00	PID			173ppm	
					NA	M				ES		2.50	PID			84ppm	
					NA	M				D/ES		3.00	PID			83ppm	
					NA	M				ES		3.50	PID			9.5ppm	
					NA	M				D/ES		4.00	PID			9.0ppm	
					NA	M											
					NA	M											
					NA	M											
	89.30	2	From 2.60m: colour change to mottled orange														
	89.305	3	Clayey GRAVEL (GC), with sand: grey brown; fine to medium, sub-angular to sub-rounded; fine to medium sand.		COL	MD	W										
	88	4	Borehole discontinued at 4.00m depth. Limit of investigation.														

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.

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: Geoprobe

OPERATOR: Tuck Environmental

LOGGED: Krebs

METHOD: Hand auger to 1.0m, dual tube to 4.0m

CASING: Uncased

REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Department of Planning Housing and Infrastructure

PROJECT: Proposed Visitor Information Centre

LOCATION: 17 Denison Street, Gloucester, NSW

SURFACE LEVEL: 91.6 AHD

COORDINATE: E:401542.2, N:6458311.5

DATUM/GRID: MGA2020 Zone 56

DIP/AZIMUTH: 90°/---°

LOCATION ID: 105

PROJECT No: 228674.00

DATE: 11/06/24

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	BACKFILL	WELL PIPE		
Free groundwater observed at 1.7m 11/06/24	91	0.10	FILL / CONCRETE: grey.		FILL	NA	D							 Bentonite Concrete 50mm Class 1B PVC Casing	50mm Class 1B PVC Casing		
			FILL / Silty CLAY (CL-Cl), trace sand: grey; low to medium plasticity; fine to medium sand; slight hydrocarbon staining.		possibly FILL	NA	w<PL		D	0.15	PID	55ppm					
									ES	0.50	PID	40ppm					
									ES	1.00	PID	182ppm					
									ES	1.50	PID	160ppm					
									ES	2.00	PID	101ppm					
									ES	2.50	PID	62ppm					
									ES	3.00	PID PP	425ppm 280-320kPa					
									ES	3.50	PID	20ppm					
									ES	4.00	PID PP	11ppm 330-400kPa					

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: Geoprobe

OPERATOR: Tuck Environmental

LOGGED: Krebs

METHOD: Dual tube from 0.1m to 4.0m

CASING: Uncased

REMARKS: D3/SBK at 1.0m

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Department of Planning Housing and Infrastructure **SURFACE LEVEL:** 91.6 AHD **LOCATION ID:** 106
PROJECT: Proposed Visitor Information Centre **COORDINATE:** E:401532.1, N:6458273.2 **PROJECT No:** 228674.00
LOCATION: 17 Denison Street, Gloucester, NSW **DATUM/GRID:** MGA2020 Zone 56 **DATE:** 11/06/24
DIP/AZIMUTH: 90°/---° **SHEET:** 1 of 1

CONDITIONS ENCOUNTERED							SAMPLE		TESTING AND REMARKS							
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ⁽¹⁾ DENSITY. ⁽¹⁾	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE	
Free groundwater observed at 1.7m 11/06/24	91.6 91 90 89 88 87	0.25	FILL / Gravelly SAND (SP): brown; fine to medium; fine to medium, sub-angular to sub-rounded gravel.		FILL	NA	D			D	0.10	PID	1.1ppm		Bentonite Concrete	50mm Class 18 PVC Casing
		ALV	D		M		ES		0.40	PID	<1ppm					
			ALV	St	w<PL	D/ES	1.00		PID PP	<1ppm 250-350kPa						
						D/ES	1.50		PID	<1ppm						
						D/ES	2.00		PID PP	<1ppm 300-400kPa						
						ES	2.50		PID	2.2ppm						
						ES	3.00		PID PP	<1ppm 3600->400kPa						
			3.20	Gravelly CLAY (CL), with silt, with sand: mottled orange brown; low plasticity; fine to medium, sub-angular to sub-rounded gravel; fine to medium sand.		COL	F		w<PL	D/ES	3.50	PID	<1ppm			
			4	Borehole discontinued at 4.00m depth. Limit of investigation.		ES	4.00		PID PP	<1ppm 200-350kPa						

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: Geoprobe **OPERATOR:** Tuck Environmental **LOGGED:** Krebs
METHOD: Dual tube **CASING:** Uncased
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Department of Planning Housing and Infrastructure **SURFACE LEVEL:**

PROJECT: Proposed Visitor Information Centre **COORDINATE:**

LOCATION: 17 Denison Street, Gloucester, NSW **DATUM/GRID:**

SURFACE LEVEL: **LOCATION ID:** 107

COORDINATE: **PROJECT No:** 228674.00

DATUM/GRID: **DATE:** 12/06/24

DIP/AZIMUTH: 90°/---° SHEET: 1 of 1

LOCATION ID: 107

PROJECT No: 228674.00

DATE: 12/06/24

SHEET: 1 of 1

GROUNDWATER		CONDITIONS ENCOUNTERED					SAMPLE			TESTING AND REMARKS			
RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*) DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	
Free groundwater observed at 2.0m 12/06/24	0.10	FILL / CONCRETE: grey.		FILL	NA	D		ES		0.05	PID	<1ppm	
		FILL / Silty CLAY (CL-CI), with sand, trace gravel: grey brown; low to medium plasticity; fine to medium sand; fine to medium, sub-angular to sub-rounded gravel.		FILL	NA	w<PL		ES		0.50	PID	<1ppm	
								ES		1.00	PID	<1ppm	
	1.30	Clayey GRAVEL (GC), with sand: orange brown; fine to medium, sub-angular to sub-rounded; fine to medium sand.		COL	D	W		ES		1.50	PID	<1ppm	
								ES		2.00	PID	<1ppm	
								ES		2.50	PID	<1ppm	
								ES		3.00	PID	<1ppm	
								D/ES		3.50	PID	<1ppm	
								ES		4.00	PID	<1ppm	
	4	Borehole discontinued at 4.00m depth. Limit of investigation.											

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.

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: Geoprobe **OPERATOR:** Tuck Environmental

METHOD: Dual tube

REMARKS:

OPERATOR: Tuck Environmental

LOGGED: Krebs

CASING: Uncased

BOREHOLE LOG

CLIENT: Department of Planning Housing and Infrastructure
PROJECT: Proposed Visitor Information Centre
LOCATION: 17 Denison Street, Gloucester, NSW

SURFACE LEVEL:
COORDINATE:
DATUM/GRID:
DIP/AZIMUTH: 90°/---°

LOCATION ID: 108
PROJECT No: 228674.00
DATE: 12/06/24
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
▼ Free groundwater observed at 1.8m 12/06/24		0.10	FILL / CONCRETE: grey.		FILL	NA	D		ES		0.05	PID	<1ppm
			FILL / Silty CLAY (CL-CI), with sand, with gravel: grey brown; low to medium plasticity; fine to medium sand; fine to medium, sub-angular to sub-rounded gravel.		FILL	NA	w<PL		ES		0.50	PID	<1ppm
		1.10	FILL / Sandy CLAY (CL-CI), with gravel: orange brown; low to medium plasticity; fine to medium sand; fine to medium, sub-angular to sub-rounded gravel.		FILL	St	w<PL	D/ES		1.50	PID	<1ppm	
		1.75	Clayey GRAVEL (GC), with sand: orange brown; fine to medium, sub-angular to sub-rounded; fine to medium sand.		COL	D	w<PL	ES		2.00	PID	<1ppm	
	2												
		3						ES		3.00	PID	<1ppm	
								ES		3.50	PID	<1ppm	
		4	Borehole discontinued at 4.00m depth. Limit of investigation.					D/ES		4.00	PID	<1ppm	

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.

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: Geoprobe
METHOD: Dual tube
REMARKS: D5/SBK at 1.0m

OPERATOR: Tuck Environmental

LOGGED: Krebs
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Department of Planning Housing and Infrastructure **SURFACE LEVEL:** **LOCATION ID:** 109
PROJECT: Proposed Visitor Information Centre **COORDINATE:** **PROJECT No:** 228674.00
LOCATION: 17 Denison Street, Gloucester, NSW **DATUM/GRID:** **DATE:** 12/06/24
DIP/AZIMUTH: 90°/---° **SHEET:** 1 of 1

CONDITIONS ENCOUNTERED										SAMPLE			TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ⁽¹⁾ DENSITY. ⁽²⁾	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	
Free groundwater observed at 2.0m 12/06/24		0.12	FILL / CONCRETE: grey.		FILL	NA	D							
		0.30	FILL / Sandy GRAVEL (GP): pale grey; fine to medium, sub-angular to sub-rounded; fine to medium sand.		FILL	NA	M		ES		0.20	PID	<1ppm	
			Silty CLAY (CL-CI), with gravel: mottled brown orange; low to medium plasticity; fine to medium, sub-angular to sub-rounded gravel.		ALV	St	w<PL		ES		0.50	PID	<1ppm	
		1							D/ES		1.00	PID PP	<1ppm 310-350kPa	
		1.30	Sandy CLAY (CL-CI), with gravel, trace silt: pale grey; low to medium plasticity; fine to medium sand; fine to medium, sub-angular to sub-rounded gravel.		ALV	F	w<PL		ES		1.50	PID	<1ppm	
		1.80	Gravelly CLAY (CL-CI), with sand, trace silt: orange brown; low to medium plasticity; fine to medium, sub-angular gravel; fine to medium sand.						ES		2.00	PID PP	<1ppm 320-360kPa	
		2							ES		2.50	PID	<1ppm	
		3			COL	F	w<PL		ES		3.00	PID PP	<1ppm 200-240kPa	
									D/ES		3.50	PID	<1ppm	
		4	Borehole discontinued at 4.00m depth. Limit of investigation.						ES		4.00	PID PP	<1ppm 250-280kPa	

NOTES: ⁽¹⁾Soil origin is "probable" unless otherwise stated. ⁽²⁾Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

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: Geoprobe **OPERATOR:** Tuck Environmental **LOGGED:** Krebs
METHOD: Dual tube **CASING:** Uncased
REMARKS: D4/SBK at 3.0m

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Department of Planning Housing and Infrastructure
PROJECT: Proposed Visitor Information Centre
LOCATION: 17 Denison Street, Gloucester, NSW

SURFACE LEVEL:
COORDINATE:
DATUM/GRID:
DIP/AZIMUTH: 90°/---°

LOCATION ID: 110
PROJECT No: 228674.00
DATE: 11/06/24
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
Free groundwater observed at 2.0m 11/06/24		0.10	FILL / CONCRETE: grey.		FILL	NA	NA						
		0.20	FILL / Clayey Silty SAND (SM), with gravel: grey; fine to medium; fine to medium, sub-angular to sub-rounded gravel.		FILL	NA	M		ES		0.15	PID	<1ppm
			Silty CLAY, trace sand: brown; fine to medium sand.		ALV	St to VSt	w<PL						
									D/ES		0.50	PID	<1ppm
									D/ES		1.00	PID PP	<1ppm 300-350kPa
		1.15	Silty Sandy CLAY: grey brown; fine to medium sand.		ALV	St to VSt	w<PL		D/ES		1.50	PID	<1ppm
		1.80	Sandy CLAY, with gravel: grey brown; fine to medium sand; fine to medium, sub-angular to sub-rounded gravel.		COL	F to St	w<PL						
		2							ES		2.00	PID PP	<1ppm 320kPa
									ES		2.50	PID	<1ppm
		3							ES		3.00	PID PP	<1ppm 250-300kPa
									ES		3.50	PID	<1ppm
	4												
								D/ES		4.00	PID PP	<1ppm 200-320kPa	
			Borehole discontinued at 4.00m depth. Limit of investigation.										

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.

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: Geoprobe

OPERATOR: Tuck Environmental

LOGGED: Krebs

METHOD: Dual tube

CASING: Uncased

REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Department of Planning Housing and Infrastructure **SURFACE LEVEL:** 91.6 AHD **LOCATION ID:** 111
PROJECT: Proposed Visitor Information Centre **COORDINATE:** E:401537.1, N:6458292.9 **PROJECT No:** 228674.00
LOCATION: 17 Denison Street, Gloucester, NSW **DATUM/GRID:** MGA2020 Zone 56 **DATE:** 12/06/24 **SHEET:** 1 of 1
DIP/AZIMUTH: 90°/---°

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					
Free groundwater observed at 1.9m 12/06/24		0.10	FILL / Gravelly SAND (SP): orange brown; fine to medium, sub-angular to sub-rounded gravel.		FILL	NA	D		ES		0.05	PID	<1ppm					
		0.30	FILL / Gravelly SAND (SP), with silt: brown; fine to medium, sub-angular to sub-rounded gravel.		FILL	NA	M		ES		0.20	PID	<1ppm					
		0.70	Clayey SAND (SC), with gravel: brown; fine to medium.		ALV	MD to D	M		D/ES		0.50	PID	<1ppm					
		1	Silty CLAY (CL-CI), with sand, trace gravel: brown; low to medium plasticity; fine to medium sand; fine to medium, sub-angular to sub-rounded gravel.		ALV	St	w<PL		D/ES		1.00	PID PP	<1ppm 300-380kPa					
								ES		1.50	PID	<1ppm						
		2						ES		2.00	PID PP	14ppm 320-360kPa						
								ES		2.50	PID	1.1ppm						
		2.70	Clayey GRAVEL (GC), with sand: orange brown grey; fine to medium, sub-angular to sub-rounded; fine to medium sand.					COL	D	W		ES		3.00	PID	<1ppm		
		3											ES		3.50	PID	8.8ppm	
		4	Borehole discontinued at 4.00m depth. Limit of investigation.								D/ES		4.00	PID	<1ppm			

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.

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: Geoprobe **OPERATOR:** Tuck Environmental **LOGGED:** Krebs
METHOD: Dual tube **CASING:** Uncased
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Department of Planning Housing and Infrastructure
PROJECT: Proposed Visitor Information Centre
LOCATION: 17 Denison Street, Gloucester, NSW

SURFACE LEVEL:
COORDINATE:
DATUM/GRID:
DIP/AZIMUTH: 90°/---°

LOCATION ID: 112
PROJECT No: 228674.00
DATE: 12/06/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED														SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ⁽¹⁾	DENSITY. ⁽²⁾	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS					
Free groundwater observed at 2.0m 12/06/24		0.10	FILL / CONCRETE: grey.		FILL	NA		D		ES		0.05	PID	<1ppm					
			FILL / Silty CLAY (CL-Cl), with sand, trace gravel: grey brown; low to medium plasticity; fine to medium, sub-angular to sub-rounded gravel.																
	1.60		Clayey GRAVEL (GC), with sand: orange brown; fine to medium, sub-angular to sub-rounded; fine to medium sand.																

BOREHOLE LOG

CLIENT: Department of Planning Housing and Infrastructure **SURFACE LEVEL:** 92.0 AHD **LOCATION ID:** 113
PROJECT: Proposed Visitor Information Centre **COORDINATE:** E:401493.5, N:6458310.9 **PROJECT No:** 228674.00
LOCATION: 17 Denison Street, Gloucester, NSW **DATUM/GRID:** MGA2020 Zone 56 **DATE:** 12/06/24
DIP/AZIMUTH: 90°/---° **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
12/06/24 No free groundwater observed	91	0.30	FILL / Silty Sandy CLAY, trace gravel: brown.		FILL	F	D		ES		0.10	PID	<1ppm
			Gravelly CLAY, with sand: brown; fine to medium, sub-angular to sub-rounded gravel.		ALV	F to St	w<PL		ES		0.50	PID	<1ppm
		1.10	Sandy CLAY, with gravel: mottled brown orange; fine to medium sand.		ALV	St to VSt	w<PL		ES		1.00	PID PP	<1ppm 280-310kPa
									ES		1.50	PID PP	<1ppm 320->400kPa
	90	2	Borehole discontinued at 2.00m depth. Limit of investigation.						ES		2.00	PID	<1ppm
	89	3											
	88	4											

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

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: Geoprobe **OPERATOR:** Tuck Environmental **LOGGED:** Krebs
METHOD: Dual tube **CASING:** Uncased
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Department of Planning Housing and Infrastructure **SURFACE LEVEL:** 91.9 AHD **LOCATION ID:** 114
PROJECT: Proposed Visitor Information Centre **COORDINATE:** E:401533.8, N:6458281.8 **PROJECT No:** 228674.00
LOCATION: 17 Denison Street, Gloucester, NSW **DATUM/GRID:** MGA2020 Zone 56 **DATE:** 12/06/24
DIP/AZIMUTH: 90°/---° **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
12/06/24 No free groundwater observed	91	0.30	FILL / Sandy GRAVEL (GP), trace silt: orange brown; fine to medium, sub-angular to sub-rounded; fine to medium sand.		FILL	NA		D		ES		0.10	PID	<1ppm
			Silty CLAY (CL-CI), with sand: brown; low to medium plasticity; fine to medium sand.		ALV	F to St		w<PL		ES		0.50	PID	<1ppm
		1								ES		1.00	PID PP	<1ppm 320-370kPa
		1.20	Sandy CLAY (CL-CI), with gravel: brown grey orange; low to medium plasticity; fine to medium sand; fine to medium, sub-angular to sub-rounded gravel.		ALV	F to St		w<PL		ES		1.50	PID	<1ppm
	90	2	Borehole discontinued at 2.00m depth. Limit of investigation.							ES		2.00	PID PP	<1ppm 300->400kPa
	89	3												
	88	4												
	87													

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.

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: Geoprobe **OPERATOR:** Tuck Environmental **LOGGED:** Krebs
METHOD: Dual tube **CASING:** Uncased
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions



TEST PIT LOG

CLIENT: Department of Planning Housing and Infrastructure **SURFACE LEVEL:** 93.0 AHD **LOCATION ID:** 201
PROJECT: Proposed Visitor Information Centre **COORDINATE:** E:401478.1, N:6458291.9 **PROJECT No:** 228674.00
LOCATION: 17 Denison Street, Gloucester, NSW **DATUM/GRID:** MGA2020 Zone 56 **DATE:** 13/06/24
DIP/AZIMUTH: 90°/---° **SHEET:** 1 of 1

CONDITIONS ENCOUNTERED										SAMPLE			TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ⁽¹⁾	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
13/06/24 No free groundwater observed	93		FILL / Silty CLAY, with sand, with gravel: brown; trace pebbles, brick fragments, tile, roots, rootlets.		FILL					D/ES		0.20	PID	<1ppm
			Test Pit discontinued at 0.60m depth. Limit of investigation.											
		1												
		2												

NOTES: ^(#)Soil origin is "probable" unless otherwise stated. ⁽¹⁾Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

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: 1.7T Excavator **OPERATOR:** CAE **LOGGED:** Krebs
METHOD: 200mm Bucket
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

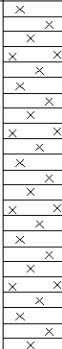


TEST PIT LOG

CLIENT: Department of Planning Housing and Infrastructure
PROJECT: Proposed Visitor Information Centre
LOCATION: 17 Denison Street, Gloucester, NSW

SURFACE LEVEL: 92.7 AHD
COORDINATE: E:401476.8, N:6458296.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 202
PROJECT No: 228674.00
DATE: 13/06/24
SHEET: 1 of 1

CONDITIONS ENCOUNTERED										SAMPLE			TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ⁽¹⁾ DENSITY ⁽²⁾	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	
13/06/24 No free groundwater observed	92		FILL / Silty CLAY, with sand, trace gravel: brown; trace brick, metal wire, tile, rootlets.		FILL				D/ES		0.20	PID	<1ppm	
		1	Test Pit discontinued at 0.70m depth. Limit of investigation.											
		91												
		2												
		90												

NOTES: ⁽¹⁾Soil origin is "probable" unless otherwise stated. ⁽²⁾Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: 1.7T Excavator
METHOD: 200mm Bucket
REMARKS:

OPERATOR: CAE

LOGGED: Krebs

TEST PIT LOG

CLIENT: Department of Planning Housing and Infrastructure **SURFACE LEVEL:** 92.5 AHD **LOCATION ID:** 203
PROJECT: Proposed Visitor Information Centre **COORDINATE:** E:401484.7, N:6458295.5 **PROJECT No:** 228674.00
LOCATION: 17 Denison Street, Gloucester, NSW **DATUM/GRID:** MGA2020 Zone 56 **DATE:** 13/06/24
DIP/AZIMUTH: 90°/---° **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				
13/06/24 No free groundwater observed	92		FILL / Silty SAND (SM), with clay, with gravel: brown; fine to medium, sub-angular to sub-rounded gravel; with pebbles, concrete cobbles, brick, rootlets.		FILL					D/ES		0.20	PID	<1ppm				
		1	Test Pit discontinued at 0.80m depth. Limit of investigation.															
		91																
		2																
									</									

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: 1.7T Excavator **OPERATOR:** CAE **LOGGED:** Krebs
METHOD: 200mm Bucket
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions



TEST PIT LOG

CLIENT: Department of Planning Housing and Infrastructure **SURFACE LEVEL:** 92.5 AHD **LOCATION ID:** 204
PROJECT: Proposed Visitor Information Centre **COORDINATE:** E:401480.3, N:6458298.7 **PROJECT No:** 228674.00
LOCATION: 17 Denison Street, Gloucester, NSW **DATUM/GRID:** MGA2020 Zone 56 **DATE:** 13/06/24
DIP/AZIMUTH: 90°/---° **SHEET:** 1 of 1

CONDITIONS ENCOUNTERED							SAMPLE			TESTING AND REMARKS			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ⁽¹⁾ DENSITY. ⁽²⁾	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
13/06/24 No free groundwater observed	92		FILL / Clayey Silty SAND (SM), with gravel: brown; fine to medium; fine to medium, sub-angular to sub-rounded gravel; trace brick, rootlets, tile, wire, plastic.		FILL				D/ES		0.20	PID	<1ppm
		1	Test Pit discontinued at 0.60m depth. Limit of investigation.										
	91												
		2											
	90												

NOTES: ⁽¹⁾ Soil origin is "probable" unless otherwise stated. ⁽²⁾ Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

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: 1.7T Excavator **OPERATOR:** CAE **LOGGED:** Krebs
METHOD: 200mm Bucket
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions



TEST PIT LOG

CLIENT: Department of Planning Housing and Infrastructure

PROJECT: Proposed Visitor Information Centre

LOCATION: 17 Denison Street, Gloucester, NSW

SURFACE LEVEL: 92.8 AHD

COORDINATE: E:401481.3, N:6458291.6

DATUM/GRID: MGA2020 Zone 56

DIP/AZIMUTH: 90°/---°

LOCATION ID: 205

PROJECT No: 228674.00

DATE: 13/06/24

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
13/06/24 No free groundwater observed			FILL / Silty Sandy CLAY (CL), with gravel: brown; low plasticity; fine to medium sand; fine to medium, sub-angular to sub-rounded gravel; trace brick, concrete, timber, glass, rootlets.		FILL					D/ES		0.20	PID	<1ppm
Test Pit discontinued at 0.60m depth. Limit of investigation.														

13/06/24 No free groundwater observed

32

1

31

2

30

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.

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: 1.7T Excavator

OPERATOR: CAE

LOGGED: Krebs

METHOD: 200mm Bucket

REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions



TEST PIT LOG

CLIENT: Department of Planning Housing and Infrastructure **SURFACE LEVEL:** 92.0 AHD **LOCATION ID:** 206
PROJECT: Proposed Visitor Information Centre **COORDINATE:** E:401475.9, N:6458278.0 **PROJECT No:** 228674.00
LOCATION: 17 Denison Street, Gloucester, NSW **DATUM/GRID:** MGA2020 Zone 56 **DATE:** 13/06/24
DIP/AZIMUTH: 90°/---° **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
13/06/24 No free groundwater observed	92		FILL / Clayey GRAVEL (GC): orange brown; fine to medium, sub-angular to sub-rounded; trace concrete slab, cobbles, brick, wire, metal.		FILL	NA	M		D/ES		0.10	PID	<1ppm
		0.25	Silty CLAY (CL-CI), trace sand: brown; low to medium plasticity; fine to medium sand.		ALV	St	w<PL		D/ES		0.50	PID	<1ppm
Test Pit discontinued at 0.70m depth. Limit of investigation.													
	91	1											
		2											
	90												

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.

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: 1.7T Excavator **OPERATOR:** CAE **LOGGED:** Krebs
METHOD: 200mm Bucket
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions



TEST PIT LOG

CLIENT: Department of Planning Housing and Infrastructure **SURFACE LEVEL:** 92.4 AHD **LOCATION ID:** 207
PROJECT: Proposed Visitor Information Centre **COORDINATE:** E:401506.7, N:6458302.1 **PROJECT No:** 228674.00
LOCATION: 17 Denison Street, Gloucester, NSW **DATUM/GRID:** MGA2020 Zone 56 **DATE:** 13/06/24
DIP/AZIMUTH: 90°/---° **SHEET:** 1 of 1

CONDITIONS ENCOUNTERED							SAMPLE			TESTING AND REMARKS			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ⁽¹⁾ DENSITY. ⁽²⁾	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
13/06/24 No free groundwater observed	92	0.03	FILL / ASPHALT: black.		FILL	NA	NA		D/ES		0.01	PID	<1ppm
			FILL / Clayey Sandy GRAVEL (GP): orange brown; fine, sub-angular to sub-rounded; fine to medium sand; trace brick, glass, wire.		FILL	NA	M		D/ES		0.20	PID	<1ppm
		0.35	Silty CLAY (CL-CI), with sand: brown; low to medium plasticity; fine to medium sand. 0.45m-0.55m: old pipe, possible drain line offsite		ALV	St	w<PL		D/ES		0.60	PID	<1ppm
Test Pit discontinued at 0.90m depth. Limit of investigation.													
		1											
		51											
		2											
		90											

NOTES: [#]Soil origin is "probable" unless otherwise stated. ⁽¹⁾Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

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: 1.7T Excavator **OPERATOR:** CAE **LOGGED:** Krebs
METHOD: 200mm Bucket
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions



TEST PIT LOG

CLIENT: Department of Planning Housing and Infrastructure **SURFACE LEVEL:** 91.8 AHD **LOCATION ID:** 208
PROJECT: Proposed Visitor Information Centre **COORDINATE:** E:401485.5, N:6458301.4 **PROJECT No:** 228674.00
LOCATION: 17 Denison Street, Gloucester, NSW **DATUM/GRID:** MGA2020 Zone 56 **DATE:** 13/06/24
DIP/AZIMUTH: 90°/---° **SHEET:** 1 of 1

CONDITIONS ENCOUNTERED							SAMPLE			TESTING AND REMARKS			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ⁽¹⁾ DENSITY. ⁽²⁾	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
13/06/24 No free groundwater observed		0.05	FILL / ASPHALT: black.		FILL	NA	NA		D		0.05		
			FILL / Clayey GRAVEL (GC), with sand: brown; fine to medium, sub-angular to sub-rounded; fine to medium sand.		FILL	NA	M		D/ES		0.20	PID	<1ppm
		0.30	Silty CLAY (CL-CI), trace sand: brown; low to medium plasticity; fine to medium sand.		ALV	St	w<PL						
			Test Pit discontinued at 0.70m depth. Limit of investigation.										
	91	1											
	90	2											
	89												

NOTES: [#]Soil origin is "probable" unless otherwise stated. ¹Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

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: 1.7T Excavator **OPERATOR:** CAE **LOGGED:** Krebs
METHOD: 200mm Bucket
REMARKS: D8/SBK at 0.5m

Refer to explanatory notes for symbol and abbreviation definitions



TEST PIT LOG

CLIENT: Department of Planning Housing and Infrastructure **SURFACE LEVEL:** 92.2 AHD **LOCATION ID:** 209
PROJECT: Proposed Visitor Information Centre **COORDINATE:** E:401494.8, N:6458288.8 **PROJECT No:** 228674.00
LOCATION: 17 Denison Street, Gloucester, NSW **DATUM/GRID:** MGA2020 Zone 56 **DATE:** 13/06/24
DIP/AZIMUTH: 90°/---° **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
13/06/24 No free groundwater observed	92	0.08	FILL / ASPHALT: black.		FILL	NA		NA		D		0.08		
			FILL / Gravelly CLAY (CL-CI), with silt: brown; low to medium plasticity; fine to medium, sub-angular to sub-rounded gravel; trace brock, metal, pipe, rubber, tile.		FILL	NA	w<PL			D/ES		0.30	PID	<1ppm
		0.40	Silty CLAY (CL-CI), trace sand: mottled orange brown; low to medium plasticity; fine to medium sand.		ALV	St	w<PL			D/ES		0.60	PID	<1ppm
		1	Test Pit discontinued at 1.00m depth. Limit of investigation.											
	91													
		2												
	90													

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.

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: 1.7T Excavator **OPERATOR:** CAE **LOGGED:** Krebs
METHOD: 200mm Bucket
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions



TEST PIT LOG

CLIENT: Department of Planning Housing and Infrastructure **SURFACE LEVEL:** 92.2 AHD **LOCATION ID:** 210
PROJECT: Proposed Visitor Information Centre **COORDINATE:** E:401496.5, N:6458301.1 **PROJECT No:** 228674.00
LOCATION: 17 Denison Street, Gloucester, NSW **DATUM/GRID:** MGA2020 Zone 56 **DATE:** 13/06/24
DIP/AZIMUTH: 90°/---° **SHEET:** 1 of 1

CONDITIONS ENCOUNTERED										SAMPLE			TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ⁽¹⁾	DENSITY. ⁽²⁾	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
13/06/24 No free groundwater observed	92	0.03	FILL / ASPHALT: black.		FILL	NA	NA	NA		D/ES		0.01	PID	<1ppm
			FILL / Sandy GRAVEL (GP), with clay: orange brown; fine to coarse, sub-angular; fine to medium sand; trace metal, plastic, glass.		FILL	NA	M			D/ES		0.20	PID	<1ppm
		0.30	Silty CLAY (CL-CI), trace sand: brown; low to medium plasticity; fine to medium sand.		ALV	St	w<PL			D/ES		0.50	PID	<1ppm
			Test Pit discontinued at 0.70m depth. Limit of investigation.											
	91	1												
	90	2												

NOTES: [#]Soil origin is "probable" unless otherwise stated. ¹Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: 1.7T Excavator **OPERATOR:** CAE **LOGGED:** Krebs
METHOD: 200mm Bucket
REMARKS:



Refer to explanatory notes for symbol and abbreviation definitions

TEST PIT LOG

CLIENT: Department of Planning Housing and Infrastructure **SURFACE LEVEL:** 92.0 AHD **LOCATION ID:** 211
PROJECT: Proposed Visitor Information Centre **COORDINATE:** E:401497.9, N:6458317.1 **PROJECT No:** 228674.00
LOCATION: 17 Denison Street, Gloucester, NSW **DATUM/GRID:** MGA2020 Zone 56 **DATE:** 13/06/24
DIP/AZIMUTH: 90°/---° **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			
13/06/24 No free groundwater observed		0.02	FILL / ASPHALT: black.				NA	NA		D		0.02	PID	<1ppm			
			FILL / Clayey GRAVEL (GC), with sand, trace silt: brown; fine to medium, sub-angular to sub-rounded; fine to medium sand.		FILL	NA	M	D/ES			0.10	PID	<1ppm				
		0.20	Silty CLAY (CL-CI), trace sand: brown; low to medium plasticity; fine to medium sand.		ALV	St	w<PL	D/ES			0.50	PID	<1ppm				
			Test Pit discontinued at 0.70m depth. Limit of investigation.														
		1															
		2															

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.

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: 1.7T Excavator **OPERATOR:** CAE **LOGGED:** Krebs
METHOD: 200mm Bucket
REMARKS: D7/SBK and T3/SBK at 0.1m

Refer to explanatory notes for symbol and abbreviation definitions



TEST PIT LOG

CLIENT: Department of Planning Housing and Infrastructure **SURFACE LEVEL:** 92.0 AHD **LOCATION ID:** 212
PROJECT: Proposed Visitor Information Centre **COORDINATE:** E:401531.0, N:6458292.1 **PROJECT No:** 228674.00
LOCATION: 17 Denison Street, Gloucester, NSW **DATUM/GRID:** MGA2020 Zone 56 **DATE:** 13/06/24
DIP/AZIMUTH: 90°/---° **SHEET:** 1 of 1

CONDITIONS ENCOUNTERED										SAMPLE			TESTING AND REMARKS	
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN ^(*)	CONSIS. ^(†)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	
13/06/24 No free groundwater observed	0.03	FILL / ASPHALT: black.		FILL	NA	NA			D		0.01	PID	<1ppm	
		FILL / Clayey GRAVEL (GC), with sand: orange brown; fine to medium, sub-angular to sub-rounded; fine to medium sand; trace rubber, wire, nails.		FILL	NA	M			D/ES		0.20	PID	<1ppm	
	0.30	Silty CLAY (CL-CI), trace sand: grey brown; low to medium plasticity.		ALV	St	w<PL			D/ES		0.50	PID	<1ppm	
		Test Pit discontinued at 0.80m depth. Limit of investigation.												
	1													
	2													

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.

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: 1.7T Excavator **OPERATOR:** CAE **LOGGED:** Krebs
METHOD: 200mm Bucket
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions



TEST PIT LOG

CLIENT: Department of Planning Housing and Infrastructure **SURFACE LEVEL:** 92.1 AHD **LOCATION ID:** 213
PROJECT: Proposed Visitor Information Centre **COORDINATE:** E:401527.2, N:6458279.8 **PROJECT No:** 228674.00
LOCATION: 17 Denison Street, Gloucester, NSW **DATUM/GRID:** MGA2020 Zone 56 **DATE:** 13/06/24
DIP/AZIMUTH: 90°/---° **SHEET:** 1 of 1

GROUNDWATER		CONDITIONS ENCOUNTERED					SAMPLE			TESTING AND REMARKS			
RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
13/06/24 No free groundwater observed	0.02	FILL / ASPHALT: black.		FILL	NA	NA	NA		D		0.01	PID	<1ppm
		FILL / Clayey GRAVEL (GC), with sand: mottled orange brown; fine to medium, sub-angular to sub-rounded; fine to medium sand; trace rubber, wire, glass.		FILL	NA	M			D/ES		0.10	PID	<1ppm
	0.30	Silty CLAY: brown; low to medium plasticity.		ALV	St	w<PL			ES		0.60	PID	<1ppm
Test Pit discontinued at 1.00m depth. Limit of investigation.													
				</									

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: 1.7T Excavator **OPERATOR:** CAE **LOGGED:** Krebs
METHOD: 200mm Bucket
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: NSW Department of Planning Housing and Infrastructure
PROJECT: Supplementary Detailed Site Investigation
LOCATION: 17 Denison Street, Gloucester, NSW

SURFACE LEVEL: 92.2 AHD
COORDINATE: E:401514.8, N:6458322.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 301
PROJECT No: 228674.02
DATE: 14/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED							SAMPLE			TESTING AND REMARKS					
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(%)	CONSIS. ^(*) DENSITY, (g)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
Free groundwater observed 14/04/25	92	0.03	FILL / BITUMINOUS CHIP SEAL: black.		FILL	NA	M		D		0.03	PID	2.2ppm	Concrete	50mm Class 18 PVC Casing
	0.25		FILL / Clayey Sandy GRAVEL (GP): pale brown; fine to medium, sub-angular to sub-rounded; fine to medium sand; gravels (natural).		FILL	NA	M		D/ES		0.20	PID	3.2ppm	Bentonite	
									D/ES		0.50	PID	3.7ppm		
									D/ES		1.00	PID	1.9ppm		
	1		CLAY (CL): brown; low plasticity.		ALV	H	w<PL		D/ES		1.50	PID	1.5ppm		
									D/ES		2.00	PID	1.3ppm		
									D/ES		2.50	PID	2.7ppm		
	2				ALV	NA	W		D/ES		3.00	PID	2.4ppm		
									D/ES		3.50	PID	<1ppm		
									D/ES		4.00	PID	<1ppm		
	2.70	Clayey GRAVEL (GP): mottled grey brown; fine to medium, sub-angular to sub-rounded; gravels (natural).		ALV	NA	W									
	2.90	CLAY (CL): brown; low plasticity.		ALV	S to F	w<PL									
	3			ALV	S to F	w<PL									
	89		From 3.40m-3.80m: slight hydrocarbon odour		ALV	S to F	w<PL								
	4				ALV	S to F	w<PL								
	88	4	Borehole discontinued at 4.00m depth. Limit of investigation.						D/ES		4.00	PID	<1ppm		

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.

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: Geoprobe 7822DT
METHOD: Push tube to 4.0m
REMARKS: Well finished with gatic cover at surface.

OPERATOR: Tuck Environmental

LOGGED: Krebs
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: NSW Department of Planning Housing and Infrastructure
PROJECT: Supplementary Detailed Site Investigation
LOCATION: 17 Denison Street, Gloucester, NSW

SURFACE LEVEL: 92.3 AHD
COORDINATE: E:401526.0, N:6458320.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 302
PROJECT No: 228674.02
DATE: 14/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED						SAMPLE			TESTING AND REMARKS						
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(%)	CONSIS. ^(*) DENSITY, ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
		0.03	FILL / BITUMINOUS CHIP SEAL: black.		FILL	NA	M		D		0.01	PID	29.7ppm	Concrete	50mm Class 18 PVC Casing
		0.18	FILL / Clayey GRAVEL (GP) with sand: pale brown; fine to medium, sub-angular to sub-rounded; gravels comprised of crushed natural rock. CLAY (CL): mottled grey brown; low plasticity.			NA			ES		0.10	PID	12.3ppm	Bentonite	
	92				ALV	H	w<PL		D/ES		0.50	PID	20.3ppm		
		1							D/ES		1.00	PID	61.5ppm		
		1.20	CLAY (CL): brown; low plasticity.		ALV	VSt	w<PL		D/ES		1.50	PID	109ppm		
		1.90	Clayey SAND (SP) with gravel: grey; fine to medium; fine to medium, sub-angular to sub-rounded gravel; gravels (natural); strong hydrocarbon odour. 1.90m: slight hydrocarbon odour						D/ES		2.00	PID	2047ppm		
		2			ALV	WC	W		D/ES		2.50	PID	208.4ppm		
		3							D/ES		3.00	PID	289.3ppm		
		3.70	Sandy CLAY (CL) trace gravel: brown; fine to medium sand; fine to medium, sub-angular to sub-rounded gravel; gravels (natural); strong hydrocarbon odour.		ALV	St	w<PL		D/ES		3.50	PID	25.8ppm		
		4	Borehole discontinued at 4.00m depth. Limit of investigation.						D/ES		4.00	PID	17.9ppm		
		88													

Free groundwater observed
14/04/25

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: Geoprobe 7822DT
METHOD: Push tube to 4.0m
REMARKS: Well finished with gatic cover at surface.
D1/SBK @ 1.0m.

OPERATOR: Tuck Environmental

LOGGED: Krebs
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: NSW Department of Planning Housing and Infrastructure
PROJECT: Supplementary Detailed Site Investigation
LOCATION: 17 Denison Street, Gloucester, NSW

SURFACE LEVEL: 92.1 AHD
COORDINATE: E:401536.9, N:6458318.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 303
PROJECT No: 228674.02
DATE: 14/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED							SAMPLE			TESTING AND REMARKS					
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(%)	CONSIS. (%) DENSITY, (g/cm ³)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	92	0.03	FILL / BITUMINOUS CHIP SEAL: black.		FILL	NA	M		D/ES		0.10	PID	106ppm	Concrete	50mm Class 18 PVC Casing
		0.25	FILL / Clayey GRAVEL (GP) with sand: pale brown; fine to medium, sub-angular to sub-rounded; fine to medium sand; gravels comprised of crushed natural rock.						D/ES		0.30	PID	72.4ppm	Bentonite	
			FILL / Sandy CLAY (CL): brown; low plasticity; fine to medium sand.												
			0.50m: slight odour observed, potentially hydrocarbon?												
	91	1			FILL possibly COL	H	w<PL		D		0.80	PID	58.1ppm		
			1.70m-3.60m: strong hydrocarbon odour, staining present						D/ES		1.50	PID	66.4ppm		
		2													
	90	2.10	Gravelly CLAY (CL): grey; low plasticity; fine to medium, sub-angular to sub-rounded gravel; (natural).						D/ES		2.00	PID	474.2ppm		
									D/ES		2.50	PID	510.3ppm		
		3			COL	ND	w<PL		D/ES		3.00	PID	759.8ppm		
	89														
									D/ES		3.50	PID	42ppm		
		3.80	CLAY (CL) with gravel trace sand: brown; low plasticity; fine to medium, sub-angular to sub-rounded, (natural) gravel; fine to medium sand.		COL	F	w<PL		D/ES		4.00	PID	<1ppm		
	88	4	Borehole discontinued at 4.00m depth. Limit of investigation.												

Free groundwater observed 14/04/25

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.

BOREHOLE LOG

CLIENT: NSW Department of Planning Housing and Infrastructure
PROJECT: Supplementary Detailed Site Investigation
LOCATION: 17 Denison Street, Gloucester, NSW

SURFACE LEVEL: 92.2 AHD
COORDINATE: E:401522.8, N:6458333.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 304
PROJECT No: 228674.02
DATE: 14/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED							SAMPLE			TESTING AND REMARKS				
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(%)	CONSIS. ^(*) DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	0.02	FILL / BITUMINOUS CHIP SEAL: black.		FILL	NA	W		D/ES		0.10	PID	3.4ppm	Concrete	50mm Class 18 PVC Casing
	0.20	FILL / Clayey GRAVEL (GP) with sand: brown; fine to medium, sub-angular to sub-rounded; gravels comprised of crushed natural rock. CLAY (CL): grey brown; low plasticity.						D/ES		0.50	PID	1.8ppm	Bentonite	
				possibly ALV	H	w<PL		D/ES		1.00	PID	<1ppm		
								D/ES		1.50	PID	<1ppm		
		CLAY (CL): brown; low plasticity.						D/ES		2.00	PID	<1ppm		
				ALV	VSt	w<PL		D/ES		2.50	PID	<1ppm		
								D/ES		3.00	PID	1.6ppm		
								D/ES		3.50	PID	17.9ppm		
		Clayey GRAVEL (GP) with sand: grey; fine to medium, sub-angular to sub-rounded; gravels (natural); slight hydrocarbon odour.		ALV	NA	W		ES		4.00	PID	<1ppm		
		Borehole discontinued at 4.00m depth. Limit of investigation.												

Free groundwater observed
14/04/25

88

89

90

91

92

Sand - 2 mm

50mm Class 18 Machine-Slotted PVC Screen

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.

NOTES: ⁽¹⁾Soil origin is "probable" unless otherwise stated. ⁽²⁾Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Geoprobe 7822DT
METHOD: Push tube to 4.0m
REMARKS: Well finished with gatic cover at surface.
D3/SBK @ 4.0m.

OPERATOR: Tuck Environmental

LOGGED: Krebs
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: NSW Department of Planning Housing and Infrastructure
PROJECT: Supplementary Detailed Site Investigation
LOCATION: 17 Denison Street, Gloucester, NSW

SURFACE LEVEL: 92.1 AHD
COORDINATE: E:401531.9, N:6458332.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 305
PROJECT No: 228674.02
DATE: 14/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED							SAMPLE			TESTING AND REMARKS														
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(%)	CONSIS. ^(*) DENSITY, ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE									
Free groundwater observed 14/04/25	92	0.02	FILL / BITUMINOUS CHIP SEAL: black.		FILL	NA	M						PID	5.0ppm	Concrete	50mm Class 18 PVC Casing								
	0.35	FILL / Clayey GRAVEL (GP) with sand: brown; fine to medium, sub-angular to sub-rounded; fine to medium sand; gravels comprised of crushed natural rock.																						
		CLAY (CL): brown; low plasticity.		ALV	H	w<PL																PID	4.5ppm	
		From 0.50m: slight hydrocarbon odour																						
	1																							
				ALV	St to VSt	w<PL																PID	4.1ppm	
	1.90	Gravelly CLAY (CL) with sand: mottled grey brown; low plasticity; fine to medium, sub-angular to sub-rounded gravel; fine to medium sand; gravels (natural); slight hydrocarbon odour.																						
	2			ALV	NA	W																	PID	3.1ppm
	2.50	Clayey GRAVEL (GP) with sand: grey; fine to medium, sub-angular to sub-rounded; fine to medium sand; gravels (natural); slight hydrocarbon odour.																						
3			ALV	S	w<PL								PID	27.5ppm										
3.10	Sandy CLAY (CL) with gravel: brown; fine to medium sand; fine to medium, sub-angular to sub-rounded gravel; gravels (natural); slight hydrocarbon odour.																							
4		Borehole discontinued at 4.00m depth. Limit of investigation.						D/ES		4.00	PID	22.9ppm												
	88																							

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.

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: Geoprobe 7822DT
METHOD: Push tube to 4.0m
REMARKS: Well finished with gatic cover at surface.

OPERATOR: Tuck Environmental

LOGGED: Krebs
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: NSW Department of Planning Housing and Infrastructure
PROJECT: Supplementary Detailed Site Investigation
LOCATION: 17 Denison Street, Gloucester, NSW

SURFACE LEVEL: 91.9 AHD
COORDINATE: E:401542.8, N:6458330.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 306
PROJECT No: 228674.02
DATE: 14/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED							SAMPLE			TESTING AND REMARKS					
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(%)	CONSIS. ^(*) DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
Free groundwater observed 14/04/25		0.03	FILL / BITUMINOUS CHIP SEAL: black.		FILL	NA	NA							Concrete	Sand - 2 mm 50mm Class 18 Machine-Slotted PVC Screen
			FILL / Clayey GRAVEL (GP) with sand: brown; fine to medium, sub-angular to sub-rounded; fine to medium sand; gravels comprised of crushed natural rock.		FILL	NA	M		ES		0.25	PID	2.0ppm	Bentonite	
		0.40	CLAY (CL): grey; low plasticity. 0.50m-3.60m: hydrocarbon odour						D/ES		0.50	PID	2.5ppm		
	91	1			ALV	H	w<PL		D/ES		1.00	PID	4.9ppm		
									D/ES		1.50	PID	3.6ppm		
	90	2	Clayey GRAVEL (GP) with sand: grey; fine to medium, sub-angular to sub-rounded; gravels (natural).		ALV	NA	M		D/ES		2.00	PID	51.8ppm		
									D/ES		2.50	PID	1200ppm		
	89	3							D/ES		3.00	PID	36.2ppm		
									D/ES		3.50	PID	21.4ppm		
	88	4	Gravelly CLAY (CL) with sand: brown; fine to medium, sub-angular to sub-rounded gravel; fine to medium sand; gravels (natural).		ALV	F	w<PL								
								D/ES		4.00	PID	17.0ppm			
			Borehole discontinued at 4.00m depth. Limit of investigation.												
									</						

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: Geoprobe 7822DT
METHOD: Push tube to 4.0m
REMARKS: Well finished with gatic cover at surface.
 D2/SBK @ 0.5m.

OPERATOR: Tuck Environmental

LOGGED: Krebs
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: NSW Department of Planning Housing and Infrastructure
PROJECT: Supplementary Detailed Site Investigation
LOCATION: 17 Denison Street, Gloucester, NSW

SURFACE LEVEL:
COORDINATE:
DATUM/GRID:
DIP/AZIMUTH: 90°/---°

LOCATION ID: SED1
PROJECT No: 228674.02
DATE: 15/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED															SAMPLE			TESTING AND REMARKS		
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS						
observed			Clayey SILT: brown; abundant organic matter; roots; rootlets.					w<PL		D/ES		0.10	PID	<1ppm						
15/04/25 No free groundwater observed			Borehole discontinued at 0.30m depth. Limit of investigation.																	
		1																		
		2																		
		3																		
		4																		

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

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

PLANT: Hand Tools
METHOD:
REMARKS: SW 0.15 above sediment.

OPERATOR: Krebs

LOGGED:
CASING: Uncased

BOREHOLE LOG

CLIENT: NSW Department of Planning Housing and Infrastructure
PROJECT: Supplementary Detailed Site Investigation
LOCATION: 17 Denison Street, Gloucester, NSW

SURFACE LEVEL:
COORDINATE:
DATUM/GRID:
DIP/AZIMUTH: 90°/---°

LOCATION ID: SED2
PROJECT No: 228674.02
DATE: 15/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED															SAMPLE			TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS					
observed			Clayey SILT: brown; abundant organic matter; roots; rootlets.					w<PL		D/ES		0.10	PID	<1ppm					
15/04/25 No free groundwater			Borehole discontinued at 0.40m depth. Limit of investigation.																
		1																	
		2																	
		3																	
		4																	

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

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

PLANT: Hand Tools
METHOD:
REMARKS: SW 0.2 above sediment.

OPERATOR: Krebs

LOGGED:
CASING: Uncased

BOREHOLE LOG

CLIENT: NSW Department of Planning Housing and Infrastructure
PROJECT: Supplementary Detailed Site Investigation
LOCATION: 17 Denison Street, Gloucester, NSW

SURFACE LEVEL:
COORDINATE:
DATUM/GRID:
DIP/AZIMUTH: 90°/---°

LOCATION ID: SED3
PROJECT No: 228674.02
DATE: 15/04/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED															SAMPLE			TESTING AND REMARKS		
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS						
observed			Clayey SILT: brown; abundant organic matter; roots; rootlets.					w<PL		D/ES		0.10	PID	<1ppm						
15/04/25 No free groundwater observed			Borehole discontinued at 0.30m depth. Limit of investigation.																	
		1																		
		2																		
		3																		
		4																		

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

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

PLANT: Hand Tools
METHOD:
REMARKS: SW 0.35 above sediment.

OPERATOR: Krebs

LOGGED:
CASING: Uncased

Appendix E

Tabulated Summary Results from Previous DSI and SDSI Reports:

Table D1: Summary of Soil Laboratory Results (Land Use Comparison) (228674.00)

Table D2: Summary of Soil Laboratory Results (Preliminary Waste Classification) (228674.00)

Table D3: Summary of Groundwater Laboratory Results (228674.00)

Table G1: Summary of Soil and Sediment Laboratory Results (Land Use Comparison) (228674.02)

Table G2: Summary of Soil and Sediment Laboratory Results (Preliminary Waste Classification) (228674.02)

Table G3: Summary of Groundwater Laboratory Results (228674.02)

Table G4: Summary of Surface Water Laboratory Results (228674.02)

Table G5: Summary of Sediment Laboratory Results (Sediment Guideline Comparison) (228674.02)

Table D1: Summary of Soil Laboratory Results (Land Use Comparison)

			Metals																Priority PAH				Priority TRH						BTEX			
			Total Arsenic	Beryllium	Boron	Cadmium	Total Chromium	Cobalt	Copper	Lead	Manganese	Mercury (inorganic)	Molybdenum	Nickel	Selenium (Total)	Silver	Zinc	Naphthalene ^a	Benz[a]pyrene (BaP)	Benz[a]pyrene TEQ (BaP 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	
		PQL	4	1	10	0.4	1	1	1	1	1	0.1	1	1	2	1	1	1	0.05	0.5	0.05		25	50	25	50	100	100	0.2	0.5	1	1
Sample ID	Depth	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	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
102	0.1 m	11/06/2024	8 3,000 160	1 500 -	<10 300,000 -	<0.4 900 -	10 3,600 680	6 4,000 -	9 240,000 200	21 1,500 1,800	150 60,000 -	<0.1 730 -	<1 -	6 6,000 95	<2 10,000 -	<1 -	31 400,000 540	<1 NL 370	<0.05 - 1.4 40 -	<0.5 4,000 -	<0.05 -	<25 -	<25 -	<50 170	<25 310 215	<50 NL -	<100 -	<100 2,500 -	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95
102	3 m	11/06/2024	7 3,000 160	<1 500 -	<10 300,000 -	<0.4 900 -	9 3,600 680	6 4,000 -	15 240,000 200	11 1,500 1,800	300 60,000 -	<0.1 730 -	<1 -	7 6,000 95	<2 10,000 -	<1 -	42 400,000 540	<1 NL 370	<0.05 - 1.4 40 -	<0.5 4,000 -	<0.05 -	<25 -	<50 170	<25 NL 215	<50 NL -	<100 -	<100 2,500 -	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	
103	2 m	11/06/2024	6 3,000 160	<1 500 -	<10 300,000 -	<0.4 900 -	14 3,600 680	4 4,000 -	9 240,000 200	8 1,500 1,800	170 60,000 -	<0.1 730 -	2 -	5 6,000 95	<2 10,000 -	<1 -	28 400,000 540	<1 NL 370	<0.05 - 1.4 40 -	<0.5 4,000 -	<0.05 -	<25 -	<50 170	<25 NL 215	<50 NL -	<100 -	<100 2,500 -	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	
D1/SBK	0 m	11/06/2024	5 3,000 160	<1 500 -	<10 300,000 -	<0.4 900 -	8 3,600 680	3 4,000 -	8 240,000 200	7 1,500 1,800	190 60,000 -	<0.1 730 -	<1 -	4 6,000 95	<2 10,000 -	<1 -	24 400,000 540	<1 NL 370	<0.05 - 1.4 40 -	<0.5 4,000 -	<0.05 -	<25 -	<50 170	<25 NL 215	<50 NL -	<100 -	<100 2,500 -	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	
104	2 m	11/06/2024	<4 3,000 160	<1 500 -	<10 300,000 -	<0.4 900 -	6 3,600 680	3 4,000 -	8 240,000 200	6 1,500 1,800	160 60,000 -	<0.1 730 -	<1 -	4 6,000 95	<2 10,000 -	<1 -	21 400,000 540	<1 NL 370	<0.05 - 1.4 40 -	<0.5 4,000 -	<0.05 -	<25 -	<50 170	<25 310 215	<50 NL -	<100 -	<100 2,500 -	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	
104	4 m	11/06/2024	9 3,000 160	<1 500 -	<10 300,000 -	<0.4 900 -	10 3,600 680	3 4,000 -	8 240,000 200	8 1,500 1,800	150 60,000 -	<0.1 730 -	1 -	6 6,000 95	<2 10,000 -	<1 -	30 400,000 540	<1 NL 370	<0.05 - 1.4 40 -	<0.5 4,000 -	<0.05 -	<25 -	<50 170	<25 NL 215	<50 NL -	<100 -	<100 2,500 -	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	
105	1 m	11/06/2024	7 3,000 160	1 500 -	<10 300,000 -	<0.4 900 -	13 3,600 680	12 4,000 -	17 240,000 200	16 1,500 1,800	680 60,000 -	<0.1 730 -	<1 -	10 6,000 95	<2 10,000 -	<1 -	40 400,000 540	<1 NL 370	<0.05 - 1.4 40 -	<0.5 4,000 -	<0.05 -	<25 -	<50 170	<25 NL 215	<50 NL -	<100 -	<100 2,500 -	<0.2 20 95	<0.5 NL 135	<1 NL 185	<1 NL 95	
D3/SBK	0 m	11/06/2024	8 3,000 160	1 500 -	<10 300,000 -	<0.4 900 -	13 3,600 680	12 4,000 -	18 240,000 200	15 1,500 1,800	440 60,000 -	<0.1 730 -	<1 -	10 6,000 95	<2 10,000 -	<1 -	40 400,000 540	<1 NL 370	<0.05 - 1.4 40 -	<0.5 4,000 -	<0.05 -	<25 -	<50 170	<25 480 215	<50 NL -	<100 -	<100 2,500 -	<0.2 6 95	<0.5 NL 135	<1 NL 185	<1 NL 95	
105	3 m	11/06/2024	5 3,000 160	<1 500 -	<10 300,000 -	<0.4 900 -	8 3,600 680	4 4,000 -	7 240,000 200	8 1,500 1,800	240 60,000 -	<0.1 730 -	<1 -	5 6,000 95	<2 10,000 -	<1 -	34 400,000 540	1 NL 370	<0.05 - 1.4 40 -	<0.5 4,000 -	0.4 -	140 -	<50 -	<25 170	<25 310 215	<50 NL -	<100 -	<100 2,500 -	<0.2 4 95	<0.5 NL 135	2 NL 185	12 NL 95
106	0.1 m	11/06/2024	<4 3,000 160	<1 500 -	<10 300,000 -	<0.4 900 -	5 3,600 680	8 4,000 -	27 240,000 200	11 1,500 1,800	650 60,000 -	<0.1 730 -	<1 -	5 6,000 95	<2 10,000 -	<1 -	72 400,000 540	<1 NL 370	<0.05 - 1.4 40 -	<0.5 4,000 -	<0.05 -	<25 -	<50 170	<25 NL 215	<50 NL -	<100 -	<100 2,500 -	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	
107	0.5 m	12/06/2024	6 3,000 160	1 500 -	<10 300,000 -	<0.4 900 -	12 3,600 680	10 4,000 -	16 240,000 200	14 1,500 1,800	280 60,000 -	<0.1 730 -	<1 -	10 6,000 95	<2 10,000 -	<1 -	38 400,000 540	<1 NL 370	<0.05 - 1.4 40 -	<0.5 4,000 -	<0.05 -	<25 -	<50 170	<25 310 215	<50 NL -	<100 -	<100 2,500 -	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	
107	2 m	12/06/2024	6 3,000 160	<1 500 -	<10 300,000 -	<0.4 900 -	11 3,600 680	6 4,000 -	12 240,000 200	7 1,500 1,800	310 60,000 -	<0.1 730 -	<1 -	8 6,000 95	<2 10,000 -	<1 -	34 400,000 540	<1 NL 370	<0.05 - 1.4 40 -	<0.5 4,000 -	<0.05 -	<25 -	<50 170	<25 NL 215	<50 NL -	<100 -	<100 2,500 -	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	
108	0.5 m	12/06/2024	9 3,000 160	1 500 -	<10 300,000 -	<0.4 900 -	12 3,600 680	6 4,000 -	16 240,000 200	18 1,500 1,800	250 60,000 -	<0.1 730 -	<1 -	8 6,000 95	<2 10,000 -	<1 -	35 400,000 540	<1 NL 370	<0.05 - 1.4 40 -	<0.5 4,000 -	<0.05 -	<25 -	<50 170	<25 310 215	<50 NL -	<100 -	<100 2,500 -	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	
109	0.5 m	12/06/2024	14 3,000 160	<1 500 -	<10 300,000 -	<0.4 900 -	10 3,600 680	8 4,000 -	16 240,000 200	37 1,500 1,800	170 60,000 -	<0.1 730 -	<1 -	8 6,000 95	<2 10,000 -	<1 -	64 400,000 540	<1 NL 370	<0.05 - 1.4 40 -	<0.5 4,000 -	<0.05 -	<25 -	<50 170	<25 310 215	<50 NL -	<100 -	<100 2,500 -	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	
110	0.15 m	11/06/2024	6 3,000 160	<1 500 -	<10 300,000 -	<0.4 900 -	8 3,600 680	7 4,000 -	18 240,000 200	22 1,500 1,800	720 60,000 -	<0.1 730 -	<1 -	8 6,000 95	<2 10,000 -	<1 -	59 400,000 540	<1 NL 370	<0.05 - 1.4 40 -	<0.5 4,000 -	6.4 -	<25 -	<50 170	<25 310 215	<50 NL -	<100 -	<100 2,500 -	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	
111	2 m	12/06/2024	4 3,000 160	<1 500 -	<10 300,000 -	<0.4 900 -	10 3,600 680	3 4,000 -	14 240,000 200	11 1,500 1,800	77 60,000 -	<0.1 730 -	<1 -	7 6,000 95	<2 10,000 -	<1 -	44 400,000 540	<1 NL 370	<0.05 - 1.4 40 -	<0.5 4,000 -	<0.05 -	<25 -	<50 170	<25 NL 215	<50 NL -	<100 -	<100 2,500 -	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	
113	0.5 m	12/06/2024	9 3,000 160	1 500 -	<10 300,000 -	<0.4 900 -	11 3,600 680	6 4,000 -	11 240,000 200	19 1,500 1,800	170 60,000 -	<0.1 730 -	<1 -	8 6,000 95	<2 10,000 -	<1 -	34 400,000 540	<1 NL 370	<0.05 - 1.4 40 -	<0.5 4,000 -	<0.05 -	<25 -	<50 170	<25 NL 215	<50 NL -	<100 -	<100 2,500 -	<0.2 4 95	<0.5 NL 135	<1 NL 185	<1 NL 95	
115	0.1 m	12/06/2024	4 3,000 160	<1 500 -	<10 300,000 -	0.6 900 -	21 3,600 680	8 4,000 -	32 240,000 200	250 1,500 1,800	640 60,000 -	<0.1 730 -	1 -	29 6,000 95	<2 10,000 -	<1 -	390 400,000 540	<1 NL 370	<0.05 - 1.4 40 -	<0.5 4,000 -	<0.05 -	<25 -	<50 170	<25 310 215	<50 NL -	<100 -	<					

Table D1: Summary of Soil Laboratory Results (Land Use Comparison)

				Priority OCP											Priority POP		PCB	Priority PFAS						Asbestos (FA/AF)					Asbestos, Other				
				DDT+DDE+DDD c		Alkyl + Chlorine		Total Chlorobenzene		Total Endosulfan		Endrin	Heptachlor	Heptachlorobenzene	Methoxychlor	Mirex		Chlorpyrifos	Total PCB	Total Inactive PFAS	PFDA	PFOS + PFHxS	PFOS	PFHxS	Trace Analysis (FA/AF)	Asbestos D in soil <10g/kg	Asbestos D in soil <10g/kg	Trace Analysis (NDEC)	Total Asbestos	Asbestos D in materials	Asbestos Summary		
				g1	g1	g1	g1	g1	g1	g1	g1	g1	g1	g1	g1	g1		g1	g1	g1	g1	g1	g1	g1	g1	g1	g1	g1	g1	g1	g1	g1	
Sample ID	Depth	Sample Date	PQL	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	g	g	g	g	g	g	g	g	g			
102	0.1 m	11/06/2024		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-			
102	3 m	11/06/2024		3,600	640	45	530	2,000	100	50	80	2,500	100	2,000	7	-	-	50	10	20	20	1	20	-	-	-	-	-	-	-	-		
103	2 m	11/06/2024		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-			
D15BK	0 m	11/06/2024		3,600	640	45	530	2,000	100	50	80	2,500	100	2,000	7	-	-	50	10	20	20	1	20	-	-	-	-	-	-	-	-		
104	2 m	11/06/2024		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-			
104	4 m	11/06/2024		3,600	640	45	530	2,000	100	50	80	2,500	100	2,000	7	-	-	50	10	20	20	1	20	-	-	-	-	-	-	-	-		
105	1 m	11/06/2024		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-			
D15BK	0 m	11/06/2024		3,600	640	45	530	2,000	100	50	80	2,500	100	2,000	7	-	-	50	10	20	20	1	20	-	-	-	-	-	-	-	-		
105	3 m	11/06/2024		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-			
106	0.1 m	11/06/2024		3,600	640	45	530	2,000	100	50	80	2,500	100	2,000	7	-	-	50	10	20	20	1	20	-	-	-	-	-	-	-	-		
107	0.5 m	12/06/2024		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-			
107	2 m	12/06/2024		3,600	640	45	530	2,000	100	50	80	2,500	100	2,000	7	-	-	50	10	20	20	1	20	-	-	-	-	-	-	-	-		
108	0.5 m	12/06/2024		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-			
109	0.5 m	12/06/2024		3,600	640	45	530	2,000	100	50	80	2,500	100	2,000	7	-	-	50	10	20	20	1	20	-	-	-	-	-	-	-	-		
110	0.5 m	11/06/2024		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-			
111	2 m	12/06/2024		3,600	640	45	530	2,000	100	50	80	2,500	100	2,000	7	-	-	50	10	20	20	1	20	-	-	-	-	-	-	-	-		
113	0.5 m	12/06/2024		3,600	640	45	530	2,000	100	50	80	2,500	100	2,000	7	-	-	50	10	20	20	1	20	-	-	-	-	-	-	-	-		
115	0.1 m	12/06/2024		<0.1	0.5	0.8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-			
201	0.2 m	13/06/2024		3,600	640	45	530	2,000	100	50	80	2,500	100	2,000	7	-	-	50	10	20	20	1	20	-	-	-	-	-	-	-	-		
202	0.2 m	13/06/2024		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-			
203	0.2 m	13/06/2024		3,600	640	45	530	2,000	100	50	80	2,500	100	2,000	7	-	-	50	10	20	20	1	20	-	-	-	-	-	-	-	-		
204	0.2 m	13/06/2024		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-			
205	0.2 m	13/06/2024		3,600	640	45	530	2,000	100	50	80	2,500	100	2,000	7	-	-	50	10	20	20	1	20	-	-	-	-	-	-	-	-		
206	0.1 m	13/06/2024		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-			
207	0.2 m	13/06/2024		3,600	640	45	530	2,000	100	50	80	2,500	100	2,000	7	-	-	50	10	20	20	1	20	-	-	-	-	-	-	-	-		
208	0.2 m	13/06/2024		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-			
209	0.3 m	13/06/2024		3,600	640	45	530	2,000	100	50	80	2,500	100	2,000	7	-	-	50	10	20	20	1	20	-	-	-	-	-	-	-	-		
210	0.2 m	13/06/2024		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-			
211	0.1 m	13/06/2024		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-			
212	0.2 m	13/06/2024		3,600	640	45	530	2,000	100	50	80	2,500	100	2,000	7	-	-	50	10	20	20	1	20	-	-	-	-	-	-	-	-		
213	0.01 m	13/06/2024		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-			
213	0.01 m	13/06/2024		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-			
PD2BK	0 m	18/04/2024		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-			

Lab result
HIL/HSI value EIL/ESI/ECOV value

HIL/HSI exceedance EIL/ESI/ECOV exceedance HIL/HSI and EIL/ESI/ECOV exceedance ML exceedance ML and HIL/HSI or EIL/ESI/ECOV exceedance

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

Bold = Lab detections - = Not tested or No HIL/HSI/EIL/ESI (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 ESI = Ecological screening level ECOV = 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 BTEXH 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 Commercial/Industrial D
Refer to the SAC section of report for information of SAC sources and rationale. Summary information as follows:
HIL HIL-D (NEPC, 2013 or HEPA 2020 (PFAS only))
HSL (vapour intrusion) HSL-D (NEPC, 2013)
DC Direct contact HSL-D Commercial/Industrial (CRC CARE, 2011)
ECV ECV, all land uses, direct exposure (HEPA, 2020)
ESI Commercial and industrial (NEPC, 2013)
ML Commercial and industrial (NEPC, 2013)
ECV-indr ECV, all land uses, indirect exposure, intensively developed sites (HEPA, 2020)

[illegible]

Site Assessment Criteria (SAC)				
SAC listed are generic (and use thresholds for Commercial/Industrial) but differ to the SAC version of request for information (SAC resources available). Summary information as follows				
MSL	MSL 01 (PAPIC 2010) or HEPB, 2010 (PAPIC 2010)	RCV	RCV 01 (all land uses, direct exposure) (HEPB, 2010)	
MSL (surface exposure)	MSL 02 (PAPIC 2010)	RCV	RCV 02 (surface and indirect) (PAPIC 2010)	
DIC	Direct contact MSL (Commercial/Industrial) (ERC 2006, 2011)	RCV	RCV 03 (all land uses, indirect exposure, indirectly absorbed via DHPA)	

- = Not tested, no criteria or not applicable NAD = no asbestos detected

a	QA/QC replicate of sample listed directly below the primary sample
b	Total chromium used as initial screen for chromium(VI)
c	Total recoverable hydrocarbons (TRH) used as an initial screen for total petroleum hydrocarbons (TPH)
d	Criteria for scheduled chemicals used as an initial screen
e	Criteria for Chlorpyrifos used as initial screen
f	NSW EPA, 2014, Waste Classification Guidelines Part 1: Classifying Waste
PQL	Practical quantitation limit
CT1	Maximum values of specific contaminant concentration (SCC) for classification without TCLP: General solid waste
SCC1	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste
TCLP1	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste
CT2	Maximum values of specific contaminant concentration (SCC) for classification without TCLP: Restricted solid waste
SCC2	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste
TCLP2	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste

Table D3: Summary of Groundwater Laboratory Results					Location Code		101	102	103	104	105	106	106	MW1	MW2
					Field ID	101	102	103	104	105	106	D1/GW	MW1	MW2	
					Date	19 Jun 2024	19 Jun 2024	19 Jun 2024	19 Jun 2024	19 Jun 2024	19 Jun 2024	19 Jun 2024	19 Jun 2024	19 Jun 2024	19 Jun 2024
Analyses	Unit	PQL	ANZG (2018) Freshwater Slightly to Moderately Disturbed Systems DGVs	PFAS NEMP 2020 Freshwater 99%	NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Clay 2 m to <4 m										
Metals															
Aluminium (Filtered)	mg/L	0.01	0.055			0.02	0.03	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01
Arsenic (Filtered)	mg/L	0.001	0.013 ^{#1}			<0.001	<0.001	<0.001	0.016	0.009	0.011	0.01	0.028	<0.001	<0.001
Beryllium (Filtered)	mg/L	0.0005				<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron (Filtered)	mg/L	0.02	0.94			0.03	0.03	0.03	0.03	0.02	<0.02	<0.02	0.03	0.02	0.02
Cadmium (Filtered)	mg/L	0.0001	0.0002			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (III+VI) (Filtered)	mg/L	0.001	0.001 ^{#2}			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt (Filtered)	mg/L	0.001	0.0014			<0.001	0.001	<0.001	0.001	0.001	0.001	0.001	0.002	<0.001	<0.001
Copper (Filtered)	mg/L	0.001	0.0014			0.007	0.004	0.002	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.002
Lead (Filtered)	mg/L	0.001	0.0034			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001
Manganese (Filtered)	mg/L	0.005	1.9			0.16	0.15	0.28	1.9	1.3	0.71	0.73	7.5	0.29	0.29
Mercury (Filtered)	mg/L	0.00005	0.00006			<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00006	<0.00005	<0.00005
Molybdenum (Filtered)	mg/L	0.001	0.034			<0.001	<0.001	<0.001	0.002	0.001	0.001	0.001	0.002	<0.001	<0.001
Nickel (Filtered)	mg/L	0.001	0.011			0.009	0.008	0.003	0.001	0.003	0.002	0.002	0.002	0.003	0.003
Selenium (Filtered)	mg/L	0.001	0.005			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Silver (Filtered)	mg/L	0.001	0.00005			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc (Filtered)	mg/L	0.001	0.008			0.12	0.24	0.039	0.031	0.056	0.039	0.039	0.028	0.018	0.018
TRH															
C6-C10 Fraction (F1)	mg/L	0.01				<0.01	<0.01	<0.01	0.33	2.8	<0.01	<0.01	79	<0.01	<0.01
C6-C10 (F1 minus BTEX)	mg/L	0.01			#4	<0.01	<0.01	<0.01	0.3	2.2	<0.01	<0.01	33	<0.01	<0.01
>C10-C16 Fraction (F2)	mg/L	0.05				<0.05	<0.05	<0.05	0.086	0.66	<0.05	<0.05	4.4	<0.05	<0.05
>C10-C16 Fraction (F2 minus Naphthalene)	mg/L	0.05			#4	<0.05	<0.05	<0.05	0.086	0.62	<0.05	<0.05	4	<0.05	<0.05
>C16-C34 Fraction (F3)	mg/L	0.1				<0.1	<0.1	<0.1	0.14	<0.1	<0.1	<0.1	0.15	<0.1	<0.1
>C34-C40 Fraction (F4)	mg/L	0.1				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>C10-C40 Fraction (Sum)	mg/L	0.05				<0.05	<0.05	<0.05	0.22	0.66	<0.05	<0.05	4.5	<0.05	<0.05
C6-C9 Fraction	mg/L	0.01				<0.01	<0.01	<0.01	0.31	1.9	<0.01	<0.01	63	<0.01	<0.01
C10-C14 Fraction	mg/L	0.05				<0.05	<0.05	<0.05	0.086	1.1	<0.05	<0.05	9.3	<0.05	<0.05
C15-C18 Fraction	mg/L	0.1				<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.29	<0.1	<0.1
C29-C36 Fraction	mg/L	0.1				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C10-C36 Fraction (Sum)	mg/L	0.05				<0.05	<0.05	<0.05	0.19	1.1	<0.05	<0.05	9.6	<0.05	<0.05
TPH															
C10-C14 Fraction (SG)	mg/L	0.05							0.06	0.89			5.9		
C15-C28 Fraction (SG)	mg/L	0.1							<0.1	<0.1			0.22		
C29-C36 Fraction (SG)	mg/L	0.1							<0.1	<0.1			0.1		
>C10-C16 Fraction (SG)	mg/L	0.05							0.07	0.55			2.8		
>C16-C34 Fraction (SG)	mg/L	0.1							<0.1	<0.1			<0.1		
>C34-C40 Fraction (SG)	mg/L	0.1							<0.1	<0.1			<0.1		
BTEX															
Naphthalene (VOC)	mg/L	0.001	0.016			<0.001	<0.001	<0.001	<0.001	0.038	<0.001	<0.001	0.42	<0.001	<0.001
Benzene	mg/L	0.0001	0.35		#3	<0.0001	<0.0001	<0.0001	0.033	0.047	<0.0001	<0.0001	20	<0.0001	<0.0001
Toluene	mg/L	0.0001	0.18			<0.0001	<0.0001	<0.0001	0.0006	0.02	<0.0001	<0.0001	9.1	<0.0001	<0.0001
Ethylbenzene	mg/L	0.0001	0.08			<0.0001	<0.0001	<0.0001	0.0006	0.14	<0.0001	<0.0001	3.3	<0.0001	<0.0001
Xylene (m & p)	mg/L	0.0002	0.075 ^{#1}			<0.0002	<0.0002	<0.0002	0.0014	0.34	<0.0002	<0.0002	11	0.00021	0.00021
Xylene (o)	mg/L	0.0001	0.35			<0.0001	<0.0001	<0.0001	0.0002	0.065	<0.0001	<0.0001	2.4	<0.0001	<0.0001
PAH															
Benzo(b+j+k)fluoranthene	mg/L	0.0002				<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Acenaphthene	mg/L	0.0001				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Acenaphthylene	mg/L	0.0001				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Anthracene	mg/L	0.0001	0.00001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Benzo(a)anthracene	mg/L	0.0001				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Benzo(a) pyrene	mg/L	0.0001	0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Benzo(g,h,i)perylene	mg/L	0.0001				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chrysene	mg/L	0.0001				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dibenz(a,h)anthracene	mg/L	0.0001				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Fluoranthene	mg/L	0.0001	0.001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Fluorene	mg/L	0.0001				<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	0.0004	<0.0001	<0.0001
Indeno(1,2,3-c,d)pyrene	mg/L	0.0001				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Naphthalene	mg/L	0.0001	0.016			<0.0001	<0.0001	<0.0001	<0.0001	0.018	<0.0001	<0.0001	0.25	<0.0001	<0.0001
Phenanthrene	mg/L	0.0001	0.0006			<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	0.0003	<0.0001	<0.0001
Pyrene	mg/L	0.0001				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Benzo(a)pyrene TEQ	mg/L	0.0005				<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
PAHs (Sum of positives)	mg/L	0.0001				<0.0001	<0.0001	<0.0001	0.00022	0.018	<0.0001	<0.0001	0.25	<0.0001	<0.0001
VOCs															
1,1,1,2-tetrachloroethane	µg/L	0.1				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<5	<0.1	<0.1
1,1,1-trichloroethane	µg/L	0.1	270			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<5		



Table G1: Summary of Soil and Sediment Laboratory Results (Land Use Comparison)

				Metals																Priority PAH				Priority TBH										BTEX																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
				Total Arsenic	Barium	Boron	Cadmium	Total Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury (inorganic)	Molybdenum	Nickel	Selenium Total	Silver	Zinc	Naphthalene ^a	Benzo(a)pyrene (BaP)	Benzo(a)anthracene (BzA)	Total PAH	Bis(4-Cl-2,6-Cl2)D	Bis(4-Cl-2,6-Cl2)B	Bis(4-Cl-2,6-Cl2)C	Bis(4-Cl-2,6-Cl2)D	Bis(4-Cl-2,6-Cl2)E	Bis(4-Cl-2,6-Cl2)F	Bis(4-Cl-2,6-Cl2)G	Bis(4-Cl-2,6-Cl2)H	Bis(4-Cl-2,6-Cl2)I	Bis(4-Cl-2,6-Cl2)J	Bis(4-Cl-2,6-Cl2)K	Bis(4-Cl-2,6-Cl2)L	Bis(4-Cl-2,6-Cl2)M	Bis(4-Cl-2,6-Cl2)N	Bis(4-Cl-2,6-Cl2)O	Bis(4-Cl-2,6-Cl2)P	Bis(4-Cl-2,6-Cl2)Q	Bis(4-Cl-2,6-Cl2)R	Bis(4-Cl-2,6-Cl2)S	Bis(4-Cl-2,6-Cl2)T	Bis(4-Cl-2,6-Cl2)U	Bis(4-Cl-2,6-Cl2)V	Bis(4-Cl-2,6-Cl2)W	Bis(4-Cl-2,6-Cl2)X	Bis(4-Cl-2,6-Cl2)Y	Bis(4-Cl-2,6-Cl2)Z	Bis(4-Cl-2,6-Cl2)AA	Bis(4-Cl-2,6-Cl2)AB	Bis(4-Cl-2,6-Cl2)AC	Bis(4-Cl-2,6-Cl2)AD	Bis(4-Cl-2,6-Cl2)AE	Bis(4-Cl-2,6-Cl2)AF	Bis(4-Cl-2,6-Cl2)AG	Bis(4-Cl-2,6-Cl2)AH	Bis(4-Cl-2,6-Cl2)AI	Bis(4-Cl-2,6-Cl2)AJ	Bis(4-Cl-2,6-Cl2)AK	Bis(4-Cl-2,6-Cl2)AL	Bis(4-Cl-2,6-Cl2)AM	Bis(4-Cl-2,6-Cl2)AN	Bis(4-Cl-2,6-Cl2)AO	Bis(4-Cl-2,6-Cl2)AP	Bis(4-Cl-2,6-Cl2)AQ	Bis(4-Cl-2,6-Cl2)AR	Bis(4-Cl-2,6-Cl2)AS	Bis(4-Cl-2,6-Cl2)AT	Bis(4-Cl-2,6-Cl2)AU	Bis(4-Cl-2,6-Cl2)AV	Bis(4-Cl-2,6-Cl2)AW	Bis(4-Cl-2,6-Cl2)AX	Bis(4-Cl-2,6-Cl2)AY	Bis(4-Cl-2,6-Cl2)AZ	Bis(4-Cl-2,6-Cl2)BA	Bis(4-Cl-2,6-Cl2)BB	Bis(4-Cl-2,6-Cl2)BC	Bis(4-Cl-2,6-Cl2)BD	Bis(4-Cl-2,6-Cl2)BE	Bis(4-Cl-2,6-Cl2)BF	Bis(4-Cl-2,6-Cl2)BG	Bis(4-Cl-2,6-Cl2)BH	Bis(4-Cl-2,6-Cl2)BI	Bis(4-Cl-2,6-Cl2)BJ	Bis(4-Cl-2,6-Cl2)BK	Bis(4-Cl-2,6-Cl2)BL	Bis(4-Cl-2,6-Cl2)BM	Bis(4-Cl-2,6-Cl2)BN	Bis(4-Cl-2,6-Cl2)BO	Bis(4-Cl-2,6-Cl2)BP	Bis(4-Cl-2,6-Cl2)BQ	Bis(4-Cl-2,6-Cl2)BR	Bis(4-Cl-2,6-Cl2)BS	Bis(4-Cl-2,6-Cl2)BT	Bis(4-Cl-2,6-Cl2)BU	Bis(4-Cl-2,6-Cl2)BV	Bis(4-Cl-2,6-Cl2)BW	Bis(4-Cl-2,6-Cl2)BX	Bis(4-Cl-2,6-Cl2)BY	Bis(4-Cl-2,6-Cl2)BZ	Bis(4-Cl-2,6-Cl2)CA	Bis(4-Cl-2,6-Cl2)CB	Bis(4-Cl-2,6-Cl2)CC	Bis(4-Cl-2,6-Cl2)CD	Bis(4-Cl-2,6-Cl2)CE	Bis(4-Cl-2,6-Cl2)CF	Bis(4-Cl-2,6-Cl2)CG	Bis(4-Cl-2,6-Cl2)CH	Bis(4-Cl-2,6-Cl2)CI	Bis(4-Cl-2,6-Cl2)CJ	Bis(4-Cl-2,6-Cl2)CK	Bis(4-Cl-2,6-Cl2)CL	Bis(4-Cl-2,6-Cl2)CM	Bis(4-Cl-2,6-Cl2)CN	Bis(4-Cl-2,6-Cl2)CO	Bis(4-Cl-2,6-Cl2)CP	Bis(4-Cl-2,6-Cl2)CQ	Bis(4-Cl-2,6-Cl2)CR	Bis(4-Cl-2,6-Cl2)CS	Bis(4-Cl-2,6-Cl2)CT	Bis(4-Cl-2,6-Cl2)CU	Bis(4-Cl-2,6-Cl2)CV	Bis(4-Cl-2,6-Cl2)CW	Bis(4-Cl-2,6-Cl2)CX	Bis(4-Cl-2,6-Cl2)CY	Bis(4-Cl-2,6-Cl2)CZ	Bis(4-Cl-2,6-Cl2)DA	Bis(4-Cl-2,6-Cl2)DB	Bis(4-Cl-2,6-Cl2)DC	Bis(4-Cl-2,6-Cl2)DD	Bis(4-Cl-2,6-Cl2)DE	Bis(4-Cl-2,6-Cl2)DF	Bis(4-Cl-2,6-Cl2)DG	Bis(4-Cl-2,6-Cl2)DH	Bis(4-Cl-2,6-Cl2)DI	Bis(4-Cl-2,6-Cl2)DJ	Bis(4-Cl-2,6-Cl2)DK	Bis(4-Cl-2,6-Cl2)DL	Bis(4-Cl-2,6-Cl2)DM	Bis(4-Cl-2,6-Cl2)DN	Bis(4-Cl-2,6-Cl2)DO	Bis(4-Cl-2,6-Cl2)DP	Bis(4-Cl-2,6-Cl2)DQ	Bis(4-Cl-2,6-Cl2)DR	Bis(4-Cl-2,6-Cl2)DS	Bis(4-Cl-2,6-Cl2)DT	Bis(4-Cl-2,6-Cl2)DU	Bis(4-Cl-2,6-Cl2)DV	Bis(4-Cl-2,6-Cl2)DW	Bis(4-Cl-2,6-Cl2)DX	Bis(4-Cl-2,6-Cl2)DY	Bis(4-Cl-2,6-Cl2)DZ	Bis(4-Cl-2,6-Cl2)EA	Bis(4-Cl-2,6-Cl2)EB	Bis(4-Cl-2,6-Cl2)EC	Bis(4-Cl-2,6-Cl2)ED	Bis(4-Cl-2,6-Cl2)EE	Bis(4-Cl-2,6-Cl2)EF	Bis(4-Cl-2,6-Cl2)EG	Bis(4-Cl-2,6-Cl2)EH	Bis(4-Cl-2,6-Cl2)EI	Bis(4-Cl-2,6-Cl2)EJ	Bis(4-Cl-2,6-Cl2)EK	Bis(4-Cl-2,6-Cl2)EL	Bis(4-Cl-2,6-Cl2)EM	Bis(4-Cl-2,6-Cl2)EN	Bis(4-Cl-2,6-Cl2)EO	Bis(4-Cl-2,6-Cl2)EP	Bis(4-Cl-2,6-Cl2)EQ	Bis(4-Cl-2,6-Cl2)ER	Bis(4-Cl-2,6-Cl2)ES	Bis(4-Cl-2,6-Cl2)ET	Bis(4-Cl-2,6-Cl2)EU	Bis(4-Cl-2,6-Cl2)EV	Bis(4-Cl-2,6-Cl2)EW	Bis(4-Cl-2,6-Cl2)EX	Bis(4-Cl-2,6-Cl2)EY	Bis(4-Cl-2,6-Cl2)EZ	Bis(4-Cl-2,6-Cl2)FA	Bis(4-Cl-2,6-Cl2)FB	Bis(4-Cl-2,6-Cl2)FC	Bis(4-Cl-2,6-Cl2)FD	Bis(4-Cl-2,6-Cl2)FE	Bis(4-Cl-2,6-Cl2)FF	Bis(4-Cl-2,6-Cl2)FG	Bis(4-Cl-2,6-Cl2)FH	Bis(4-Cl-2,6-Cl2)FI	Bis(4-Cl-2,6-Cl2)FJ	Bis(4-Cl-2,6-Cl2)FK	Bis(4-Cl-2,6-Cl2)FL	Bis(4-Cl-2,6-Cl2)FM	Bis(4-Cl-2,6-Cl2)FN	Bis(4-Cl-2,6-Cl2)FO	Bis(4-Cl-2,6-Cl2)FP	Bis(4-Cl-2,6-Cl2)FQ	Bis(4-Cl-2,6-Cl2)FR	Bis(4-Cl-2,6-Cl2)FS	Bis(4-Cl-2,6-Cl2)FT	Bis(4-Cl-2,6-Cl2)FU	Bis(4-Cl-2,6-Cl2)FV	Bis(4-Cl-2,6-Cl2)FW	Bis(4-Cl-2,6-Cl2)FX	Bis(4-Cl-2,6-Cl2)FY	Bis(4-Cl-2,6-Cl2)FZ	Bis(4-Cl-2,6-Cl2)GA	Bis(4-Cl-2,6-Cl2)GB	Bis(4-Cl-2,6-Cl2)GC	Bis(4-Cl-2,6-Cl2)GD	Bis(4-Cl-2,6-Cl2)GE	Bis(4-Cl-2,6-Cl2)GF	Bis(4-Cl-2,6-Cl2)GG	Bis(4-Cl-2,6-Cl2)GH	Bis(4-Cl-2,6-Cl2)GI	Bis(4-Cl-2,6-Cl2)GJ	Bis(4-Cl-2,6-Cl2)GK	Bis(4-Cl-2,6-Cl2)GL	Bis(4-Cl-2,6-Cl2)GM	Bis(4-Cl-2,6-Cl2)GN	Bis(4-Cl-2,6-Cl2)GO	Bis(4-Cl-2,6-Cl2)GP	Bis(4-Cl-2,6-Cl2)GQ	Bis(4-Cl-2,6-Cl2)GR	Bis(4-Cl-2,6-Cl2)GS	Bis(4-Cl-2,6-Cl2)GT	Bis(4-Cl-2,6-Cl2)GU	Bis(4-Cl-2,6-Cl2)GV	Bis(4-Cl-2,6-Cl2)GW	Bis(4-Cl-2,6-Cl2)GX	Bis(4-Cl-2,6-Cl2)GY	Bis(4-Cl-2,6-Cl2)GZ	Bis(4-Cl-2,6-Cl2)HA	Bis(4-Cl-2,6-Cl2)HB	Bis(4-Cl-2,6-Cl2)HC	Bis(4-Cl-2,6-Cl2)HD	Bis(4-Cl-2,6-Cl2)HE	Bis(4-Cl-2,6-Cl2)HF	Bis(4-Cl-2,6-Cl2)HG	Bis(4-Cl-2,6-Cl2)HH	Bis(4-Cl-2,6-Cl2)HI	Bis(4-Cl-2,6-Cl2)HJ	Bis(4-Cl-2,6-Cl2)HK	Bis(4-Cl-2,6-Cl2)HL	Bis(4-Cl-2,6-Cl2)HM	Bis(4-Cl-2,6-Cl2)HN	Bis(4-Cl-2,6-Cl2)HO	Bis(4-Cl-2,6-Cl2)HP	Bis(4-Cl-2,6-Cl2)HQ	Bis(4-Cl-2,6-Cl2)HR	Bis(4-Cl-2,6-Cl2)HS	Bis(4-Cl-2,6-Cl2)HT	Bis(4-Cl-2,6-Cl2)HU	Bis(4-Cl-2,6-Cl2)HV	Bis(4-Cl-2,6-Cl2)HW	Bis(4-Cl-2,6-Cl2)HX	Bis(4-Cl-2,6-Cl2)HY	Bis(4-Cl-2,6-Cl2)HZ	Bis(4-Cl-2,6-Cl2)IA	Bis(4-Cl-2,6-Cl2)IB	Bis(4-Cl-2,6-Cl2)IC	Bis(4-Cl-2,6-Cl2>ID	Bis(4-Cl-2,6-Cl2)IE	Bis(4-Cl-2,6-Cl2)IF	Bis(4-Cl-2,6-Cl2)IG	Bis(4-Cl-2,6-Cl2)IH	Bis(4-Cl-2,6-Cl2)II	Bis(4-Cl-2,6-Cl2>IJ	Bis(4-Cl-2,6-Cl2)IK	Bis(4-Cl-2,6-Cl2)IL	Bis(4-Cl-2,6-Cl2)IM	Bis(4-Cl-2,6-Cl2)IN	Bis(4-Cl-2,6-Cl2)IO	Bis(4-Cl-2,6-Cl2)IP	Bis(4-Cl-2,6-Cl2)IQ	Bis(4-Cl-2,6-Cl2)IR	Bis(4-Cl-2,6-Cl2)IS	Bis(4-Cl-2,6-Cl2)IT	Bis(4-Cl-2,6-Cl2)IU	Bis(4-Cl-2,6-Cl2)IV	Bis(4-Cl-2,6-Cl2)IW	Bis(4-Cl-2,6-Cl2)IX	Bis(4-Cl-2,6-Cl2)IY	Bis(4-Cl-2,6-Cl2)IZ	Bis(4-Cl-2,6-Cl2)JA	Bis(4-Cl-2,6-Cl2)JB	Bis(4-Cl-2,6-Cl2)JC	Bis(4-Cl-2,6-Cl2)JD	Bis(4-Cl-2,6-Cl2)JE	Bis(4-Cl-2,6-Cl2)JF	Bis(4-Cl-2,6-Cl2)JG	Bis(4-Cl-2,6-Cl2)JH	Bis(4-Cl-2,6-Cl2)JI	Bis(4-Cl-2,6-Cl2)JJ	Bis(4-Cl-2,6-Cl2)JK	Bis(4-Cl-2,6-Cl2)JL	Bis(4-Cl-2,6-Cl2)JM	Bis(4-Cl-2,6-Cl2)JN	Bis(4-Cl-2,6-Cl2)JO	Bis(4-Cl-2,6-Cl2)JP	Bis(4-Cl-2,6-Cl2)JQ	Bis(4-Cl-2,6-Cl2)JR	Bis(4-Cl-2,6-Cl2)JS	Bis(4-Cl-2,6-Cl2)JT	Bis(4-Cl-2,6-Cl2)JU	Bis(4-Cl-2,6-Cl2)JV	Bis(4-Cl-2,6-Cl2)JW	Bis(4-Cl-2,6-Cl2)JX	Bis(4-Cl-2,6-Cl2)JY	Bis(4-Cl-2,6-Cl2)JZ	Bis(4-Cl-2,6-Cl2)KA	Bis(4-Cl-2,6-Cl2)KB	Bis(4-Cl-2,6-Cl2)KC	Bis(4-Cl-2,6-Cl2)KD	Bis(4-Cl-2,6-Cl2)KE	Bis(4-Cl-2,6-Cl2)KF	Bis(4-Cl-2,6-Cl2)KG	Bis(4-Cl-2,6-Cl2)KH	Bis(4-Cl-2,6-Cl2)KI	Bis(4-Cl-2,6-Cl2)KJ	Bis(4-Cl-2,6-Cl2)KL	Bis(4-Cl-2,6-Cl2)KM	Bis(4-Cl-2,6-Cl2)KN	Bis(4-Cl-2,6-Cl2)KO	Bis(4-Cl-2,6-Cl2)KP	Bis(4-Cl-2,6-Cl2)KQ	Bis(4-Cl-2,6-Cl2)KR	Bis(4-Cl-2,6-Cl2)KS	Bis(4-Cl-2,6-Cl2)KT	Bis(4-Cl-2,6-Cl2)KU	Bis(4-Cl-2,6-Cl2)KV	Bis(4-Cl-2,6-Cl2)KW	Bis(4-Cl-2,6-Cl2)KX	Bis(4-Cl-2,6-Cl2)KY	Bis(4-Cl-2,6-Cl2)KZ	Bis(4-Cl-2,6-Cl2)LA	Bis(4-Cl-2,6-Cl2)LB	Bis(4-Cl-2,6-Cl2)LC	Bis(4-Cl-2,6-Cl2)LD	Bis(4-Cl-2,6-Cl2)LE	Bis(4-Cl-2,6-Cl2)LF	Bis(4-Cl-2,6-Cl2)LG	Bis(4-Cl-2,6-Cl2)LH	Bis(4-Cl-2,6-Cl2)LI	Bis(4-Cl-2,6-Cl2)LJ	Bis(4-Cl-2,6-Cl2)LK	Bis(4-Cl-2,6-Cl2)LL	Bis(4-Cl-2,6-Cl2)LM	Bis(4-Cl-2,6-Cl2)LN	Bis(4-Cl-2,6-Cl2)LO	Bis(4-Cl-2,6-Cl2)LP	Bis(4-Cl-2,6-Cl2)LQ	Bis(4-Cl-2,6-Cl2)LR	Bis(4-Cl-2,6-Cl2)LS	Bis(4-Cl-2,6-Cl2)LT	Bis(4-Cl-2,6-Cl2)LU	Bis(4-Cl-2,6-Cl2)LV	Bis(4-Cl-2,6-Cl2)LW	Bis(4-Cl-2,6-Cl2)LX	Bis(4-Cl-2,6-Cl2)LY	Bis(4-Cl-2,6-Cl2)LZ	Bis(4-Cl-2,6-Cl2)MA	Bis(4-Cl-2,6-Cl2)MB	Bis(4-Cl-2,6-Cl2)MC	Bis(4-Cl-2,6-Cl2)MD	Bis(4-Cl-2,6-Cl2)ME	Bis(4-Cl-2,6-Cl2)MF	Bis(4-Cl-2,6-Cl2)MG	Bis(4-Cl-2,6-Cl2)MH	Bis(4-Cl-2,6-Cl2)MI	Bis(4-Cl-2,6-Cl2)MJ	Bis(4-Cl-2,6-Cl2)MK	Bis(4-Cl-2,6-Cl2)ML	Bis(4-Cl-2,6-Cl2)MM	Bis(4-Cl-2,6-Cl2)MN	Bis(4-Cl-2,6-Cl2)MO	Bis(4-Cl-2,6-Cl2)MP	Bis(4-Cl-2,6-Cl2)MQ	Bis(4-Cl-2,6-Cl2)MR	Bis(4-Cl-2,6-Cl2)MS	Bis(4-Cl-2,6-Cl2)MT	Bis(4-Cl-2,6-Cl2)MU	Bis(4-Cl-2,6-Cl2)MV	Bis(4-Cl-2,6-Cl2)MW	Bis(4-Cl-2,6-Cl2)MX	Bis(4-Cl-2,6-Cl2)MY	Bis(4-Cl-2,6-Cl2)MZ	Bis(4-Cl-2,6-Cl2)NA	Bis(4-Cl-2,6-Cl2)NB	Bis(4-Cl-2,6-Cl2)NC	Bis(4-Cl-2,6-Cl2)ND	Bis(4-Cl-2,6-Cl2)NE	Bis(4-Cl-2,6-Cl2)NF	Bis(4-Cl-2,6-Cl2)NG	Bis(4-Cl-2,6-Cl2)NH	Bis(4-Cl-2,6-Cl2)NI	Bis(4-Cl-2,6-Cl2)NJ	Bis(4-Cl-2,6-Cl2)NK	Bis(4-Cl-2,6-Cl2)NL	Bis(4-Cl-2,6-Cl2)NM	Bis(4-Cl-2,6-Cl2)NN	Bis(4-Cl-2,6-Cl2)NO	Bis(4-Cl-2,6-Cl2)NP	Bis(4-Cl-2,6-Cl2)NQ	Bis(4-Cl-2,6-Cl2)NR	Bis(4-Cl-2,6-Cl2)NS	Bis(4-Cl-2,6-Cl2)NT	Bis(4-Cl-2,6-Cl2)NU	Bis(4-Cl-2,6-Cl2)NV	Bis(4-Cl-2,6-Cl2)NW	Bis(4-Cl-2,6-Cl2)NX	Bis(4-Cl-2,6-Cl2)NY	Bis(4-Cl-2,6-Cl2)NZ	Bis(4-Cl-2,6-Cl2)OA	Bis(4-Cl-2,6-Cl2)OB	Bis(4-Cl-2,6-Cl2)OC	Bis(4-Cl-2,6-Cl2)OD	Bis(4-Cl-2,6-Cl2)OE	Bis(4-Cl-2,6-Cl2)OF	Bis(4-Cl-2,6-Cl2)OG	Bis(4-Cl-2,6-Cl2)OH	Bis(4-Cl-2,6-Cl2)OI	Bis(4-Cl-2,6-Cl2)OJ	Bis(4-Cl-2,6-Cl2)OK	Bis(4-Cl-2,6-Cl2)OL	Bis(4-Cl-2,6-Cl2)OM	Bis(4-Cl-2,6-Cl2)ON	Bis(4-Cl-2,6-Cl2)OO	Bis(4-Cl-2,6-Cl2)OP	Bis(4-Cl-2,6-Cl2)OQ	Bis(4-Cl-2,6-Cl2)OR	Bis(4-Cl-2,6-Cl2)OS	Bis(4-Cl-2,6-Cl2)OT	Bis(4-Cl-2,6-Cl2)OU	Bis(4-Cl-2,6-Cl2)OV	Bis(4-Cl-2,6-Cl2)OW	Bis(4-Cl-2,6-Cl2)OX	Bis(4-Cl-2,6-Cl2)OY	Bis(4-Cl-2,6-Cl2)OZ	Bis(4-Cl-2,6-Cl2)PA	Bis(4-Cl-2,6-Cl2)PB	Bis(4-Cl-2,6-Cl2)PC	Bis(4-Cl-2,6-Cl2)PD	Bis(4-Cl-2,6-Cl2)PE	Bis(4-Cl-2,6-Cl2)PF	Bis(4-Cl-2,6-Cl2)PG	Bis(4-Cl-2,6-Cl2)PH	Bis(4-Cl-2,6-Cl2)PI	Bis(4-Cl-2,6-Cl2)PJ	Bis(4-Cl-2,6-Cl2)PK	Bis(4-Cl-2,6-Cl2)PL	Bis(4-Cl-2,6-Cl2)PM	Bis(4-Cl-2,6-Cl2)PN	Bis(4-Cl-2,6-Cl2)PO	Bis(4-Cl-2,6-Cl2)PP	Bis(4-Cl-2,6-Cl2)PQ	Bis(4-Cl-2,6-Cl2)PR	Bis(4-Cl-2,6-Cl2)PS	Bis(4-Cl-2,6-Cl2)PT	Bis(4-Cl-2,6-Cl2)PU	Bis(4-Cl-2,6-Cl2)PV	Bis(4-Cl-2,6-Cl2)PW	Bis(4-Cl-2,6-Cl2)PX	Bis(4-Cl-2,6-Cl2)PY	Bis(4-Cl-2,6-Cl2)PZ	Bis(4-Cl-2,6-Cl2)QA	Bis(4-Cl-2,6-Cl2)QB	Bis(4-Cl-2,6-Cl2)QC	Bis(4-Cl-2,6-Cl2)QD	Bis(4-Cl-2,6-Cl2)QE	Bis(4-Cl-2,6-Cl2)QF	Bis(4-Cl-2,6-Cl2)QG	Bis(4-Cl-2,6-Cl2)QH	Bis(4-Cl-2,6-Cl2)QI	Bis(4-Cl-2,6-Cl2)QJ	Bis(4-Cl-2,6-Cl2)QK	Bis(4-Cl-2,6-Cl2)QL	Bis(4-Cl-2,6-Cl2)QM	Bis(4-Cl-2,6-Cl2)QN	Bis(4-Cl-2,6-Cl2)QO	Bis(4-Cl-2,6-Cl2)QP	Bis(4-Cl-2,6-Cl2)QQ	Bis(4-Cl-2,6-Cl2)QR	Bis(4-Cl-2,6-Cl2)QS	Bis(4-Cl-2,6-Cl2)QT	Bis(4-Cl-2,6-Cl2)QU	Bis(4-Cl-2,6-Cl2)QV	Bis(4-Cl-2,6-Cl2)QW	Bis(4-Cl-2,6-Cl2)QX	Bis(4-Cl-2,6-Cl2)QY	Bis(4-Cl-2,6-Cl2)QZ	Bis(4-Cl-2,6-Cl2)RA	Bis(4-Cl-2,6-Cl2)RB	Bis(4-Cl-2,6-Cl2)RC	Bis(4-Cl-2,6-Cl2)RD	Bis(4-Cl-2,6-Cl2)RE	Bis(4-Cl-2,6-Cl2)RF	Bis(4-Cl-2,6-Cl2)RG	Bis(4-Cl-2,6-Cl2)RH	Bis(4-Cl-2,6-Cl2)RI	Bis(4-Cl-2,6-Cl2)RJ	Bis(4-Cl-2,6-Cl2)RK	Bis(4-Cl-2,6-Cl2)RL	Bis(4-Cl-2,6-Cl2)RM	Bis(4-Cl-2,6-Cl2)RN	Bis(4-Cl-2,6-Cl2)RO	Bis(4-Cl-2,6-Cl2)RP	Bis(4-Cl-2,6-Cl2)RQ	Bis(4-Cl-2,6-Cl2)RR	Bis(4-Cl-2,6-Cl2)RS	Bis(4-Cl-2,6-Cl2)RT	Bis(4-Cl-2,6-Cl2)RU	Bis(4-Cl-2,6-Cl2)RV	Bis(4-Cl-2,6-Cl2)RW	Bis(4-Cl-2,6-Cl2)RX	Bis(4-Cl-2,6-Cl2)RY	Bis(4-Cl-2,6-Cl2)RZ	Bis(4-Cl-2,6-Cl2)SA	Bis(4-Cl-2,6-Cl2)SB	Bis(4-Cl-2,6-Cl2)SC	Bis(4-Cl-2,6-Cl2)SD	Bis(4-Cl-2,6-Cl2)SE	Bis(4-Cl-2,6-Cl2)SF	Bis(4-Cl-2,6-Cl2)SG	Bis(4-Cl-2,6-Cl2)SH	Bis(4-Cl-2,6-Cl2)SI	Bis(4-Cl-2,6-Cl2)SJ	Bis(4-Cl-2,6-Cl2)SK	Bis(4-Cl-2,6-Cl2)SL	Bis(4-Cl-2,6-Cl2)SM	Bis(4-Cl-2,6-Cl2)SN	Bis(4-Cl-2,6-Cl2)SO	Bis(4-Cl-2,6-Cl2)SP	Bis(4-Cl-2,6-Cl2)SQ	Bis(4-Cl-2,6-Cl2)SR	Bis(4-Cl-2,6-Cl2)SS	Bis(4-Cl-2,6-Cl2)ST	Bis(4-Cl-2,6-Cl2)SU	Bis(4-Cl-2,6-Cl2)SV	Bis(4-Cl-2,6-Cl2)SW	Bis(4-Cl-2,6-Cl2)SX	Bis(4-Cl-2,6-Cl2)SY	Bis(4-Cl-2,6-Cl2)SZ	Bis(4-Cl-2,6-Cl2)TA	Bis(4-Cl-2,6-Cl2)TB	Bis(4-Cl-2,6-Cl2)TC	Bis(4-Cl-2,6-Cl2)TD	Bis(4-Cl-2,6-Cl2)TE	Bis(4-Cl-2,6-Cl2)TF	Bis(4-Cl-2,6-Cl2)TG	Bis(4-Cl-2,6-Cl2)TH	Bis(4-Cl-2,6-Cl2)TI	Bis(4-Cl-2,6-Cl2)TJ	Bis(4-Cl-2,6-Cl2)TK	Bis(4-Cl-2,6-Cl2)TL	Bis(4-Cl-2,6-Cl2)TM	Bis(4-Cl-2,6-Cl2)TN	Bis(4-Cl-2,6-Cl2)TO	Bis(4-Cl-2,6-Cl2)TP	Bis(4-Cl-2,6-Cl2)TQ	Bis(4-Cl-2,6-Cl2)TR	Bis(4-Cl-2,6-Cl2)TS	Bis(4-Cl-2,6-Cl2)TT	Bis(4-Cl-2,6-Cl2)TU	Bis(4-Cl-2,6-Cl2)TV	Bis(4-Cl-2,6-Cl2)TW	Bis(4-Cl-2,6-Cl2)TX	Bis(4-Cl-2,6-Cl2)TY	Bis(4-Cl-2,6-Cl2)TZ	Bis(4-Cl-2,6-Cl2)UA	Bis(4-Cl-2,6-Cl2)UB	Bis(4-Cl-2,6-Cl2)UC	Bis(4-Cl-2,6-Cl2)UD	Bis(4-Cl-2,6-Cl2)UE	Bis(4-Cl-2,6-Cl2)UF	Bis(4-Cl-2,6-Cl2)UG	Bis(4-Cl-2,6-Cl2)UH	Bis(4-Cl-2,6-Cl2)UI	Bis(4-Cl-2,6-Cl2)UJ	Bis(4-Cl-2,6-Cl2)UK	Bis(4-Cl-2,6-Cl2)UL	Bis(4-Cl-2,6-Cl2)UM	Bis(4-Cl-2,6-Cl2)UN	Bis(4-Cl-2,6-Cl2)UO	Bis(4-Cl-2,6-Cl2)UP	Bis(4-Cl-2,6-Cl2)UQ	Bis(4-Cl-2,6-Cl2)UR	Bis(4-Cl-2,6-Cl2)US	Bis(4-Cl-2,6-Cl2)UT	Bis(4-Cl-2,6-Cl2)UU	Bis(4-Cl-2,6-Cl2)UV	Bis(4-Cl-2,6-Cl2)UW	Bis(4-Cl-2,6-Cl2)UX	Bis(4-Cl-2,6-Cl2)UY	Bis(4-Cl-2,6-Cl2)UZ	Bis(4-Cl-2,6-Cl2)VA	Bis(4-Cl-2,6-Cl2)VB	Bis(4-Cl-2,6-Cl2)VC	Bis(4-Cl-2,6-Cl2)VD	Bis(4-Cl-2,6-Cl2)VE	Bis(4-Cl-2,6-Cl2)VF	Bis(4-Cl-2,6-Cl2)VG	Bis(4-Cl-2,6-Cl2)VH	Bis(4-Cl-2,6-Cl2)VI	Bis(4-Cl-2,6-Cl2)VJ	Bis(4-Cl-2,6-Cl2)VK	Bis(4-Cl-2,6-Cl2)VL	Bis(4-Cl-2,6-Cl2)VM	Bis(4-Cl-2,6-Cl2)VN	Bis(4-Cl-2,6-Cl2)VO	Bis(4-Cl-2,6-Cl2)VP	Bis(4-Cl-2,6-Cl2)VQ	Bis(4-Cl-2,6-Cl2)VR	Bis(4-Cl-2,6-Cl2)VS	Bis(4-Cl-2,6-Cl2)VT	Bis(4-Cl-2,6-Cl2)VU	Bis(4-Cl-2,6-Cl2)VV	Bis(4-Cl-2,6-Cl2)VW	Bis(4-Cl-2,6-Cl2)VX	Bis(4-Cl-2,6-Cl2)VY	Bis(4-Cl-2,6-Cl2)VZ	Bis(4-Cl-2,6-Cl2)WA	Bis(4-Cl-2,6-Cl2)WB	Bis(4-Cl-2,6-Cl2)WC	Bis(4-Cl-2,6-Cl2)WD	Bis(4-Cl-2,6-Cl2)WE	Bis(4-Cl-2,6-Cl2)WF	Bis(4-Cl-2,6-Cl2)WG	Bis(4-Cl-2,6-Cl2)WH	Bis(4-Cl-2,6-Cl2)WI	Bis(4-Cl-2,6-Cl2)WJ	Bis(4-Cl-2,6-Cl2)WK	Bis(4-Cl-2,6-Cl2)WL	Bis(4-Cl-2,6-Cl2)WM	Bis(4-Cl-2,6-Cl2)WN	Bis(4-Cl-2,6-Cl2)WO	Bis(4-Cl-2,6-Cl2)WP	Bis(4-Cl-2,6-Cl2)WQ	Bis(4-Cl-2,6-Cl2)WR	Bis(4-Cl-2,6-Cl2)WS	Bis(4-Cl-2,6-Cl2)WT	Bis(4-Cl-2,6-Cl2)WU	Bis(4-Cl-2,6-Cl2)WV	Bis(4-Cl-2,6-Cl2)WW	Bis(4-Cl-2,6-Cl2)WX	Bis(4-Cl-2,6-Cl2)WY	Bis(4-Cl-2,6-Cl2)WZ	Bis(4-Cl-2,6-Cl2)XA	Bis(4-Cl-2,6-Cl2)XB	Bis(4-Cl-2,6-Cl2)XC	Bis(4-Cl-2,6-Cl2)XD	Bis(4-Cl-2,6-Cl2)XE	Bis(4-Cl-2,6-Cl2)XF	Bis(4-Cl-2,6-Cl2)XG	Bis(4-Cl-2,6-Cl2)XH	Bis(4-Cl-2,6-Cl2)XI

Lab result
HL/HSL value EL/ESL/ECV value

HL/HSL exceedance EL/ESL exceedance HL/HSL and EL/ESL exceedance ML exceedance ML and HL/HSL or EL/ESL exceedance
Indicates that asbestos has been detected by the lab, refer to the lab report Blue = DC exceedance Red = ECV-indirect exceedance HSL 0-1 Exceedance
Bold = Lab detection - - = Not tested or No HL/HSL/EL/ESL (as applicable) or Not applicable NL = Not limiting NAD = No Asbestos detected

HL = Health investigation level HSL = Health screening level (excluding DC) EL = Ecological investigation level ESL = Ecological screening level ECV = 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 BTEX or PAH suite, or if both results >PQL as lowest PQL
c EL criteria applies to DDT only

Site Assessment Criteria (SAC)

SAC based on generic land use thresholds for Commercial/Industrial C.

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

HL	HL-D (NEPC 2013 or HEPA 2020 (P&AS only))	ECV	ECV, all land uses, direct exposure (HEPA, 2020)
HSL (vapour intrusion)	HSL-D (NEPC 2013)	ESL	Commercial and Industrial (NEPC, 2013)
DC	Direct contact HSL-D Commercial/Industrial (JRC CARE, 2018)	ML	Commercial and Industrial (NEPC, 2013)
		ECV-indir	ECV, all land uses, indirect exposure (HEPA, 2020)



Table G1: Summary of Soil and Sediment Laboratory Results (Land Use Comparison)

				Priority OCP									Priority OPP	PCB	Priority PFAS						Miscellaneous Inorganics				Additional PhysChem				
				DDT-DDD- DDE-DDD-																									

Lab result

HIL/HSL value EIL/ESL/EOV 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 = EOV-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 EOV = 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 Commercial/ industrial D

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

HIL	HIL-D (NEPC, 2013 or HEPA, 2020 (PFAS only))	EOV	EOV, all land uses, direct exposure (HEPA, 2020)
HSL (vapour intrusion)	HSL-D (NEPC, 2013)	ESL	Commercial and Industrial (NEPC, 2013)
DC	Direct contact HSL D Commercial/Industrial (CRC CARE, 2011)	ML	Commercial and Industrial (NEPC, 2013)
		EOV-Indir	EOV, all land uses, Indirect exposure (HEPA, 2020)

[illegible]

Site Assessment Criteria (SAC)			
SAC based on generic land use thresholds for Commercial/Industrial/ID			
Refer to the SAC section of report for information of SAC scores and estimate. Summary information as follows			
HSL	HSL ID (NAPIC, 2018) or HSLPA, 2020 (PFA only)	EDV	EDV all land uses, direct exposure (HSLPA, 2020)
HSL (aqueous inclusion)	HSL ID (NAPIC, 2018)	ESL	Commercial and Industrial (NAPIC, 2018)
EC	Direct contact HSL ID Commercial/Industrial (NJC LAR, 2017)	ISL	Commercial and Industrial (NAPIC, 2018)
		EDV-Indir	EDV, all land uses, indirect exposure (HSLPA, 2020)

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

- = Not tested, no criteria or not applicable NAD = no asbestos detected

a	QA/QC replicate of sample listed directly below the primary sample
b	Total chromium used as initial screen for chromium(VI).
c	Total recoverable hydrocarbons (TRH) used as an initial screen for total petroleum hydrocarbons (TPH)
d	Criteria for scheduled chemicals used as an initial screen
e	Criteria for Chlorypyrifos used as initial screen
f	NSW EPA, 2014, Waste Classification Guidelines Part I; Classifying Waste
PQL	Practical quantitation limit
CT1	Maximum values of specific contaminant concentration (SCC) for classification without TCLP; General solid waste
SCC1	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste
TCLP1	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste
CT2	Maximum values of specific contaminant concentration (SCC) for classification without TCLP; Restricted solid waste
SCC2	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste
TCLP2	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste
95% UCL	95% upper confidence limit of the mean concentration calculated using ProUCL v5.1 and the 95% Student's t UCL method

Table G3: Summary of Groundwater Laboratory Results

Table G3: Summary of Groundwater Laboratory Results						Field ID	101	102	D1/GW	T1/GW	103	104	105	106	MW1	MW2	301	302	303	304	305	306		
						Date	28 Apr 2025	28 Apr 2025	28 Apr 2025	28 Apr 2025	28 Apr 2025	28 Apr 2025	28 Apr 2025	28 Apr 2025	28 Apr 2025	28 Apr 2025	29 Apr 2025	29 Apr 2025	29 Apr 2025	29 Apr 2025	29 Apr 2025	29 Apr 2025		
	Unit	PQL	ANZECC 2000 SE Aust - Lowland River	ANZG (2018) Freshwater Slightly to Moderately Disturbed Systems DGVS	PFAS NEMP 2025 Freshwater 95%	PFAS NEMP 2025 Freshwater 99%	NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand	NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Clay																
Inorganics	-	-	6.5-8						6.9	7.1	6.8	-	6.8	6.9	6.9	6.8	7	6.8	6.9	6.8	6.8	6.8	7	
pH (Lab)	-	-							350	510	320	-	320	480	570	900	740	440	510	620	740	620	610	980
Electrical Conductivity (Non Compensated)	µS/cm	1							-	-	-	-	-	-	-	-	-	120	-	-	-	-	-	
Hardness (filtered)	mg/L	3							-	-	-	-	-	-	-	-	-	22	-	-	-	-	-	
Chloride	mg/L	1							-	-	-	-	-	-	-	-	-	47	-	-	-	-	-	
Sulphate	mg/L	1							-	-	-	-	-	-	-	-	-	<5	-	-	-	-	-	
Alkalinity (Hydroxide) as CaCO3	mg/L	5							-	-	-	-	-	-	-	-	-	210	-	-	-	-	-	
Alkalinity (Carbonate as CaCO3)	mg/L	5							-	-	-	-	-	-	-	-	-	210	-	-	-	-	-	
Alkalinity (total) as CaCO3	mg/L	5							-	-	-	-	-	-	-	-	-	210	-	-	-	-	-	
Ammonia as N (filtered)	mg/L	0.005		0.9					-	-	-	-	-	-	-	-	-	210	-	-	-	-	-	
Alkalinity [Bicarbonate as CaCO3]	mg/L	5							-	-	-	-	-	-	-	-	-	210	-	-	-	-	-	
Ionic Balance	%	-							-	-	-	-	-	-	-	-	-	210	-	-	-	-	-	
Kjeldahl Nitrogen Total	mg/L	0.1							-	-	-	-	-	-	-	-	-	210	-	-	-	-	-	
Nitrate (as N) (filtered)	mg/L	0.005							-	-	-	-	-	-	-	-	-	210	-	-	-	-	-	
Nitrite (as N) (filtered)	mg/L	0.005							-	-	-	-	-	-	-	-	-	210	-	-	-	-	-	
Organic Nitrogen as N	mg/L	0.2							-	-	-	-	-	-	-	-	-	210	-	-	-	-	-	
Nitrogen (Total Oxidised)	mg/L	0.005							-	-	-	-	-	-	-	-	-	210	-	-	-	-	-	
Nitrogen (Total)	mg/L	0.1		0.04 ^{NS}					-	-	-	-	-	-	-	-	-	210	-	-	-	-	-	
Total Phosphorus (Organic Phosphate)	mg/L	0.05		0.05					-	-	-	-	-	-	-	-	-	210	-	-	-	-	-	
Sodium (filtered)	mg/L	0.5							-	-	-	-	-	-	-	-	-	210	-	-	-	-	-	
Total Dissolved Solids (Lab)	mg/L	5							-	-	-	-	-	-	-	-	-	210	-	-	-	-	-	
Metals																								
Aluminium (filtered)	mg/L	0.01		0.055					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Arsenic (filtered)	mg/L	0.001		0.013 ^{AI}					<0.001	<0.001	<0.001	<0.001	<0.001	0.009	0.009	0.011	0.023	<0.001	0.001	0.016	0.02	0.011	0.023	0.005
Barium (filtered)	mg/L	0.001							0.03															
Beryllium (filtered)	mg/L	0.0005							<0.0005	<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Boron (filtered)	mg/L	0.02		0.94					<0.01	0.03	0.03	0.03	<0.05	0.03	<0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.03	0.03	
Cadmium (filtered)	mg/L	0.001		0.0002					<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Calcium (filtered)	mg/L	0.5																						
Chromium [III+VI] (filtered)	mg/L	0.001		0.001 ^{AI2}					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cobalt (filtered)	mg/L	0.001		0.0014					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.001	0.001	0.001	0.003	
Copper (filtered)	mg/L	0.001		0.0014					0.001	0.002	0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Iron (filtered)	mg/L	0.01							<0.01	<0.01	<0.01	<0.01	<0.01	2.2	1	0.49	3.4	0.06	0.28	2.1	4.1	0.6	2.5	0.69
Lead (filtered)	mg/L	0.001		0.0034					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.002	<0.001	
Magnesium (filtered)	mg/L	0.5																						
Manganese (filtered)	mg/L	0.001		1.9					0.13	0.017	0.22	0.23	0.21	1.1	0.82	0.45	4	0.091	0.23	2.6	3.8	0.51	2.8	2
Mercury (filtered)	mg/L	0.00005		0.00006					<0.00005	<0.00005	<0.00005	<0.0001	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	
Molybdenum (filtered)	mg/L	0.001		0.034					<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.001	<0.001	0.001	0.002	0.001	0.001	0.001	
Nickel (filtered)	mg/L	0.001		0.011					0.01	0.002	0.005	0.005	0.005	0.005	0.016	0.002	0.009	0.003	0.001	0.005	0.005	0.001	0.023	0.006
Potassium (filtered)	mg/L	0.5																						
Selenium (filtered)	mg/L	0.001		0.005					<0.001	0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Silver (filtered)	mg/L	0.001		0.00005					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Vanadium (filtered)	mg/L	0.01							<0.01			<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Zinc (filtered)	mg/L	0.001		0.008					0.008	0.005	0.049	0.029	0.028	0.003	0.006	0.015	0.005	<0.001	0.002	0.004	0.006	0.002	0.01	0.002
TRI																								
C6-C10 Fraction (F1)	mg/L	0.01							<0.01	<0.01	<0.01	<0.02	<0.01	0.12	0.6	<0.01	48	<0.01	<0.01	11	21	1	23	3.6
C6-C10 [F1 minus BTEX]	mg/L	0.01							<0.01	<0.01	<0.01	<0.02	<0.01	0.12	0.54	<0.01	18	<0.01	<0.01	5.2	10	0.86	11	1.8
>C10-C16 Fraction (F2)	mg/L	0.05							<0.05	<0.05	<0.05	<0.1	<0.05	0.15	<0.05	3.5	<0.05	<0.05	1.1	2.2	0.24	2.2	2.8	
>C10-C16 Fraction (F2 minus Naphthalene)	mg/L	0.05							<0.05	<0.05	<0.05	<0.1	<0.05	0.14	<0.05	3.1	<0.05	<0.05	0.97	1.8	0.21	1.8	2.5	
>C16-C34 Fraction (F3)	mg/L	0.1							<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
>C34-C40 Fraction (F4)	mg/L	0.1							<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
>C10-C40 Fraction (Sum)	mg/L	0.05							<0.05	<0.05	<0.05	<0.1	<0.05	0.15	<0.05	3.6	<0.05	<0.05	1.1	2.2	0.24	2.2	2.8	
C6-C9 Fraction	mg/L	0.01							<0.01	<0.01	<0.01	<0.02	<0.01	0.11	0.49	<0.01	42	<0.01	<0.01	8.3	19	0.93	21	3.3
C10-C14 Fraction	mg/L	0.05							<0.05	<0.05	<0.05	<0.05	<0.05	0.2	<0.05	7.1	<0.05	2.3	4.2	0.3	5.1	3.9	5.1	
C15-C28 Fraction	mg/L	0.1							<0.1	<0.1	<0.1	<0.1	<0.1	0.21	<0.1	0.1	0.13	0.19	0.1	0.1	0.19	0.1	0.19	
C29-C36 Fraction	mg/L	0.05							<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
C10-C36 Fraction (Sum)	mg/L	0.05							<0.05	<0.05	<0.05	<0.05	<0.05	0.2	<0.05	7.4	<0.05	<0.05	2.4	4.4	0.3	5.1	4.1	
TPH (Silica-Gel Cleanup)																								
C10-C14 Fraction (SG)	mg/L	0.05							-	-	-	-	-	0.06	-	1.8	-	-	0.65	1.5	0.1	2.1	1	
C15-C28 Fraction (SG)	mg/L	0.1							-	-	-	-	-	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
C29-C36 Fraction (SG)	mg/L	0.1							-	-	-	-	-	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
>C10-C16 Fraction (SG)	mg/L	0.05							-	-	-	-	-	0.067	-	0.96	-	0.35	0.83	0.12	0.97	0.78		
>C16-C34 Fraction (SG)	mg/L	0.1							-	-	-	-	-	0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
>C34-C40 Fraction (SG)	mg/L	0.1							-	-	-	-	-	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
BTEX																								
Benzene	mg/L	0.00005		0.95					<0.001	<0.001	<0.001	<0.00005	<0.001	0.002	0.02	<0.001	11	<0.001	<0.001	1	3.8	0.11	2.2	0.14
Toluene	mg/L	0.0001		0.18					<0.001	<0.001	<0.001	<0.0005	<0.001	0.003	<0.001	5.1	<0.001	<0.001	1.4	1.7	0.004	0.16	0.008</	

Table G3: Summary of Groundwater Laboratory Results

Field ID	Date	101	102	D1/GW	T1/GW	103	104	105	106	MW1	MW2	301	302	303	304	305	306
		28 Apr 2025	28 Apr 2025	28 Apr 2025	28 Apr 2025	28 Apr 2025	28 Apr 2025	28 Apr 2025	28 Apr 2025	28 Apr 2025	28 Apr 2025	29 Apr 2025	29 Apr 2025	29 Apr 2025	29 Apr 2025	29 Apr 2025	29 Apr 2025
	Unit	PQL	ANZECC 2000 SE Aust - Lowland River	ANZG (2018) Freshwater Slightly to Moderately Disturbed Systems DGVS	PFAS NEMP 2025 Freshwater 95%	PFAS NEMP 2025 Freshwater 99%	NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand	NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Clay									
VOCs																	
1,1,1,2-tetrachloroethane	mg/L	0.0001															
1,1,1-trichloroethane	mg/L	0.0001		0.27													
1,1,2,2-tetrachloroethane	mg/L	0.0001		0.4													
1,1,2-trichloroethane	mg/L	0.0001		6.5													
1,1-dichloroethane	mg/L	0.0001															
1,1-dichloroethene	mg/L	0.0001		0.7													
1,1-dichloropropene	mg/L	0.0001															
1,2,3-trichlorobenzene	mg/L	0.0001		0.003													
1,2,3-trichloropropene	mg/L	0.0001															
1,2,4-trichlorobenzene	mg/L	0.0001		0.085													
1,2,4-trimethylbenzene	mg/L	0.00005															
1,2-dibromo-3-chloropropane	mg/L	0.0001															
1,2-dibromoethane	mg/L	0.0001															
1,2-dichlorobenzene	mg/L	0.0001		0.16													
1,2-dichloroethane	mg/L	0.0001		1.9													
1,2-Dichloroethene	µg/L	0.1															
1,2-dichloropropane	mg/L	0.0001		0.9													
1,3,5-trimethylbenzene	mg/L	0.00005															
1,3-dichlorobenzene	mg/L	0.0001		0.26													
1,3-dichloropropane	mg/L	0.0001		1.1													
1,4-dichlorobenzene	mg/L	0.0001		0.06													
2,2-dichloropropane	mg/L	0.0001															
Trihalomethanes	mg/L	0.0001															
2-chlorotoluene	mg/L	0.0001															
4-chlorotoluene	mg/L	0.0001															
Benzene	mg/L	0.0001		0.95													
Benzyl chloride	mg/L	0.0002															
Bromobenzene	mg/L	0.0001															
Bromochloromethane	mg/L	0.0005															
Bromodichloromethane	mg/L	0.0001															
Bromoform	mg/L	0.0001															
Bromomethane	mg/L	0.0005															
Carbon tetrachloride	mg/L	0.00005		0.24													
Chlorobenzene	mg/L	0.0001		0.055													
Chlorodibromomethane	mg/L	0.0001															
Chloroethane	mg/L	0.0005															
Chloroform	mg/L	0.0001		0.37													
Chloromethane	mg/L	0.002															
cis-1,2-dichloroethene	mg/L	0.0001															
cis-1,3-dichloropropene	mg/L	0.0001															
Cyclohexane	mg/L	0.0001															
Dibromomethane	mg/L	0.0005															
Dichlorodifluoromethane	mg/L	0.0005															
Dichloromethane	µg/L	1		4.000													
Ethylbenzene	mg/L	0.0001		0.08													
Hexachlorobutadiene	mg/L	0.00004															
Isopropylbenzene	mg/L	0.0001		0.03													
MTBE	mg/L	0.0001															
n-butylbenzene	mg/L	0.0001															
n-propylbenzene	mg/L	0.0001															
p-isopropyltoluene	mg/L	0.0001															
sec-butylbenzene	mg/L	0.0001															
Styrene	mg/L	0.00005															
Trichloroethene	mg/L	0.00005		0.33													
tert-butylbenzene	mg/L	0.0001															
Tetrachloroethene	mg/L	0.00005		0.07													
trans-1,2-dichloroethene	mg/L	0.0001															
trans-1,3-dichloropropene	mg/L	0.0001															
Toluene	mg/L	0.0001		0.18													
Trichlorobenzene (total)	mg/L	0.0001															
Trichlorofluoromethane	mg/L	0.0005															
Xylene (m & p)	mg/L	0.0002		0.075 ^{#3}													
Xylene (o)	mg/L	0.0001		0.35													
Vinyl chloride	mg/L	0.0002		0.1													
PFAS																	
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01															
Perfluorobutane sulfonic acid (PFBS)	mg/L	0.000001															
Perfluoropentane sulfonic acid (PFPeS)	mg/L	0.000001															
Perfluorohexane sulfonic acid (PFHxS)	mg/L	0.000001															
Perfluorooctane sulfonic acid (PFHxS)	mg/L	0.000001															
Perfluorooctane sulfonic acid (PFOS)	mg/L	0.000001															
Perfluorodecane sulfonic acid (PFDS)	mg/L	0.000002															
Perfluorobutanoic acid (PFBA)	mg/L	0.000002															
Perfluorohexanoic acid (PFHxA)	mg/L	0.000001															
Perfluorooctanoic acid (PFPeA)	mg/L	0.000002															
Perfluoroheptanoic acid (PFHpA)	mg/L	0.000001															
Perfluorooctanoic acid (PFOA)	mg/L	0.000001															
Perfluorodecanoic acid (PFDA)	mg/L	0.000002															
Perfluorododecanoic acid (PFDoDA)	mg/L	0.000002															
Perfluorononanoic acid (PFNA)	mg/L	0.000001															
Perfluorotridecanoic acid (PFTeDA)	mg/L	0.000005															
Perfluorotridecanoic acid (PFTeDA)	mg/L	0.000002															
Perfluoroundecanoic acid (PFUnDA)	mg/L	0.000002															
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/L	0.000001															
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	mg/L	0.000001															
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/L	0.000002															
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/L	0.000002															
Perfluorooctane sulfonamide (FOSA)	mg/L	0.000002															
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/L	0.000005															
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	mg/L	0.000002															
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	mg/L	0.000005															
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/L	0.000005															
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	mg/L	0.000002															
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/L	0.000005															
Perfluorohexadecanoic acid (PFHxDA)	µg/L	0.005															
Sum of PFHxS and PFOS	mg/L	0.000001															
Sum of PFAS	mg/L	0.000001															
Sum of PFAS (WA DER List)	µg/L	0.002															
Sum of PFAS (PFOS + PFOA)	mg/L	0.000001															

Comments
#1 Adopted As(V) criteria (conservative)
#2 Adopted Cr(VI) criteria (conservative)
#3 Adopted Xylene (m) criteria (conservative)
#4 Refer to Table 8 in PFAS NEMP 2025 for comments and notes
#5 60µg/L for Old rivers
#6 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.
#7 To obtain F2 subtract naphthalene from the >C10 - C16 fraction.

Environmental Standards
ANZG, August 2023, ANZG (2018) Freshwater Slightly to Moderately Disturbed Systems DGVS
HEPA, March 2025, PFAS NEMP 2025 Freshwater 95%
HEPA, March 2025, PFAS NEMP 2025 Freshwater 99%
DoE, 2000, ANZECC 2000 SE Aust - Lowland River
2013, NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Clay

Table G4: Summary of Surface Water Laboratory Results

Table G4: Summary of Surface Water Laboratory Results							Field ID	SW1	SW2	SW3
							Date	15 Apr 2025	15 Apr 2025	15 Apr 2025
							Location	Up-Stream	Mid-Stream	Down-Stream
	Unit	PQL	ANZECC 2000 SE Aust - Lowland River	ANZG (2018) Freshwater Slightly to Moderately Disturbed Systems DGVs	PFAS NEMP 2025 Freshwater 95%	PFAS NEMP 2025 Freshwater 99%				
Inorganics										
pH (Lab)	-		6.5-8					7.4	7.4	7.4
Electrical Conductivity (Non Compensated)	µS/cm	1						190	230	160
Metals										
Arsenic	mg/L	0.001		0.013 ²¹				0.006	0.003	0.004
Beryllium	mg/L	0.0005						<0.0005	<0.0005	<0.0005
Boron	mg/L	0.02		0.94				<0.02	<0.02	<0.02
Cadmium	mg/L	0.0001		0.0002				<0.0001	<0.0001	<0.0001
Chromium (III+VI)	mg/L	0.001		0.001 ²²				0.002	0.001	0.002
Cobalt	mg/L	0.001		0.0014				<0.001	<0.001	<0.001
Copper	mg/L	0.001		0.0014				0.013	0.007	0.011
Lead	mg/L	0.001		0.0034				0.013	0.006	0.011
Manganese	mg/L	0.005		1.9				0.035	0.066	0.068
Mercury	mg/L	0.00005		0.00006				<0.00005	<0.00005	<0.00005
Nickel	mg/L	0.001		0.011				0.002	0.001	0.002
Selenium	mg/L	0.001		0.005				<0.001	<0.001	<0.001
Zinc	mg/L	0.001		0.008				0.088	0.048	0.068
TRH										
C6-C10 Fraction (F1)	mg/L	0.01						<0.01	<0.01	<0.01
C6-C10 (F1 minus BTEX)	mg/L	0.01						<0.01	<0.01	<0.01
>C10-C16 Fraction (F2)	mg/L	0.05						<0.05	<0.05	<0.05
>C10-C16 Fraction (F2 minus Naphthalene)	mg/L	0.05						<0.05	<0.05	<0.05
>C16-C34 Fraction (F3)	mg/L	0.1						<0.1	<0.1	<0.1
>C34-C40 Fraction (F4)	mg/L	0.1						<0.1	<0.1	<0.1
>C10-C40 Fraction (Sum)	mg/L	0.05						<0.05	<0.05	<0.05
C6-C9 Fraction	mg/L	0.01						<0.01	<0.01	<0.01
C10-C14 Fraction	mg/L	0.05						<0.05	<0.05	<0.05
C15-C28 Fraction	mg/L	0.1						<0.1	<0.1	<0.1
C29-C36 Fraction	mg/L	0.1						<0.1	<0.1	<0.1
C10-C36 Fraction (Sum)	mg/L	0.05						<0.05	<0.05	<0.05
BTEX										
Benzene	mg/L	0.001		0.95				<0.001	<0.001	<0.001
Toluene	mg/L	0.001		0.18				<0.001	<0.001	<0.001
Ethylbenzene	mg/L	0.001		0.08				<0.001	<0.001	<0.001
Xylene (m & p)	mg/L	0.002		0.075 ²³				<0.002	<0.002	<0.002
Xylene (o)	mg/L	0.001		0.35				<0.001	<0.001	<0.001
Naphthalene (VOC)	mg/L	0.001		0.016				<0.001	<0.001	<0.001
PAH										
Acenaphthene	mg/L	0.0001						<0.0001	<0.0001	<0.0001
Acenaphthylene	mg/L	0.0001						<0.0001	<0.0001	<0.0001
Anthracene	mg/L	0.0001		0.00001				<0.0001	<0.0001	<0.0001
Benzo(a)anthracene	mg/L	0.0001						<0.0001	<0.0001	<0.0001
Benzo(b+j+k)fluoranthene	mg/L	0.0002						<0.0002	<0.0002	<0.0002
Benzo(a) pyrene	mg/L	0.0001		0.0001				<0.0001	<0.0001	<0.0001
Benzo(g,h,i)perylene	mg/L	0.0001						<0.0001	<0.0001	<0.0001
Chrysene	mg/L	0.0001						<0.0001	<0.0001	<0.0001
Dibenz(a,h)anthracene	mg/L	0.0001						<0.0001	<0.0001	<0.0001
Fluoranthene	mg/L	0.0001		0.001				<0.0001	<0.0001	<0.0001
Fluorene	mg/L	0.0001						<0.0001	<0.0001	<0.0001
Indeno(1,2,3-c,d)pyrene	mg/L	0.0001						<0.0001	<0.0001	<0.0001
Naphthalene	mg/L	0.0001		0.016				<0.0001	<0.0001	<0.0001
Phenanthrene	mg/L	0.0001		0.0006				<0.0001	<0.0001	<0.0001
Pyrene	mg/L	0.0001						<0.0001	<0.0001	<0.0001
PAHs (Sum of positives)	mg/L	0.0001						<0.0001	<0.0001	<0.0001
VOCs										
1,1,1,2-tetrachloroethane	mg/L	0.001						<0.001	<0.001	<0.001
1,1,1-trichloroethane	mg/L	0.001		0.27				<0.001	<0.001	<0.001
1,1,2,2-tetrachloroethane	mg/L	0.001		0.4				<0.001	<0.001	<0.001
1,1,2-trichloroethane	mg/L	0.001		6.5				<0.001	<0.001	<0.001
1,1-dichloroethane	mg/L	0.001						<0.001	<0.001	<0.001
1,1-dichloroethene	mg/L	0.001		0.7				<0.001	<0.001	<0.001
1,1-dichloropropene	mg/L	0.001						<0.001	<0.001	<0.001
1,2,3-trichlorobenzene	mg/L	0.001		0.003				<0.001	<0.001	<0.001
1,2,3-trichloropropane	mg/L	0.001						<0.001	<0.001	<0.001
1,2,4-trichlorobenzene	mg/L	0.001		0.085				<0.001	<0.001	<0.001
1,2,4-trimethylbenzene	mg/L	0.001						<0.001	<0.001	<0.001
1,2-dibromo-3-chloropropane	mg/L	0.001						<0.001	<0.001	<0.001
1,2-dibromoethane	mg/L	0.001						<0.001	<0.001	<0.001
1,2-dichlorobenzene	mg/L	0.001		0.16				<0.001	<0.001	<0.001
1,2-dichloroethane	mg/L	0.001		1.9				<0.001	<0.001	<0.001
1,2-dichloropropane	mg/L	0.001		0.9				<0.001	<0.001	<0.001
1,3,5-trimethylbenzene	mg/L	0.001						<0.001	<0.001	<0.001
1,3-dichlorobenzene	mg/L	0.001		0.26				<0.001	<0.001	<0.001
1,3-dichloropropane	mg/L	0.001		1.1				<0.001	<0.001	<0.001
1,4-dichlorobenzene	mg/L	0.001		0.06				<0.001	<0.001	<0.001
2,2-dichloropropane	mg/L	0.001						<0.001	<0.001	<0.001
2-chlorotoluene	mg/L	0.001						<0.001	<0.001	<0.001
4-chlorotoluene	mg/L	0.001						<0.001	<0.001	<0.001
Bromobenzene	mg/L	0.001						<0.001	<0.001	<0.001
Bromochloromethane	mg/L	0.001						<0.001	<0.001	<0.001
Bromodichloromethane	mg/L	0.001						<0.001	<0.001	<0.001
Bromoform	mg/L	0.001						<0.001	<0.001	<0.001
Bromomethane	mg/L	0.01						<0.01	<0.01	<0.01
Carbon tetrachloride	mg/L	0.001		0.24				<0.001	<0.001	<0.001
Chlorobenzene	mg/L	0.001		0.055				<0.001	<0.001	<0.001
Chlorodibromomethane	mg/L	0.001						<0.001	<0.001	<0.001
Chloroethane	mg/L	0.01						<0.01	<0.01	<0.01
Chloroform	mg/L	0.001		0.37				<0.001	<0.001	<0.001
Chloromethane	mg/L	0.01						<0.01	<0.01	<0.01
cis-1,2-dichloroethene	mg/L	0.001						<0.001	<0.001	<0.001
cis-1,3-dichloropropene	mg/L	0.001						<0.001	<0.001	<0.001
Cyclohexane	mg/L	0.001						<0.001	<0.001	<0.001
Dibromomethane	mg/L	0.001						<0.001	<0.001	<0.001
Dichlorodifluoromethane	mg/L	0.01						<0.01	<0.01	<0.01
Hexachlorobutadiene	mg/L	0.001						<0.001	<0.001	<0.001
Isopropylbenzene	mg/L	0.001		0.03				<0.001	<0.001	<0.001
n-butylbenzene	mg/L	0.001						<0.001	<0.001	<0.001
n-propylbenzene	mg/L	0.001						<0.001	<0.001	<0.001
p-isopropyltoluene	mg/L	0.001						<0.001	<0.001	<0.001
sec-butylbenzene	mg/L	0.001						<0.001	<0.001	<0.001
Styrene	mg/L	0.001						<0.001	<0.001	<0.001
Trichloroethene	mg/L	0.001		0.33				<0.001	<0.001	<0.001
tert-butylbenzene	mg/L	0.001						<0.001	<0.001	<0.001
Tetrachloroethene	mg/L	0.001		0.07				<0.001	<0.001	<0.001
trans-1,2-dichloroethene	mg/L	0.001						<0.001	<0.001	<0.001
trans-1,3-dichloropropene	mg/L	0.001						<0.001	<0.001	<0.001
Trichlorofluoromethane	mg/L	0.01						<0.01	<0.01	<0.01
Vinyl chloride	mg/L	0.01		0.1				<0.01	<0.01	<0.01
PFAS										
Perfluorobutane sulfonic acid (PFBS)	mg/L	0.000001						0.000007	0.000006	0.000006

Table G5: Summary of Laboratory Results Against Sediment Criteria					Organic		Metals										TRH	PAH	Organochlorine Pesticides										PCB
					Total Organic Carbon	Total Organic Carbon	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Silver	Zinc	C10-C36 Fraction (sum)	PAHs (sum of positives)	4,4'-DDE	Chlordane (cis)	Chlordane (trans)	DDD	DDT	Dieldrin	Endrin	γ-BHC (Lindane)	PCBs (sum of total)			
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							
PQL	100	-	4	0.4	1	1	1	0.1	1	1	1	1	50	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1						
Toxicant DGV for Sediment Quality (ANZG 2018)							20	15	80	65	50	0.15	21	1	200	280	10	0.0014	0.0345	0.0335	0.0012	0.0028	0.0027	0.0029	0.034				
Toxicant DGV for Sediment Quality (ANZG 2018) CV-high							70	10	370	270	220	1	52	4	410	550	50	0.007	0.009	0.009	0.009	0.005	0.007	0.06	0.0014	0.28			
Sediment results																													
Field ID	Depth	Date	Location	Matrix Description	32,000	3.2	9	<0.4	12	19	43	<0.1	8	<1	170	<50	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				
SED1	0 - 0.1	15 Apr 2025	Up-Stream	Clayey Silt	32,000	3.2	9	<0.4	12	19	43	<0.1	8	<1	170	<50	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				
SED2	0 - 0.1	15 Apr 2025	Mid-Stream	Clayey Silt	53,000	5.3	9	<0.4	14	33	47	<0.1	11	<1	270	250	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				
SED3	0 - 0.1	15 Apr 2025	Down-Stream	Clayey Silt	26,000	2.6	11	<0.4	16	38	59	<0.1	11	<1	190	<50	3.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				
Sediment results - normalised to 1% organic carbon as below																													
Field ID	Depth	Date	Location	Matrix Description	32,000	3.2	9	<0.4	12	19	43	<0.1	8	<1	170	<50	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				
SED1	0 - 0.1	15 Apr 2025	Up-Stream	Clayey Silt	32,000	3.2	9	<0.4	12	19	43	<0.1	8	<1	170	<50	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				
SED2	0 - 0.1	15 Apr 2025	Mid-Stream	Clayey Silt	53,000	5.3	9	<0.4	14	33	47	<0.1	11	<1	270	250	0.04	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				
SED3	0 - 0.1	15 Apr 2025	Down-Stream	Clayey Silt	26,000	2.6	11	<0.4	16	38	59	<0.1	11	<1	190	<50	1.35	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				

Environmental Standards
ANZECC & ARMCANZ 2000, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra, 2020, Toxicant DGV for Sediment Quality (ANZG 2018)
ANZECC & ARMCANZ 2000, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra, 2020, Toxicant DGV for Sediment Quality (ANZG 2018) CV-high

Appendix F

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, devised with reference to 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.

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

The following issues have been identified at the site which require remediation:

- Remediation Area 1 (RA1):
 - o The former UPSS infrastructure (northern portion) and associated workshops/buildings (including decommissioning, removal and validation of the UPSS and workshop/building areas; and
 - o Remediation Area 2 (RA2):
 - Stockpile A materials which require off-site disposal; and
- Remediation Area 3 (RA3):
 - o Hotspot containing surface ACM impacts in the vicinity of F1/JRK within central portion of the site (and the risk of further surface impacts to be assessed during remediation).
- Remediation Area (RA4) - Off-site Hydrocarbon Plume
 - o Hydrocarbon impacted groundwater observed off-site to the north of the site. Impacts are sourced from the existing UST infrastructure located along the northern site boundary, directly adjacent Denison Street.

3.2 Remediation options

Given the nature of the contamination issues at the site and the necessary site demolition works as part of the proposed development, four options for the soil contamination have been considered, as follows:

- No action;
- On-site treatment of contaminated material;
- Excavation and removal of contaminated material to landfill; and
- Capping / on-site containment of contaminated materials.

Douglas investigations (2024a and 2025) identified on-site impacts in soil and groundwater associated with UPSS infrastructure (UST's) adjacent to the northern (downgradient) boundary of the site as shown on Drawing 1 in Appendix A. Hydrocarbon impacts have also migrated off-site to the north (downgradient) through Denison Street. The extent of off-site impacts has not been fully assessed. Asbestos impact has also been identified within stockpiled materials, at the surface and within near surface fill (extent not confirmed). The objective of the current RAP is to decommission the UPSS and remove the primary source

of contamination (i.e. impacted soils and localised groundwater associated with UPSS infrastructure within the site). Monitored natural attenuation has been recommended to address the off-site groundwater impacts caused by the UPSS infrastructure.

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);
- NSW EPA *Underground Petroleum Storage Systems (UPSS)* (NSW EPA, 2020);
- NSW EPA *Best Practice Note: Landfarming* (NSW EPA, 2014a)
- CRC CARE *Technical Guide – Soil Bioremediation* (CRC CARE, 2019d);
- 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, 2014b).

3.2.1 No Action

The 'No Action' option involves no remedial response to the contamination identified in the locality of the UPSS infrastructure. This option was not considered appropriate for the following reasons:

- The UPSS infrastructure is required to be appropriately decommissioned and removed;
- Leaving residual contamination (hydrocarbon or asbestos) in situ may have impacts to human health and the environment;
- Continuing off-site migration of hydrocarbon impacts from UPSS area on-site.

3.2.2 On-site Treatment of Contaminated Material

On-site treatment of the contaminated soils would typically involve the excavation, stockpiling, treatment and replacement of the treated contaminated material.

For the localised fill (i.e. Stockpile A) and ACM hotspot and asbestos in near surface fill, on-site treatment is not considered to be feasible, based on the localised nature and presence of asbestos contamination.

For underlying soils impacted by UPSS infrastructure, on-site treatment of contamination may be feasible (but will be dependent on ex situ assessment results). It is foreseeable (based on Douglas (2024) soil contamination results) that these soils can be excavated, managed / treated for hydrocarbon impacts, assessed/validated ex situ and then reinstated on-site. The feasibility of on-site treatment of soil (i.e. through bioremediation via landfarming) will depend on the contaminant concentrations present within excavated soils and the volume and waste classification of impacted soils. Treatment via bioremediation may also be required to reduce contaminant concentrations to allow removal/disposal of contaminated materials to landfill (i.e. where treatment is not practical to reduce contaminant concentrations to allow on-site reuse or where hydrocarbon

concentrations (waste classification) are too high to allow direct disposal to a locally licensed landfill). The feasibility and requirements for on-site treatment of impacted soils from the UPSS area will be assessed following UPSS decommissioning, excavation and stockpiling of impacted soils.

3.2.3 Removal of Contaminated Material to Landfill

Off-site disposal of contaminated soils is considered a suitable option for managing human health and environmental impacts from the contaminated materials.

Stockpile A was classified as 'General Solid Waste (non-putrescible) (CT1 and TCLP1/SCC1) – Special Waste (Asbestos)' during the initial Douglas DSI (Douglas, 2024a). The materials should be disposed of off-site to a suitably licensed landfill.

Accordingly, this option would adequately address the remediation objectives via the (likely) removal of the contaminants and areas of environmental concern from the subject site. As stated in Section 3.2.2, bioremediation may also be required to facilitate off-site disposal of hydrocarbon impacted soils from the UPSS area (i.e. to reduce the concentration of contamination in soils to allow disposal to a licensed landfill).

As stated above, the objective of the current RAP is to remove the primary source of contamination (i.e. impacted soils and localised groundwater associated with UPSS infrastructure within the site) and undertake monitored natural attenuation for residual hydrocarbon impacts to groundwater both on-site and off-site. Active groundwater remediation is not proposed in this RAP, however, localised removal and disposal of groundwater within tank pit excavations is recommended along with the removal of impacted soils within the subject site.

3.2.4 Capping

Impacted Stockpile A materials and the near surface ACM hotspot are not considered to be feasible for on-site capping, due to the localised nature of contamination and geotechnically unsuitable materials present (i.e. Stockpile A). These materials can be effectively and feasibly management via off-site disposal to avoid requirements for long term management of such materials if capped on-site.

Capping of impacted materials associated with the UPSS area is not considered to be feasible as it would not remove the primary source of contamination (i.e. hydrocarbon impacted soils), which has already been shown to have migrated off-site, and as such would present a continued source of soil/groundwater impact for the site and downgradient receptors unless removed or treated.

3.3 Residual Groundwater Contamination

The following technical reports have been consulted for the options assessment for residual groundwater contamination:

- CRC CARE *Technology Guide: Groundwater - Barrier Systems* (CRC CARE, 2019c);
- CRC CARE *Technology Guide: Groundwater - In-situ Air Sparging* (CRC CARE, 2019d);

- CRC CARE *Technology Guide: Groundwater - In-situ Chemical Oxidation* (CRC CARE, 2019e);
- CRC CARE *Technology Guide: Groundwater - Monitored Natural Attenuation* (CRC CARE, 2019f);
- CRC CARE *Technology Guide: Groundwater - Pump and Treat* (CRC CARE, 2019g); and
- CRC CARE *Technology Guide: Groundwater - Skimming* (CRC CARE, 2019h).

The various options for vapour intrusion mitigations are outlined in the aforementioned guidelines. Selected options are canvassed in Table 1, below. It is important to note that more than one option could be adopted as the overall remedial strategy, either at the same time, or in succession.

Table 1: Remediation Options for Groundwater Contamination

Remedial Technique / Technology	Description	Advantages	Disadvantages
Impermeable barrier	Cut off walls are impermeable walls installed in the subsurface to contain contaminated groundwater and prevent migration of contaminants beyond the wall. Cut off walls can be used to contain any contaminant, although the construction materials may degrade over time and could be attacked by some contaminants, which should be considered at the design stage.	A cut off wall could be a permanent solution to potential off-site migration, so long as the wall remained in place.	Cut off walls have a high capital cost. A cut off wall could be prone to damming groundwater. Unless the wall surrounded the whole site to restrict ingress and egress of groundwater. The potential risks posed by the residual groundwater contamination are not considered sufficient to warrant the high capital cost. Additional remedial design investigations would be required.
Permeable reactive barrier (PRB)	PRBs treat contaminants as groundwater passes through a reactive barrier installed in the subsurface in the direction of groundwater flow, enabling contaminated groundwater to passively flow through the treatment zone (the reactive barrier). PRBs can treat contaminants that are dissolved in groundwater, including for example volatile and semi-volatile organic compounds, petroleum hydrocarbons, explosives and metals (CRC CARE, 2019c).	A cut off wall could be a permanent solution to potential off-site migration, so long as the wall remained in place.	PRBs have a high capital cost. Some secondary constituents produced by the reactive media may have an adverse impact on the creek without careful design. Groundwater contamination at the site is a commingled plume of TRH/BTEX, naphthalene and Isopropylbenzene. Therefore, a PRB system would require reactive media to treat both contaminant types. This would add to the complexity and cost of the system. The potential risks posed by the residual groundwater contamination are not considered sufficient to warrant the high capital cost. Additional remediation design investigations would be required.
In situ air sparging (IAS)	IAS is the process by which air is injected directly into the saturated subsurface to volatilise contaminants from the liquid phase to the vapour phase for treatment and/or removal in the unsaturated zone, and to biodegrade contaminants in the saturated and unsaturated zone via stimulation by the introduction of oxygen (CRC CARE, 2019d).	IAS can treat both TRH and BTEX. The depth of the contamination and likely thickness of the plume would be appropriate for an IAS system.	The low permeability clayey soils at the site and underlying shale mean IAS is unlikely to be an effective solution.

Remedial Technique / Technology	Description	Advantages	Disadvantages
Enhanced in situ bioremediation (EISB)	EISB can include either bioremediation and/or bioaugmentation. Bioremediation alone involves the addition of a substrate (food source) for bacteria that will dramatically multiply in the presence of the substrate to engineer the geochemistry of the aquifer, such that biodegradation of the CoPC(s) occurs. Bioaugmentation involves the addition of bacteria populations which have been cultivated to degrade the relevant CoPC. For BTEX, it is <i>Pseudomonads</i> .	EISB could potentially increase the rate of TRH/BTEX/VOC bioremediation if project timing was critical or impact to downgradient receptors was occurring/imminent.	The low permeability clayey soils at the site would make EISB a challenging solution and is likely to be a more costly solution compared to MNA. Additional remediation design investigations would be required.
In situ chemical oxidation (ISCO)	ISCO involves the injection of a chemical oxidant into the ground for the purpose of transforming groundwater (or soil contaminants) into less harmful chemical products, such as carbon dioxide, water. There may be many chemical reaction steps required to complete this transformation, and the design of the oxidant delivery system (ensuring the contaminants enter the aqueous phase) and optimisation of the dose (for the oxidant and activator / solvent / surfactant where relevant) is important in facilitating the necessary reactions and in achieving the remediation objectives (CRC CARE, 2019e).	ISCO could result in the destruction of a substantial mass of the residual contamination.	The low permeability clayey soils at the site would make ISCO a challenging solution. Additional remediation design investigations would be required.
Pump and treat (P&T)	P&T involves the extraction of contaminated groundwater and treating the contamination above ground. Treated water is then either disposed of off-site or reinjected. Variations and enhancements of conventional P&T include hydraulic fracturing as well as chemical and biological enhancements (CRC CARE, 2019g). P&T is usually utilised if hydraulic control of the plume is necessary to protect a receptor.	P&T is a proven and widely used technology. The TRH and BTEX are all amenable to above ground treatment either via air stripper or granular activated carbon.	P&T has a high capital and O&M cost. The low permeability clayey soils at the site would make P&T a challenging solution. Additional remediation design investigations would be required.

Remedial Technique / Technology	Description	Advantages	Disadvantages
Multi-phase extraction (MPE)	Multi-phase extraction (MPE) uses a vacuum system, which can also be combined with a downhole pump, to remove various combinations of contaminated groundwater, separate-phase petroleum product, and vapours from the subsurface. ¹	MPE is suitable for TRH and BTEX. The low permeability conditions are suited to MPE where the applied vacuum is most effective.	MPE is usually deployed on sites with substantial mass of LNAPL. The data to date, does not suggest this reflects conditions at the subject site. MPE has a high capital costs, especially for fixed-MPE systems, which include substantial O&M costs.
Skimming	A tool for mass recovery of LNAPLs (and occasionally DNAPLs) using a pump or hydrophobic belt to extract LNAPL from a well at the air / LNAPL interface. Skimming is effective for confined, unconfined and perched LNAPL (CRC CARE, 2019h).	Not applicable, unless substantial volumes of LNAPL are identified at the site.	
Monitored natural attenuation (MNA)	MNA is the monitoring of naturally occurring physical, chemical and biological processes to demonstrate via multiple lines of evidence that one or any combination of those processes reduce the mass, concentration, flux or toxicity of polluting substances in groundwater, to an acceptable level within an acceptable timeframe (CRC CARE, 2019f).	MNA involves minimal / no capital cost. It is considered likely to prove an effective solution over the longer term. Provided there is no immediate risks to identified receptors, MNA could be a suitable permanent solution.	MNA could take years or decades to complete. Some limited additional monitoring data would be required to prove effectiveness.

¹ https://clu-in.org/techfocus/default.focus/sec/Multi-Phase_Extraction/cat/Overview/

The preferred remediation option for the TRH and BTEX impacted groundwater plume is source removal on site followed by monitored natural attenuation (**MNA**) based on the following:

- No LNAPL was observed in groundwater at the well locations during the DSI (Douglas, 2024a) and SDSI (Douglas, 2025);
- No immediately threatened off-site receptors have been identified at this stage;
- MNA is likely to work effectively upon removal of source (UST, associated infrastructure and impacted soils) based on our current understanding of site conditions;
- MNA is considered to be the most practical solution given impacts have migrated under Denison Street (immediately downgradient of the site) which is not conducive to more active remediation approaches.
- MNA is considered more cost effective than other remediation methods.

4. Summary of preferred remediation strategy

Based on the outcome of the options assessment, the preferred remediation strategy is:

- Remediation Area 1 (RA1) – UPSS Area:
 - o Following demolition of site structures;
 - o Decommissioning and removal of the UPSS infrastructure and services including workshop/building areas (i.e. USTs and associated pipework, building slabs, drains and sumps etc);
 - o Excavation of impacted soils, stockpiling for ex situ assessment, and then either disposal of contaminated materials to a licensed waste facility (landfill), or bioremediation via landfarming to allow disposal to a licensed facility or re-use on-site if suitable/feasible;
 - o Removal of localised impacted waters within open tank pit excavations and disposal to a licensed facility.
- Remediation Area 2 (RA2) – Stockpile A:
 - o Excavation and off-site disposal of Stockpile A materials.
- Remediation Area 3 (RA3) – ACM Hotspot:
 - o Surface inspection and clearance of site following demolition of site structures and pavements;
 - o Excavation and off-site disposal of ACM impacts in the vicinity of F1/JRK and other identified near surface asbestos impacts (if any).
- Remediation Area 4 (RA4) – Off-site Hydrocarbon Plume
 - o Monitored natural attenuation (MNA) of off-site hydrocarbon impacts.

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: Groundwater - Barrier Systems*. 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.

CRC CARE. (2019d). *Technology Guide: Groundwater - In-situ Air Sparging*. National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

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

CRC CARE. (2019e). *Technology Guide: Groundwater - In-situ Chemical Oxidation*. National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

CRC CARE. (2019f). *Technology Guide: Groundwater - Monitored Natural Attenuation*. National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

CRC CARE. (2019g). *Technology Guide: Groundwater - Pump and Treat*. National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

CRC CARE. (2019h). *Technology Guide: Groundwater - Skimming*. 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.

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NSW EPA. (2020). *Underground Petroleum Storage Systems - Guidelines for implementing the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019*. Doc Ref: EPA 2020P2700: 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.

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

Appendix G

Site Assessment Criteria

1. Introduction

1.1 Guidelines

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

- NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013).
- CRC CARE *Health screening levels for petroleum hydrocarbons in soil and groundwater* (CRC CARE, 2011).
- HEPA *PFAS National Environmental Management Plan (NEMP)* (HEPA, 2020).
- ANZG *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018).
- ANZECC *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000).

1.2 General

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

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

- Land use: commercial / industrial.
 - Corresponding to land use category 'D', commercial / industrial such as shops, offices, factories and industrial sites.
- Soil type clay.

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-D
Metals	
Arsenic	3000
Beryllium	500
Boron	300 000
Cadmium	900
Chromium (VI)	3600
Cobalt	4000
Copper	240 000
Lead	1500
Manganese	60 000
Mercury (inorganic)	730
Methyl mercury	180
Nickel	6000
Selenium	10 000
Zinc	400 000
PAH	
B(a)P TEQ	40
Total PAH	4000
OCP	
DDT+DDE+DDD	3600
Aldrin and dieldrin	45
Chlordane	530
Endosulfan	2000
Endrin	100
Heptachlor	50
HCB	80
Methoxychlor	2500
Mirex	100
OPP	
Chlorpyrifos	2000
PCB	
PCB	7

Table 2: Health screening levels (mg/kg)

Contaminant	HSL-D	HSL-D	HSL-D	HSL-D
SAND	0 m to <1 m	1 m to <2 m	2 m to <4 m	4 m+
Benzene	3	3	3	3
Toluene	NL	NL	NL	NL
Ethylbenzene	NL	NL	NL	NL
Xylenes	230	NL	NL	NL
Naphthalene	NL	NL	NL	NL
TRH F1	260	370	630	NL
TRH F2	NL	NL	NL	NL
SILT	0 m to <1 m	1 m to <2 m	2 m to <4 m	4 m+
Benzene	4	4	6	10
Toluene	NL	NL	NL	NL
Ethylbenzene	NL	NL	NL	NL
Xylenes	NL	NL	NL	NL
Naphthalene	NL	NL	NL	NL
TRH F1	250	360	590	NL
TRH F2	NL	NL	NL	NL
CLAY	0 m to <1 m	1 m to <2 m	2 m to <4 m	4 m+
Benzene	4	6	9	20
Toluene	NL	NL	NL	NL
Ethylbenzene	NL	NL	NL	NL
Xylenes	NL	NL	NL	NL
Naphthalene	NL	NL	NL	NL
TRH F1	310	480	NL	NL
TRH F2	NL	NL	NL	NL

Notes:

TRH F1 is TRH C₆-C₁₀ minus BTEX

TRH F2 is TRH >C₁₀-C₁₆ minus naphthalene

The soil saturation concentration (C_{sat}) 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 C_{sat}, a soil vapour source concentration for a petroleum mixture could not exceed a level that would result 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-D	DC HSL-IMW
Benzene	430	1100
Toluene	99 000	120 000
Ethylbenzene	27 000	85 000
Xylenes	81 000	130 000
Naphthalene	11 000	29 000
TRH F1	26 000	82 000
TRH F2	20 000	62 000
TRH F3	27 000	85 000
TRH F4	38 000	120 000

Notes:

TRH F1 is TRH C₆-C₁₀ minus BTEX

TRH F2 is TRH >C₁₀-C₁₆ minus naphthalene

IMW intrusive maintenance worker

2.2 Health investigation levels for per- and poly-fluoroalkyl substances in soil

The SAC applied to any contingency or unexpected finds scenarios during site remediation for per- and poly-fluoroalkyl substances (PFAS) in soil will be assessed against HIL published in HEPA (2020). The HIL represent a nationally-agreed suite that should be used to inform site investigations. The HIL are intentionally conservative, and an exceedance of these criteria may not constitute a risk if other exposure pathways are controlled. An exceedance of the HIL should trigger further investigations, such as a site-specific risk assessment. At the time of this investigation, screening values were available only for perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA) and perfluorohexane sulfonate (PFHxS).

The HIL derived from Table 2 of HEPA (2020) are in Table 4.

Table 4: Health investigation levels (mg/kg)

Contaminant	HIL-D
PFOS and PFHxS *	20
PFOA	50

Notes:

* Includes PFOS only, PFHxS only and the sum of the two.

2.3 Asbestos in soil

The SAC applied to any contingency or unexpected finds scenarios during site remediation 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 5.

Table 5: Health screening levels for asbestos

Form of asbestos	HSL-D
ACM	0.05%
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 during inspection of the finished ground surface and at the sampling points and the analytical results of surface samples.

2.4 Ecological investigation levels

The SAC applied to any contingency or unexpected finds scenarios during site remediation will use ecological investigation levels (EIL) and added contaminant limits (ACL), where appropriate, as per 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 6.

Table 6: Inputs to the derivation of the ecological investigation levels

Variable	Input	Rationale
Age of contaminants	'Aged' (>2 years)	Historic commercial / industrial land use
pH	8.1	Conservative value based on previous site testing
CEC	11.1 cmol _c /kg	Conservative value based on previous site testing
Clay content	10%	Conservative value, site soils observed to be clay
Traffic volumes	High	Commercial / industrial site
State / Territory	NSW	17 Denison Street, Gloucester, NSW

Table 7: Ecological investigation levels (mg/kg)

Contaminant	EIL-D
Metals	
Arsenic	160
Copper	310
Nickel	310
Chromium III	680
Lead	1800
Zinc	800
PAH	
Naphthalene	370
OCP	
DDT	640

2.5 Ecological screening levels

The SAC applied to any contingency or unexpected finds scenarios during site remediation will use ecological screening levels (ESL) to assess the risk of selected petroleum hydrocarbon compounds, BTEX and benzo(a)pyrene to terrestrial ecosystems. The adopted ESL are shown in Table 8.

Table 8: Ecological screening levels (mg/kg)

Contaminant	Soil Type	ESL-D
Benzene	Coarse	75
Toluene	Coarse	135
Ethylbenzene	Coarse	165
Xylenes	Coarse	180
TRH F1	Coarse/ Fine	215*
TRH F2	Coarse/ Fine	170*
TRH F3	Coarse	1700
TRH F4	Coarse	3300
B(a)P	Coarse	1.4
Benzene	Fine	95
Toluene	Fine	135
Ethylbenzene	Fine	185
Xylenes	Fine	95
TRH F1	Coarse/ Fine	215*
TRH F2	Coarse/ Fine	170*
TRH F3	Fine	2500
TRH F4	Fine	6600
B(a)P	Fine	1.4

Notes:

ESL are of low reliability except where indicated by * which indicates that the ESL is of moderate reliability

TRH F1 is TRH C₆-C₁₀ minus BTEX

TRH F2 is TRH >C₁₀-C₁₆ including naphthalene

2.6 Ecological soil guideline values

The SAC applied to any contingency or unexpected finds scenarios during site remediation for PFAS will use the interim ecological soil guideline values (EGV) derived from Table 3 of HEPA (2025) are in Table 9.

Table 9: Ecological soil guideline values (mg/kg) – all land uses

Contaminant	Direct exposure	Indirect exposure
PFOS	1	0.003
PFOA	10	0.003
PFHxS	NC	NC

Notes:

NC no criterion

2.7 Management limits

The SAC applied to any contingency or unexpected finds scenarios during site remediation for TRH, 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.

These 'management limits' (NEPC, 2013) are in Table 10. Management limits must not be used as remediation acceptance criteria, or validation criteria for imported material. They are included for reference only, and to aid in assessment of contingency or unexpected finds scenarios.

Table 10: Management limits (mg/kg)

Contaminant	Soil Type	ML-D
TRH F1	Coarse	700
TRH F2	Coarse	1000
TRH F3	Coarse	3500
TRH F4	Coarse	10 000
TRH F1	Fine	800
TRH F2	Fine	1000
TRH F3	Fine	5000
TRH F4	Fine	10 000

Notes:

TRH F1 is TRH C₆-C₁₀ including BTEX

TRH F2 is TRH >C₁₀-C₁₆ including naphthalene

ML-A-B-C residential, parkland and public open space

3. Groundwater

3.1 Introduction

The groundwater investigation levels (GIL) used for interpretation of the groundwater data (as a Tier 1 assessment) have been selected based on the potential risks posed from contamination sourced from the site to receptors at or down-gradient of the site, as identified by the conceptual site model (CSM). The receptors, exposure points and pathways are summarised in Table 11.

Table 11: Summary of potential receptors and potential risks

Receptor	Location	Exposure point	Exposure pathway
Surface water aquatic ecosystem	Down-gradient from site.	Receiving surface water body at the groundwater discharge point.	Exposure to contaminants.
Occupants of buildings / trespassers	On site and down-gradient from site.	Enclosed buildings (existing or proposed).	Inhalation of VOC (including TRH and BTEX) overlying VOC impacted groundwater via the vapour intrusion pathway.

The rationale for the selection of GIL is in Table 12.

Table 12: Groundwater investigation level rationale

Receptor / beneficial use	GIL	Source	Comments / rationale
Aquatic ecosystem	DGV	ANZG (2018)	Freshwater 99% LOP for bioaccumulative contaminants 95% LOP for non-bioaccumulative contaminants
Aquatic ecosystem	DGV	HEPA (2025)	Freshwater 99% LOP as recommended for potential bioaccumulation Screening values were only available for PFOS and PFOA at the time of this investigation.
Building occupants (vapour intrusion)	HSL	NEPC (2013)	2 m to <4 m

Notes:

DGV default guideline value

% LOP percentage level of protection of species

HSL health screening level

GV guideline value

3.2 Groundwater investigation levels for aquatic ecosystems

The DGV for the protection of aquatic ecosystems derived from ANZG (2018) are in Table 12.

Table 13: Groundwater investigation levels for protection of aquatic ecosystems (µg/L)

Contaminant	Freshwater DGV 95% LOP	Notes
Metals / metalloids		
Arsenic	13	Levels provided for As V (conservative) respectively. Moderate reliability.
Boron	940	Very high reliability.
Cadmium	0.2	Very high reliability.
Chromium (VI)	1	Chromium VI levels adopted as initial screen for total chromium. Very high reliability.
Cobalt	1.4	Unknown reliability and LOP.
Copper	1.4	Very high reliability.
Lead	3.4	Moderate reliability.
Manganese	1900	Moderate reliability.
Mercury (inorganic)	0.06	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Nickel	11	Low reliability.
Selenium	5	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Zinc	8	Very high reliability.
BTEX		
Benzene	950	Moderate reliability.
Ethylbenzene	80	Unknown reliability.
m-Xylene	75	Unknown reliability.
o-xylene	350	Low reliability.
p-Xylene	200	Low reliability.
Toluene	180	Unknown reliability.
PAH		
Anthracene	0.01	99% LOP adopted as recommended due to potential for bioaccumulation. Unknown reliability.
Benzo(a)pyrene	0.1	99% LOP adopted as recommended due to potential for bioaccumulation. Unknown reliability.
Fluoranthene	1	99% LOP adopted as recommended due to potential for bioaccumulation. Unknown reliability.
Naphthalene	16	Low reliability.
Phenanthrene	0.6	99% LOP adopted as recommended due to potential for bioaccumulation. Unknown reliability.
VOC		
Tetrachloroethene (PCE)	70	Unknown reliability.
Trichloroethene (TCE)	330	Unknown reliability.
Cis-1,2-dichloroethene (DCE)	700	Unknown reliability.
Chloroethene (vinyl chloride / VC)	100	Unknown reliability.

Contaminant	Freshwater DGV 95% LOP	Notes
Isopropyl benzene	30	Unknown reliability.
Tetrachloromethane (carbon tetrachloride / CT)	240	Unknown reliability.
Trichloromethane (chloroform / TCM)	370	99% LOP adopted as recommended to protect key species from chronic toxicity. Unknown reliability.

Notes:

95% LOP for non-bioaccumulative contaminants

99% LOP for bioaccumulative contaminants

The DGV for the protection of aquatic ecosystems derived from HEPA (2025) are in Table 14.

Table 14: Groundwater investigation levels for protection of aquatic ecosystems (µg/L)

Contaminant / LOP	Freshwater DGV
PFOS 99% LOP	0.00023
PFOA 99% LOP	19
PFOS 95% LOP	0.13
PFOA 95% LOP	220

3.3 Health screening levels for vapour intrusion

The HSL to evaluate potential vapour intrusion risks derived from NEPC (2013) are in Table 14.

Table 15: Groundwater health screening levels for vapour intrusion (µg/L)

Contaminant	HSL-D	Solubility limit
CLAY	2 m to <4 m	-
Benzene	30 000	59 000
Toluene	NL	61 000
Ethylbenzene	NL	3900
Xylenes	NL	21 000
Naphthalene	NL	170
TRH F1	NL	9000
TRH F2	NL	3000

Notes:

TRH F1 is TRH C₆-C₁₀ minus BTEX

TRH F2 is TRH >C₁₀-C₁₆ minus naphthalene

The solubility limit is defined as the groundwater concentration at which the water cannot dissolve any more of an individual chemical based on a petroleum mixture. The soil vapour that is in equilibrium with the groundwater will be at its maximum. If the derived groundwater HSL exceeds the water solubility limit, a soil vapour source concentration for a petroleum mixture could not exceed a level that would result 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'.

It is noted that groundwater health screening levels for vapour intrusion are not applicable where groundwater is less than 2 m below ground level. It is also noted that decommissioning is proposed for the service station UST's and infrastructure.

4. References

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

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

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.

HEPA. (2020). *PFAS National Environmental Management Plan (NEMP)*. Version 2.0: Heads of EPAs Australia and New Zealand and Australian Government Department 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 H

Data Quality Objectives

1. Introduction

The objective of the validation plan is to assess the results of validation testing against the remediation acceptance criteria (RAC) stated within Section 11.1, assess the resultant suitability of the site for the intended land use, and to provide information on environmental impacts which may have resulted from the works.

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

2. Data quality objectives

Table 1: Data quality objectives

Step	Summary
1: State the problem	The site requires remediation and validation of remediation in order to render it suitable for commercial 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 TRH, BTEXN, PAH, metals, VOC, asbestos and PFAS. The validation sampling results will be compared against the RAC. The preferred remediation strategy as outlined in the RAP is the excavation and disposal of contaminated soils. Bioremediation via landfarming will be considered where contaminant concentrations within excavated materials exceed GSW criteria for off-site landfill disposal, or where on-site reuse of excavated soils is determined to be feasible (ie following effective remediation of excavated impacted soils to achieve land use criteria – if feasible). The success of the soil 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% UCL of the mean concentrations. The success of the groundwater remediation and subsequent validation will be based on a comparison of the analytical results for all CoPC to the adopted RAC, i.e. Mann-Kendall trend analysis confirming a stable or shrinking plume.
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 (including trend analysis for groundwater concentrations over time) and geochemical indicator data; • Assessments of aggregates, soil, etc imported as part of the permanent remediation works; and • A photoionisation detector (PID) will be used on-site to screen soils for VOC. PID readings will be used to inform sample selection for laboratory analysis. • Landfill gases will be monitored with a GA5000 as part of the monitored natural attenuation program.

Step	Summary
4: Define the study boundaries	The lateral boundaries of 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. The extent of the groundwater plume is yet to be determined, however additional installation of groundwater wells during remediation works will be undertaken to address this.
5: Develop the analytical approach (or decision rule)	The decision rule is to compare all analytical results with RAC. Initial comparisons will be with individual results then, where required, summary statistics (including mean, standard deviation and 95% upper confidence limit (UCL) of the arithmetic mean (95% UCL) to 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 15.
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 as such, 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 is assumed that the baseline condition is true. Uncertainty that may exist due to the above potential decision errors shall be mitigated as follows: Non-parametric statistical analysis of groundwater data will be undertaken (Mann-Kendall trend analysis).
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 12.4; - Analysis for the CoPC at NATA accredited laboratories using NATA endorsed methods will be used to perform laboratory analysis whenever possible; - Undertake periodic reviews of the adequacy of the groundwater monitoring well network at the site based on the data being obtained; - Adequately experienced environmental scientists/engineers will conduct field work and sample analysis interpretation.

3. Reference

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 I

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 (Department of Planning Housing and Infrastructure - DPHI) 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:
 - o Tracking of all movement of soil within the site and off-site from cradle to grave;
 - o 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.);
 - o Disposal dockets: for any soil disposed off-site including transportation records, spoil source, spoil disposal location, receipt provided by the receiving waste facility / site;
 - o 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;
 - o Decommissioning and off-site disposal of USTs and associated infrastructure;
 - o Records relating to any unexpected finds and contingency plans implemented;
 - o Photographic records by all contractors and consultants of the works undertaken within their purview of responsibilities;
 - o Airborne asbestos monitoring records (where asbestos works are undertaken);
 - o Interim / final visual and sampling clearances for any asbestos related works (where 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 (i.e. records of excavations).

2.4 Asbestos Contractor

The Asbestos Contractor will be responsible for undertaking all asbestos work involving any asbestos impacted filling 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. additional investigation for delineation, waste classification, validation);
- Review of proposed imported fill documentation prior to importation;
- Provide advice and recommendations arising from monitoring and/or inspections, including unexpected finds;
- Review of documentation from the remediation contractor following RAP and preparation of an interim / final validation report;
- Ongoing monitoring for MNA purposes; 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;
- Assess if asbestos removal works constitute friable or bonded asbestos removal work;
- 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 runoff or seepage water accumulated in site excavations that requires removal must initially be sampled and tested for suspended solids, pH and any contaminants of potential concern (CoPC) as identified by the Environmental Consultant. The options for management of excavation pump-out water, dependent upon the test results, are for disposal of the water as follows:

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

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

4. Soil management plan

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

4.1 Stockpiling of contaminated material

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

- An impermeable membrane and appropriate bunding such as plastic sheeting and haybales should be provided at the surface by the Remediation Contractor prior to stockpiling. Plastic sheeting should be taped at joins, as necessary. The bunding should be constructed such that any water draining from stockpiles can be contained within the bund for subsequent collection/disposal or returned to the remediation excavation (refer to Section 3.2 for the protocol);
- Where possible, areas containing existing concrete slabs/pavement could be utilised for stockpiling;
- 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 Bioremediation via Landfarming (if required)

As stated in the RAP, requirements for remediation of hydrocarbon impacted materials excavated from the UPSS area will be determined following stockpiling and confirmation of contaminant concentrations and waste classification.

If testing indicates that the excavated stockpiled soils exceed waste classification as General Solid Waste (GSW) for landfill disposal, or the RAC for on-site reuse, due to elevated hydrocarbons, bioremediation via landfarming should be conducted. The objective of remediation will be to reduce contaminant concentration to allow disposal to a licensed landfill (as GSW), or to allow re-use on-site (for soils within the RAC/SAC).

The requirements and feasibility of landfarming will be confirmed following initial testing of excavated/stockpiled soils and will depend on a number of the factors including the nature and concentration of contaminants, the volume to be treated and area available for treatment, time scales, and the remediation criteria to be achieved (SAC). If it is not practical or feasible to reduce contaminant concentrations that allow reuse of the materials onsite (based on the SAC), off-site disposal to a licensed landfill will be considered. Landfarming may also be required to reduce contaminant concentration to within GSW to allow appropriate landfill disposal. The remediation strategy (i.e. landfill disposal or on-site reuse) will be subject to feasibility and client approval.

Where required, bioremediation via landfarming should be conducted by the Remediation Contractor with reference to the NSW EPA Best Practice Note: Landfarming (NSW EPA, 2014a), CRC CARE Bioremediation Guide (2019) (CRC CARE, 2019b), and procedures in this site management plan (SMP), including the following:

- Appropriate excavation, segregation and stockpiling of impacted materials;
- Establish and implement environmental controls including stormwater, leachate and run-off management, control of odour and volatile emissions and monitoring, control of dust and erosion of soils;
- Regular turning the material to enable air flow through the soil matrix (introducing oxygen to facilitate degradation);
- Control of soil conditions to maximise the degradation rate (including moisture content (via irrigation/spraying), aeration (by tilling) and pH (buffered to neutral by adding acid or alkali);
- Inspection and monitoring by the environmental consultant to allow the optimisation of biodegradation rates during the landfarming process, including possible requirements for the addition of nutrients;
- Validation by the environmental consultant to confirm the outcomes of remediation and fate of treated soils (i.e. landfill disposal or on-site use).

A site-specific bioremediation management plan should be prepared by the remediation contractor if bioremediation is proposed at the site, with due consideration to the environmental controls, minimisation and monitoring of emissions or discharges from the bioremediation process.

4.3 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.

4.4 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 by 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 by contractors holding the appropriate license(s), consent or approvals to transport the materials with the appropriate approvals obtained from the EPA, were required.

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

5. Noise and vibration control plan

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

6. Dust control plan

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

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

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

7. Odour control plan

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

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

8. Work health and safety plan

8.1 General

It is the Remediation Contractor's responsibility to devise a SWMS¹ (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 reference to CRC CARE *Remediation Action Plan: Implementation - Guideline on Health and Safety* (CRC CARE, 2019a). 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.

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

8.2 Site access

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

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

8.3 Personnel and responsibilities

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

8.4 Chemical contamination hazards

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

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

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

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

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

8.5 Physical hazards

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

- Heat exposure;
- Excavations;
- Buried services;
- Noise;

- Dust;
- Electrical equipment;
- Heavy equipment and truck operation; and
- Asbestos.

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

8.6 Safe work practices

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

- Steel-capped boots (mandatory);
- High visibility clothing / vest (mandatory);
- Safety glasses or safety goggles with side shields requirements (as necessary);
- Hard hat (as necessary);
- Appropriate respiratory and protective equipment for any works involving asbestos (as necessary); and
- Hearing protection when working in the vicinity of machinery or plant equipment if noise levels exceed exposure standards (as necessary).

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

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

- SafeWork NSW *Code of Practice, How to Manage and Control Asbestos in the Workplace* (SafeWork NSW, 2019c)
- SafeWork NSW *Code of Practice, How to Safely Remove Asbestos* (SafeWork NSW, 2019d);
- WorkCover NSW *Managing Asbestos in or on Soil* (WorkCover NSW, 2014b);
- 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	Department of Planning Housing and Infrastructure (DPHI) - TBC	
Principal's Representative	TBC	
Site Manager	TBC	
Remediation Contractor and Builder	TBC	
Site Office	TBC	
Environmental Consultant	Douglas Partners - TBC	
Consent Authority	MidCoast Council	(02) 6592 5399
Regulator	NSW EPA (pollution line and general enquiries)	131 555
Utility Provider	MidCoast Water	1300 133 455
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. (2019a). *Remediation Action Plan: Implementation - Guideline on Health and Safety*. National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

CRC CARE. (2019b). *Technology Guide: Soil - Bioremediation*. 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. (2014a). *Best Practice Note: Landfarming*. NSW Environment Protection Authority.

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

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

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

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

Appendix J

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), petroleum, or other chemical odours which weren't previously identified the following protocols will apply:

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

3. Unexpected finds protocol

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

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

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

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

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

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

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.