Remediation Action Plan

Landscaped Area, Medical Gas Loading Bay Area, West Campus of RPA

304100230

Prepared for

TSA Management

10 February 2023

Cardno

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Stantec

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1	10 February	Final to address client comments	AB:MB	DH

Executive Summary

Stantec was engaged by TSA Management (TSA) ("the Client"), on behalf of NSW Health Infrastructure (HI), to prepare a Remediation Action Plan (RAP) for the landscaped area located to the west of the Medical Gas Loading Bay Area (MGLBA), within the West Campus of the Royal Prince Alfred Hospital (RPA), Camperdown, NSW (the site), as shown in **Figure 1** and **2**, **Appendix A**. For ease of reference throughout the report, the subject area proposed for remediation has been designated as the 'landscaped area'.

This RAP has been requested by TSA to manage asbestos contaminated soils identified during investigations within the landscaped area where asbestos was found to exceed the adopted human health criteria.

This assessment follows on from a previous site investigation completed by Cardno during August 2022:

> Cardno (2022). DRAFT Detailed Site Investigation Report – Royal Prince Alfred Hospital, Building 28, West Campus, Job Reference 80022023_R001, Revision A, dated 20 December 2022.

The current land use for the overall MGLBA comprises of landscaping, access roadways, a loading bay and medical gas storage area.

The purpose of the proposed remedial works is to mitigate the human health risk presented by the bonded and friable asbestos contaminated soils that currently exist within the landscaped area. It is considered that the identified risk could be managed as per the proposed remedial approaches (read below).

As outlined in **Section 7.3**, the remedial options considered to be suitable for the proposed ongoing land use as a landscaped area; are **Option 7** (excavation and offsite disposal) and **Option 9** (In-situ encapsulation). The following brief remediation strategy for each option is recommended for implementation, as appropriate:

Option 7: Offsite Disposal;

1. Preliminaries and site establishment;
1. Vegetation pruning / removal;
2. Remedial excavation;
3. Stockpiling and waste classification;
4. Site validation;
5. Reporting (validation report).

Option 9: Onsite Encapsulation;

1. Preliminaries and site establishment;
1. Vegetation pruning / removal;
2. Confirmation of encapsulation area;
3. Onsite encapsulation concept;
4. Civil design of encapsulation;
5. Validation of encapsulation works;
6. Reporting (validation report and LTEMP document).

Once all remediation works have been undertaken and the validation works have been completed successfully in accordance with this RAP, the site would be considered suitable for the ongoing land use as a landscaped area (open space).

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Abbreviations

ACM	Asbestos containing material
AEC	Areas of Environmental Concern
AF	Asbestos fines
ARCP	Asbestos Removal Control Plan
AS	Australian Standard
ASS	Acid Sulfate Soil
B(α)P	Benzo(α)pyrene
BTEX	Benzene, toluene, ethylbenzene and xylene
CAR	Contamination Assessment Report
CBD	Central business district
CEWMP	Construction Environmental and Waste Management Plan
COC	Chain of Custody
COPC	Chemicals of Potential Concern
CSM	Conceptual Site Model
DP	Deposited plan
DPIE	Department of Planning Industry and Environments (now Department of Planning and Environment
DQI	Data Quality Indicators
DQO	Data Quality Objectives
EIL	Ecological Investigation Level
EMP	Environmental Management Plan
EPA	Environment Protection Authority
FA	Friable asbestos
HIL	Health Investigation Level
LAA	Licenced Asbestos Assessor
LOR	Limit of Reporting
m	metres
mBGL	metres Below Ground Level
NATA	National Association of Testing Authorities
NEPC	National Environmental Protection Council
NEPM	National Environmental Protection Measures
NSW	New South Wales
OCP	Organochlorine Pesticides
OPP	Organophosphorus Pesticides
PAH	Polycyclic Aromatic Hydrocarbons
PASS	Potential Acid Sulfate Soils
PCB	Polychlorinated Biphenyls
PID	Photoionization Detector
PoEO	Protection of Environment Operations

PPE	Personal protective equipment
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance / Quality Control
RAP	Remediation Action Plan
REF	Review Environmental Factors
RG	Remediation Goals
RPA	Royal Prince Alfred Hospital
RPD	Relative Percentage Difference
SEPP	State Environmental Planning Policy
SOP	Standard Operating procedures
SPR	Source-pathway-receptor
SSDA	State Significant Development
SWMS	Safe Work Method Statement
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxicity Equivalent Quotient
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons
UFP	Unexpected finds protocol
UST	Underground storage tanks
WADoH	Western Australia Department of Health
WHESP	Work Health, Environment and Safety Plan
WHS	Work Health and Safety
WHSP	Work Health and Safety Plan

1 Introduction

1.1 Background

Stantec was engaged by TSA Management (TSA) ("the Client"), on behalf of NSW Health Infrastructure (HI), to prepare a Remediation Action Plan (RAP) for the landscaped area located to the west of the Medical Gas Loading Bay Area (MGLBA), within the West Campus of the Royal Prince Alfred Hospital (RPA), Camperdown, NSW (the site), as shown in **Figure 1** and **2**, **Appendix A**.

For ease of reference throughout the report, the subject area proposed for remediation has been designated as the 'landscaped area' with an approximate area of 107m^2, as shown in **Figure 2**, **Appendix A**.

This RAP has been requested by TSA to manage asbestos contaminated soils identified during investigations within the landscaped area where asbestos was found to exceed the adopted human health criteria.

This RAP follows on from a previous investigation completed by Cardno during August 2022:

> Detailed Site Investigation Report – Royal Prince Alfred Hospital, Building 28, West Campus, Job Reference 80022023_R001, Revision 0, dated 25 January 2023 (Cardno 2023).

The current land use for the MGLBA is comprised of landscaping, access roadways, a loading bay and medical gas storage area. This RAP is intended to be a supporting document to REF#5, which is being prepared for the proposed works within the MGLBA, which includes activities within the landscaped area as outlined in **Section 1.2**.

1.2 Proposed Development

The proposed development associated with REF#5 centres around the Capital Infrastructure and Engineering (CI & E) building loading dock located off Rochester Street in the RPA Hospital West Campus. Specifically, the works are primarily to establish a reconfigured and expanded Medical Gas Compound (MGC) comprising the following works, which are shown in the current development plans completed by Jacobs (RPAH_ARC_JAC-DRG Revision C/D drawing set, dated 17 January 2023, attached under **Appendix A**:

> Demolish three (3) existing oxygen tanks;

> Demolish existing shed structure (roof, walls and slab). Earthworks required sub-slab to 300mm below existing ground level according to current design drawings;

> Removal of redundant services;

> Existing road surface to be saw cut;

> New MGC enclosure comprising fire rated walls and sliding door to house new main primary and secondary oxygen tanks (60kL), emergency oxygen tank (20kL) and new vaporisers;

> Install new hard stand on road for filling point;

> Install new bollards;

> Install new roof mounted fans;

> New oxygen pipe distribution system infrastructure within confines of MGC area;

> Remove existing trees within a landscaped area in the western portion of the site, located immediately west of the existing vaporisers and nitrogen tanks; and

> Demolish an aboveground storage tank (AST) that contains diesel and has a capacity of 2.5kL. The tank is situated upon a concrete slab and surrounded by protective bollards to prevent vehicle collision and is located south of the landscaped area described above.

The proposed works requiring possible disturbance or excavation of soils are identified on **Figure 2**, **Appendix A**. The Revision D drawing set for the design indicates the following with respect to earthworks:

- Demolition of the existing shed / structure and shallow earthworks to 0.3m below existing ground level to allow for construction of 60kL oxygen tank. Following construction there will be no enclosed structures at this location.
- Saw cutting in the road, limited to resurfacing with no requirement for excavation beyond the asphalt surface.

- Demolition of the AST, which is located south of the landscaped area, however, the slab and underlying soils are understood to remain undisturbed.
- Removal of trees in the landscaped area.

1.3 Purpose and Objectives

The purpose of the RAP is to set remediation objectives and document the process to remediate the contaminated area for the proposed development.

The objectives of this RAP are:

> Define remediation and validation requirements;

> Evaluate the relative feasibility and effectiveness of potentially applicable remedial options;

> Recommend appropriate remedial strategy;

> Establish the site validation criteria;

> Outline the remedial process to be undertaken to achieve the selected remediation strategy for the landscaped area;

> Outline a Construction Environmental and Waste Management Plan (CEWMP), Workplace Health and Safety (WHS) requirements, and an unexpected finds protocol and contingency plan;

> Identify work health and safety measures to minimise the potential risks to human health and the environment during the remedial works;

> Address SEARs condition 17 – Contamination and Remediation. *In accordance with Chapter 4 of SEPP (Resilience and Hazards) 2021, assess and quantify any soil and groundwater contamination and demonstrate that the*

> *is suitable (or will be suitable, after remediation) for the development*; and

> Address DPE SEARs cover letter dated 8 August 2022, whereby it requires a Remediation Action Plan to be completed if contamination is identified. The condition also states that the RAP is to be reviewed and approved by a NSW EPA Accredited Site Auditor

1.4 Scope of Work

To meet the objectives outlined in **Section 1.3**, the following scope of works has been completed:

> Summarise the site features and history, areas of environmental concern and develop a Conceptual Site Model (CSM);

> Identify remediation options suitable for identified contaminants of potential concern (CoPC);

> Evaluate the various remedial options and identify the preferred remediation strategy;

> Document the process for implementing the preferred remediation strategy;

> Develop a Construction Environmental and Waste Management Plan (CEWMP), which outlines environmental controls required for the duration of the works including an Unexpected Finds Protocol and contingency plan;

> Detail environmental and Work Health and Safety (WHS) control measures and community consultation requirements associated with implementation of the preferred remedial strategy; and

> Preparation of the Remediation Action Plan (RAP).

1.5 Guidelines and Legislation

The scope of the RAP has been developed in accordance with the following guidelines and legislation:

> NEPC National Environment protection (Assessment of Site Contamination) Measure 1999. National Environmental Protection Council (NEPC 2013).

> NSW Department of Urban Affairs and Planning Managing Land Contamination: Planning Guidelines: State Environmental Planning Policy (Resilience and Hazards), 2021 (Resilience and Hazards SEPP).

> NSW EPA Consultants Reporting on Contaminated Land: Contaminated Land Guidelines. New South Wales Environment Protection Authority, April 2020, Updated May 2020 (EPA 2020).

- NSW EPA Waste Classification Guidelines, Part 1: Classifying Waste (EPA 2014).
- NSW EPA Contaminated Sites Sampling Design Guidelines. New South Wales Environment Protection Authority (EPA), August 2022 (NSW EPA 2022).

Cardno completed this RAP report in accordance with the NSW EPA framework.

1.6 Deviation from this RAP

To ensure that the correct measures are implemented during the remediation works, a qualified and experienced contaminated lands professional should be involved with the project to ensure that critical stages of the remediation/validation process are appropriately supervised and documented.

If required, such as due to constraints, any deviations from the works specified in this RAP as detailed in **Section 8** are to be justified and properly documented and approved. Amendments to and deviations from the RAP must be discussed with and agreed to by the appointed Environmental Consultant prior to implementation.

2 Medical Gas Loading Bay Area Identification

2.1 Site Details

Details related to the MGLBA and the nearby landscaped area are provided in **Table 2-1** below. An aerial photograph and lateral boundaries of each is presented in **Figure 2**, **Appendix A**.

Table 2-1 Medical Gas Loading Bay Area & Landscaped Area

Details	Comments
Site address	Medical Gas Loading Bay, 23-33 Carillon Avenue, Camperdown NSW (Building 28 Capital Infrastructure & Engineering, West Campus of RPA Hospital)
Applicable Lot and Deposited Plan	A portion of Lot 4 DP 880430
Current land use and area	The current land use is associated with Building 28 Capital Infrastructure & Engineering, former Building 37 (Emergency Generator area), formerly named Building 37A (medical gases storage) and the medical gas loading bay area, which is approximately 650 m^2. The land use of the landscaped area that is proposed for remediation is limited to shrubbery and exposed soils with an approximate area of 107m^2. Immediately south of the landscaped area is a small metal aboveground storage tank (AST) on a concrete slab that is associated with a backup generator.
Proposed land use of landscaped area	To Stantec's knowledge, the land uses will remain consistent with the current open space land use of the landscaped area. The current development plans completed by Jacobs (RPAH_ARC_JAC-DRG_EW7_Revision A, dated 28 October 2022), attached under **Appendix A**; do not indicate that any works are proposed within the landscaped area.
Local Government Authority (LGA)	City of Sydney Local Government Area
Current zoning (Sydney Local Environmental Plan 2012)	SP2: Infrastructure
Site coordinates	-33.89094, 151.18119

2.2 Surrounding Land Use

The land uses immediately surrounding the landscaped area is summarised below in **Table 2-2**. The area of investigation and surrounding land uses is shown in **Figure 2** in **Appendix A**.

Table 2-2 Surrounding Land Use

Direction	Surrounding Land Use or Activity
North	Rochester Street and Radiation Oncology (Building 27), Building 26 and ground level car parking further north.
East	Building 28 (Boiler House), Susan Street, Chris O'Brien Lifehouse building (Building 14), then Missenden Road, then East Campus.
South	Building 28 (Laundry), then Brown Street and Carillon Avenue and residential.
West	Rochester Street and Radiation Oncology (Building 27), and Hospital Road, then the vacant lot undergoing re-development and residential further west.

2.3 Regional and Overall Site Settings

Site setting information, as listed within publicly available data sets, is summarised in **Table 2-3**. The information below is representative of the MGLBA and landscaped area and was obtained from the previous DSI report (Cardno, 2022).

Table 2-3 Site Setting Information

Item	Details
Regional Soil Landscape	The NSW DPIE *eSPADE* v2.2 website indicated that the site overlies Blacktown (bt) residual soil landscape. Soils within the Blacktown landscape consisted of shallow to moderately deep (<100 cm) red and brown podzolic soils on crests, upper slopes and well drained areas, whilst deep yellow podzolic soils and soloths are evident on lower slopes and in poor drainage areas. The landscape has gently undulating rises in Wianamatta Group Shales.
Regional Geology	The Sydney 1:100 000 Geological Map, Herbert C, 1983, illustrates that the subject site is underlain by Ashfield Shale (Rwa) of Wianamatta Group from Middle Triassic period of Mesozoic era. The map shows the site is underlain by Ashfield Shale (Rwa) which is charactered as Black to dark-grey shale and laminite.
Regional Groundwater	A search for registered groundwater bores was conducted during previous DSI investigation (Cardno, 2022) and the search identified three registered bores within a less than or equal to 500m radius of the site. The authorised and intended purpose of the bores were that of monitoring purposes and one as a household bore. The three nearest bores (<500m) included: ▪ GW109230– installed as a private bore in 2008 with a final depth of 1.80m bgl. The listed intended purpose is as a monitoring bore and was located ~ 415 m north of the site; ▪ GW109231 – installed as a private bore in 2008 with a final depth of 3.2m bgl. The listed intended purpose is as a monitoring bore and was located ~ 425 m north of the site. ▪ GW110247 – installed as a private bore in 2000 with a final depth of 210m bgl. The listed intended purpose is as a household bore and was located ~ 430 m east of the site. Bore data was provided and noted the following, standing water level of 31 m, salinity of 4,400 mg/L and low yield of 1.13 L/s The dominant aquifer type at the site was described as Late Permian/Triassic consolidated sediments, porous, extensive and highly productive. Based on the topography at and around the site, the inferred groundwater flow direction was to the north-west.
Surface Water Bodies	The nearest surface water body is Johnstons Creek, which is located approximately 900 m west north-west of the site and discharges to Rozelle Bay. The site and surrounds are mostly paved and surface water flows, are inferred to flow west and north-west, toward Johnstons Creek along the surface topographic gradient.
Acid Sulfate Soils	The NSW Government Planning Industry and Environment online mapping tool, eSPADE Version 2.2, indicates that the site is not mapped as being situated within or near an ASS risk area. The nearest mapped ASS risk area is approximately 930m north-west, in the vicinity of Johnstons Creek. In accordance with the ASS Planning Maps, the site is within a Class 5 risk area, however the probability of occurrence for ASS was extremely low.
Salinity	The Soil Landscape Map accessed from the NSW Government Planning Industry and Environment online mapping tool, eSPADE Version 2.2, indicates that the site lies within the Blacktown Soil Landscape, which typically comprises of four dominant soil materials that overlie Wianamatta geology. 'Localised sodicity' and 'localised salinity' are listed as potential soil limitations of the Blacktown Soil Landscape within the four dominant soils comprising of clays and loams. In the absence of surface salting and obvious corrosion on nearby structures, the likelihood of saline soil existing to a level that could constrain future development is considered low.
Underground Services	No active services were identified within the landscaped area. In other parts of the MGLBA, a sewer main connecting to the Laundry House (Building 28), then heading south-west toward Hospital Road and a water main along Rochester Street, toward Hospital Road. Strom water drains, water mains, electrical and gas were identified along Rochester Street, including unknown infrastructure (refer to services survey plans completed by RPS and attached under **Appendix A**).

3 Site Characterisation

3.1 Previous Report Review

3.1.1 Detailed Site Investigation, Building 28, West Campus, Camperdown

Reference: Cardno (2023). Detailed Site Investigation Report – Royal Prince Alfred Hospital, Building 28, West Campus, Job Reference 80022023_R001, Revision 0, dated 25 January 2023.

Cardno (NSW/ACT), now Stantec Pty Ltd ("Cardno") was engaged by TSA Management (client) to complete a Detailed Site Investigation Report for the entire Medical Gas Loading Bay Area (MGLBA) footprint; but the proposed development only extended across a small portion of the north east corner of the MGLBA. The proposed development comprises of the demolition of the existing structure on the north east corner of MGLBA, and construction of a 60kL oxygen above ground storage tank which would require excavations of up to 1mBGL. The area was proposed to be free of any enclosed structures.

Ground conditions were assessed within the site due to the original design provided to Cardno encompassing a broader area, however, due to a design change following engagement, the DSI and assessment of suitability was targeted to the areas investigated within the Medical Gas Bay Area where construction activities were proposed. The DSI investigation was therefore completed to assess the land for potential contamination within the MGLBA to inform contamination remediation and/or management requirements for the proposed development. It is also noted that investigation within the footprint of the existing building could not be conducted and as such remained as a data gap.

3.1.1.1 Key findings

Desktop Study

- The surrounding land use was occupied by the western precinct of the RPA Hospital.
- The documented history and land use appeared to be limited to hospital services / medical health buildings and infrastructure. The West Campus of the RPA Hospital grounds have undergone significant alteration and refurbishment since operations commenced in 1935. Specific activities of relevance to potential contamination that appear to have occurred on site included demolition, filling, storage and handling of dangerous goods, laundry facilities, construction, electrical substation infrastructure (substation), above ground storage tanks and previously held NSW EPA licence for hazardous, industrial Group A Waste Generation or storage at a site within 21m east and 350m and 475m north east of the MGLBA.
- The MGLBA was not subject to regulation by the NSW EPA and was found to be free of statutory notices and licencing agreements under both the CLM Act 1997 and PoEO Act 1997 and was not included on the List of NSW Contaminated Site.
- Receipt and review of a Dangerous Goods Search through SafeWork NSW for the entire RPA site identified the following:
  - Three stored non-flammable and non-toxic gases within the boundaries of formerly named Building 37A:
    - 28/GS-1 Nitrogen refrigerated liquid, stored within a 4,200 L aboveground storage tank;
    - 28/GS-2; Oxygen refrigerated liquid, stored within a 13,500 L aboveground storage tank; and
    - 28/GS-4 Liquid oxygen, unknown volume and storage.
  - One stored toxic gas within the boundaries of formerly named Building 37A:
    - 28/GS-3; Compressed Toxic Gas, unknown volume and storage
  - Offsite, two potentially decommissioned underground storage tanks were identified approximately 150m north of Building 28. Tank and fuel containment details were unavailable, however aerial imagery indicate the area was recently redeveloped into the Parent and Baby Unit (new Building 23).
  - The status of the USTs was unavailable. However, the location was inferred hydraulically cross gradient from the inferred UST locations (west of former Building 23) and presented a low offsite contamination migration risk to Building 28.
  - Gases stored onsite were contained within bottles or above ground tanks and were not considered to pose a contamination risk to soil or groundwater due to the products being a gas (which would immediately transport into the atmosphere if a leak was present).

Soil

- The soil profile encountered across the area of investigation comprised of hardstand (concrete slab, asphalt), overlying FILL consisting of Silty Sand, Sandy Gravel, Gravelly Sand, Sand, Sandy Clay, Silty Clay, Gravelly Clay; overlying residual soil (Silty CLAY and Sandy CLAY); overlying weathered silty clay, and bedrock at depth. Fill material was identified to a maximum depth of 1.0m BGL at BH514, however refusal was met in fill at HA508 to HA512 and HA518 to HA521 therefore the thickness of fill was unable to be determined at these locations. Anthropogenic materials in fill were not observed, except for gravels and soft plastic at HA518.
- All examined soil samples were evaluated on a qualitative basis for odour and visual signs of contamination (e.g. hydrocarbon odours, oil staining, petrochemical filming, asbestos fragments, ash, slag) and the following observations were noted:
  - Anthropogenic inclusions such as traces of soft plastics, broken tiles, ash bricks, were observed in the fill material;
  - Asbestos was not observed within excavated soils during the field investigation; however, it was identified in laboratory analysis at the following locations:
    - Loading bay area: BH506, BH508, HA510
    - Landscaped area: HA518 and HA521 and it was identified at surface in the form of potential asbestos containing material at sample location HA511
  - PID readings ranged between 1.3 ppm to 5.6 ppm indicating low level of volatile vapour presence;
  - No olfactory or visual signs of oil staining or petrochemical filming were observed during drilling; and
  - Indicators of acid sulfate soils and salinity were not observed within excavated soils.
- Concentrations of metals, BTEX, TRH, PCB, phenols, OCP/OPP, VOCs and PFAS in the collected samples of both fill and natural soils were all either below the applicable laboratory LOR or below the adopted NEPC 2013 Tier 1 human health screening criteria and ecological criteria; either by individual sample concentrations or via statistical analysis.
- Asbestos in the form of bonded ACM and/or AF/FA was detected at sample locations as follows: HA506 (bonded and friable), HA508 (bonded and friable), landscaped area: HA510 (bonded), at concentrations exceeding the human health criteria. Asbestos was also detected in the form of friable at landscaped area: HA518 and HA521 at concentrations below the human health criteria for friable asbestos in soils.
- The locations of asbestos impacted samples from HA506 and HA508 were within a hardstand area (concrete slab (approximately 0.25m thick), where no demolition or excavation works are proposed (under the design provided to Cardno at the time of report preparation). As such, it was considered that the current risk of exposure at that location was low and remediation at these locations was not warranted. However, an asbestos management plan was recommended to be implemented for this area to mitigate the risk for any future development that may require excavation or disturbance within the hardstand area.
- The locations of asbestos impacted soil samples HA510_0.1-0.2, HA518_0.3 and HA521_0.3; and the potential ACM sheet observed at BH511, were within an existing landscaped area where no demolition or excavation works were proposed (under the design available at the time of reporting). However, given the current use of this area which is for landscaping purposes the risk of a complete source-pathway-receptor exposure scenario was considered high, and as such remediation for this area was recommended.
- Overall, widespread soil contamination was not found within or in the direct vicinity of Medical Gas Bay area, however, the asbestos detected within the landscape area (HA510, HA518 and HA521) required remediation to reduce the risk exposure.

  The preliminary waste classification of in-situ soils indicated that the material across the investigation area was preliminarily classified as General Solid Waste (non-putrescible) and Special Waste (Asbestos) – General Solid Waste. Multiple exceedances of the CT1 guideline values were reported, however, leachability testing indicated leachability of the samples were below leachability criteria. Cardno noted that the preliminary classification did not act as a standalone waste classification and did not enable off-site disposal or re-use of soil within the site. The data obtained during this assessment may be considered during future classification.

Groundwater

- During drilling of boreholes, perched water was noted at BH503 at 0.6mBGL and at BH504 at 1.8mBGL; and groundwater strike was noted at BH503 (5.5mBGL), BH504 (5.8mBGL), BH513 (5.5 mBGL), BH514 (4m BGL) and BH515 (4.5m BGL). None of these locations were within the landscaped area.
- During the GME 29 September and 29 November 2022, groundwater was encountered at depths ranging from 29.95 mAHD (BH503, south west of the site) to 31.14 mAHD (BH504, north east of the site). Based on estimates of ground surface topography and groundwater standing water levels, groundwater was estimated to flow in a westerly direction. It was also noted that given the proposed development, groundwater was not expected to be encountered as the maximum depth of excavation was <1mBGL which is above the depth of groundwater strike during the investigation.
- Baseline groundwater physico-chemical parameters indicated groundwater was fresh, acidic, warm, oxidising and of low dissolved oxygen (anoxic).
- The groundwater concentrations for all analytes (BTEX, metals (arsenic, cadmium, chromium, lead and mercury), TRH, PAH, OCP, OPP, PCBs, PFAS, VOCs and phenols) were all below the applicable laboratory LOR, the adopted NEPC 2013 Tier 1 groundwater Human Health and Ecological Criteria, and/or bioaccumulative aquatic ecosystem criteria.
- Despite no exceedances of the adopted criteria, volatile organic compounds were detected in groundwater in groundwater wells BH503, BH504, BH513, BH514 and BH515. The VOC detected included the following:
  - 1,1-dichloroethene
  - cis-1,2-dichloroethene
  - Trichloroethene (TCE)
  - Toluene
- Exceedances for dissolved copper and zinc were reported but were considered that the results were representative of background groundwater concentration and likely attributable to the local geological profile.
- Overall, based on the absence of significant ecological receptors on site, the location of the site and its distance to the inferred receiving surface water body (Johnstons Creek, 900m west), it was considered that groundwater underlying the site as not directly connected with the aquatic environment of Johnstons Creek or adversely impacting environmental receptors situated within the site.

Soil Vapour

- Overall, BTEX were variously detected at concentrations above the laboratory reporting limits but well below the HSL B and HSL C soil vapour assessment criteria in the soil vapour samples analysed. Other VOCs, including 1.2.4-Trimethylbenzene, 4-Ethyltoluene, ethanol, acetone, carbon disulfide, propylene, and chloroform were also detected at concentrations below the assessment criteria. No other VOC's analysed were detected at concentrations above the assessment criteria.
- The soil vapour and groundwater results were used to complete a preliminary risk assessment for a scenario where workers are in an open pit for an assumed period of time, with the scenario designed to assess the risk to workers during construction activities at the MGLBA. The assessment indicated the risk to intrusive maintenance workers on the site from the identified analytes at the measured concentrations in groundwater was low and acceptable. Assessment of risk under any other scenario was not considered, including for occupants of structures in adjacent areas and potential future structures within the site area.

Conceptual Site Model

- The revised CSM established that there was a potential for localised contamination (i.e. asbestos) to exist on the areas outside the development footprint (i.e. landscaped area located to the north west), and further targeted soil sampling would be required to delineate this contamination.

3.1.1.2 Recommendations

- Given that asbestos (bonded and friable) was identified at five locations across the Medical Gas Loading Bay Area (MGLBA), further soil sampling for asbestos was recommended within the footprint of the existing building which is also the proposed development footprint (earthworks / construction footprint). During the DSI this area was not accessible for testing; and as such the additional testing was recommended following demolition of the existing building and concrete slab. Upon completion of the supplementary investigation, the suitability of the material is to be re-considered and appropriate actions taken, as necessary, to render the site suitable.

- Implementation of an Asbestos Management Plan for the development footprint and the remainder of the Medical Gas Loading Bay Area.
- Due to the presence of asbestos in soil (outside of the development footprint), the following was recommended:
  - Areas identified as containing asbestos must be made-safe by a suitably qualified expert by implementation of management measures consistent with the SafeWork NSW Asbestos Code of Practice. Advice regarding interim management was provided to TSA on 2 December 2022.
  - Construction activities associated with the development footprint must not interact with areas identified as containing asbestos. This includes establishment of laydown areas, storage of materials or vehicle / worker access.
  - Preparation of a Remediation Action Plan (RAP), which should:
    - Outline the requirements for management of human health exceedance of asbestos contamination in fill within the landscaped area. The extent of the landscaped area is approximately 107m^2.
    - Include an Unexpected Finds Protocol to manage any risks of unidentified or undocumented contaminated materials such as hazardous materials or waste in fill material;
    - Include a Construction and Environmental Management Plan (CEMP) to minimise potential risks to human health and the environment during implementation of the RAP.
- Any material being removed from site (including virgin excavated natural materials or VENM) be classified for off-site disposal in accordance the EPA (2014) Waste Classification Guidelines.
- Should redevelopment of the areas outside the MGLBA footprint and/or the proposed development plans for the MGLBA differ to those considered in the DSI; then the requirement for further soil, groundwater and soil vapour testing is to be assessed and if warranted, completed.
- The source of TCE was not identified and the preliminary risk assessment completed as part of the DSI only considered a land use scenario specific to the proposed development (construction) at the noted area. It is recommended that the potential risk to receptors within and surrounding the MGLBA under different land use scenarios be considered, such as for occupants and medical patients within buildings (as applicable).

3.2 Site History Summary

Based on the previous report reviews, the documented site history and land use of the MGLBA and immediate surrounds appeared to have been used for industrial/commercial purposes and public health purposes, either by ownership or through leasing, since at least the 1930s.

The use of the MGLBA and immediate surroundings for commercial, industrial and public health purposes has continued to present day. Surrounding land, mostly to the north, east and south has undergone significant re-development from commercial/industrial and residential, into public health related operations. These areas have mostly remained consistent. The MGLBA has been historically used for medical gases storage and loading bay, and the landscaped area was previously occupied by a structure which based on historical aerial imagery, was demolished sometime between the year 2000 and 2005 and was converted to a landscaped area which has remained to date.

Specific activities of relevance to potential contamination that appear to have occurred within the landscaped area and surrounding land, include demolition, potential cut and filling, potential ACM which was observed at the surface in the south eastern portion of the landscaped area; boiler house works and associated engineering workshop (including historic laundry works) and the storage and handling of dangerous goods. To the south of the landscaped area, a diesel AST was identified which appeared to be in good condition, with no evidence of staining or spills surrounding the ground area. Medical gases and fire extinguisher storage was apparent to the east of the landscaped area. Asbestos was also identified beneath pavement at two locations outside of the landscaped area but within the MGLBA, indicating that asbestos impact may be present within shallow fill more broadly, however this has not been assessed outside of the MGLBA.

Where asbestos was detected beneath a pavement layer, the existing asphalt hardstand layer acts as a barrier for potential exposure, creating an incomplete source-pathway-receptor linkage. These hardstand barriers are considered appropriate for ongoing management of a potential human health risk under an asbestos management plan (AMP).

3.3 Existing Contamination within Landscaped Area

Based on the findings of the site investigation summarised above in **Section 3.1**, asbestos was identified within the landscaped area that presents a potential unacceptable risk to human health. A summary of the laboratory analytical results exceeding adopted assessment criteria identified at the landscaped area has been provided below in **Table 3-1**. A copy of the tabulated data for the landscaped area only, is provided under **Appendix B**. Refer to **Figures 2** for the location of exceedances.

Benzo(α)pyrene was also identified in one soil sample that exceeded the urban/residential open space ecological criteria with a discussion provided below.

Table 3-1 Summary of Identified Soil Exceedances - Landscaped Area

Analyte	Criteria (mg/kg)	Soil Exceedances	Comments
Asbestos Containing Material (bonded)	**Human Health** HSL C: 0.02% w/w	HA510_0.1-0.2 - chrysotile and crocidolite asbestos, 0.06%w/w *The results have been compared to the NEPM criteria, however, we note that due to the sampling methodology caused by lack of excavator access, sample masses were not sufficient in accordance with the WA guidelines for assessing ACM in soils. As such the assessment was done as preliminary screening measure.*	**Human Health:** Whilst exceedances of the applicable HSL were not reported, the presence of asbestos within the landscaped area, both friable and bonded, may be disturbed and interacted with during ongoing maintenance, landscaping, and environmental climatic conditions. As such the asbestos is considered to present a potential human health risk and management / remediation is recommended.
Asbestos Fines / Friable Asbestos	**Human Health** HSL C: 0.001% w/w	Amosite asbestos in the form of spongey fibrous material was detected at HA518_0.3 and HA521_0.3 at concentration less than the laboratory LOR of 0.001%w/w	
Benzo(α)pyrene	**Ecological** ESL Urban residential: 0.7mg/kg	HA512_0.1-0.2 – benzo(α)pyrene, 1.1mg/kg	**Ecological:** Based on the information provided by the client relating to the future land use of the landscaped area, it is understood that the area is to remain consistent and that no intrusive works were proposed for this area. On this basis and taking into account that only one out of four samples indicated B(α)P above ecological criteria within the landscaped area, it is considered that remedial action may not be warranted. If the intention for the area is to create a setting that hosts or interacts with ecological receptors, then the requirement for remediation should be reconsidered.

It is noted that remediation and construction works must allow for flexibility to manage potential unexpected finds that may be discovered during construction, such as greater volumes of impacted materials and other contaminants / contaminated materials not previously identified.

4 Conceptual Site Model

Outlined within NEPM (2013) *Schedule B2 – Guideline on Site Characterisation,* a Conceptual Site Model (CSM) is required to aid the assessment of data collected for the landscaped area.

A CSM provides an assessment of the fate and transport of contaminants of potential concern within the context of site-specific subsurface conditions with regard to their potential risk to human health and the environment. Risk to human health and the environment is identified through complete Source – Pathway – Receptor (SPR) linkages. In order to identify SPR linkages the CSM considers site specific factors including:

- Source(s) of contamination;
- Identification of contaminants of concern associated with past (and present) source(s);
- Site specific information including soil type(s), depth to groundwater, effective porosity, groundwater flow velocity and surface water bodies and interactions;
- Locations of any identified sources relative to the proposed site development; and
- Actual or potential receptors considering both current and future land use both for the site, adjacent properties and any sensitive ecological receptors.

4.1 Identified Asbestos Contamination Sources

As outlined in the DSI (Cardno 2023) and based on review of the site history, available documentation, surrounding land uses (**Section 2.2**), and previous environmental reports (**Section 3**), the following potential contamination sources may have resulted in ground contamination by asbestos within the landscaped area:

- Imported fill material potentially used for filling, levelling or landscaping.
- Potential contamination from current and historical land uses including poor demolition of historical structures;
- Hazardous building materials contained in former demolition rubble; and
- Weathering of hazardous building materials such as asbestos containing products.

Other potential contamination sources at the landscaped area, unrelated to asbestos or this RAP, include an aboveground storage tank (AST) in the southern portion of the landscaped area that contains diesel and a laundry in the vicinity of the landscaped area to the south to south-east.

4.1.1 Identified Receptors

A high-level summary of potential receptors considered to be susceptible to asbestos contamination include:

- Current and future workers and hospital patients and visitors;
- Neighbouring users;
- Fauna.

A refined CSM for the human health and ecological contamination identified in the DSI (Cardno 2022) within the landscaped area, is summarised in **Table 4-1** and applies to the current land use setting which is understood will remain consistent with the current land use.

Table 4-1 Conceptual Site Model – Landscaped Area, MGLBA, West Campus RPA

Contaminant Source	Impacted Media	Contaminants of Potential Concern	Potential Exposure Pathways	Receptors	Likelihood of Complete Exposure Pathway
Completed Source-Pathway-Receptor Linkages					
▪ Imported fill material ▪ Poor demolition of historical structures ▪ Weathering of Hazardous Building Materials	▪ Fill soils	**Human Health / Ecological** ▪ Asbestos (bonded, friable)	▪ Direct Contact ▪ Incidental Inhalation (where respirable asbestos fibres become released) ▪ Incidental Ingestion	**Human Health:** ▪ Site users ▪ Site workers (including maintenance workers) ▪ Neighbouring users **Ecological:** ▪ Terrestrial fauna	**High:** Bonded ACM was found at ground surfaces and within soil. The identified bonded ACM can degrade and weather and release fibres that heighten exposure risks to site users and workers. AF/FA was also detected within the soil matrix at a depth of 0.3mBGL, which presents a high risk of exposure to site users and workers.
Potential Source-Pathway-Receptor Linkages					
▪ Imported fill material ▪ Poor demolition of historical structures ▪ Weathering of Hazardous Building Materials	▪ Air ▪ Surficial Soils	▪ Asbestos ▪ Lead ▪ PCB ▪ Synthetic mineral fibres	▪ Direct Contact ▪ Incidental Inhalation ▪ Incidental Ingestion	**Human Health:** ▪ Site users ▪ Site workers (including maintenance workers) ▪ Neighbouring users **Ecological:** ▪ Terrestrial based flora and fauna ▪ Aquatic environmental organisms	**Moderate:** Building infrastructure does not exist within the landscaped area. However, a former structure occupying the landscaped area was demolished circa 2005. No documentation has been provided with regards to the rehabilitation of the landscaped area post demolition of the structure; and as such it is possible that other hazardous building materials may be present.

4.2 Data Gaps

Based on Stantec's assessment of the site historical information, which included a review of the existing environmental report (**Section 3**), the following data gaps were identified for the landscaped area:

- The lateral and vertical extent of the potential asbestos impact along a subsurface utility (as mapped) is unknown.
- Final Waste classification for offsite disposal is not known.
- The appropriateness and suitability of on-site encapsulation along with a long-term Environmental Management Plan as a remedial option has not necessarily been considered or endorsed by RPA stakeholders.

4.3 Extent of Remediation Required

Based on the summary provided above (**Section 3**), the indicative areas requiring remediation are outlined in **Figure 2**, **Appendix A** and outlined in the following sub-sections.

4.3.1 Soil

The contamination present and requiring remediation consists of bonded and friable asbestos found to present a potential risk to human health, specifically at sampling locations HA510, HA518, HA521 located within the landscaped area, as well as a fragment of surficial asbestos in the vicinity of HA520.

Based on the findings of the Cardno (2022) investigation, as outlined in **Section 3**, preliminary volumes of asbestos contaminated fill soils have been estimated. If offsite disposal is chosen as the preferred remedial option. A such the estimates are subject to change.

Table 4-1 Estimated Known Soil Contamination Onsite

Remediation Area	Contaminant	Estimated Depth of Impact	Preliminary Area of Impact	Estimated Volume
Human Health				
Landscaped area (see **Figure 2**)	Asbestos	0.5m*	107 m^2	~54m^3
** assumed depth as natural soil layer was not encountered at hand augers HA510, HA518, HA521*				

5 Remediation Objectives and Criteria

5.1 Remediation Objectives

The purpose of the proposed remedial works is to mitigate the human health risk presented by the bonded and friable asbestos contaminated soils that are considered to present an unacceptable human health risk under the current land use.

The remediation objectives are:

- To ensure the identified asbestos contaminated soils are appropriately managed so that they do not pose risk to human health and the environment at the landscaped area for the existing and future users of the landscaped area;
- To validate that the requirements of this RAP have been successfully completed such that the landscaped area is suitable for the ongoing use as an open space landscaped area.

The approximate areas that are required to be remediated and/or further investigated in the implementation of this plan are shown on **Figure 2** presented in **Appendix A**.

5.2 Validation of Remediation Works

Once remediation works are completed, a process to validate the works must be undertaken to confirm that the remediation objectives have been met. The requirements, methodology and documentation required for validation will depend on the final approved and preferred remediation works undertaken. In any case, if the remediation works are not adequately validated by a qualified environmental consultant, there would not be confirmation that the objectives were met, and the contamination risk would remain despite the cost of works. Specific validation requirements based on the preferred methodology are outlined in **Section 8**.

5.3 Triggers for Further Management

Further investigation or remediation may be required during the construction phase of the proposed works due to events that may include:

- A later decision to undertake redevelopment of the landscaped area; which may involve excavation works or piling for building foundations;
- If landscape plans are developed for the area and it is identified that the area is required to be suitable for hosting or potentially impacting sensitive ecological receptors;
- Unexpected finds of contaminated material which are incompatible with the remedial approach;
- Change of land use to a more sensitive land use;
- Any modification to NSW environmental or planning legislation affecting the RAP.

Where the triggers for further management are identified, refer to **Section 9.6** for the measures to be implemented.

6 Data Quality Objectives

6.1 Data Quality Objective

The NEPC (2013) which is endorsed by the NSW EPA under s105 of the *Contaminated Land Management Act 1997*, requires that Data Quality Objectives (DQOs) are adopted for all assessment and remediation programs. The DQO process as adopted by the NSW EPA is described within the US EPA (2000) *Guidance for the Data Quality Objectives Process and Data Quality Objectives Process for Hazardous Waste Site Investigations.*

The DQOs for the remediation of the landscaped area are summarised below in **Table 6-1**.

Table 6-1 Data Quality Objectives

DQO Step	Discussion
Step 1: State the Problem (Summarise the contamination problem that will require new environmental data, and identify the resources available to resolve the problem; develop a conceptual site model).	Soil materials at the landscaped area have been contaminated by asbestos and there is a potential complete source to receptor pathway, indicating a potential risk to human health and the environment. Therefore, remediation or management of soils is necessary to render the landscaped area suitable for the intended land use as a publicly accessible landscaped area within an area of the RPA west campus.
Step 2: Identify the decision / goal of the study (Identify the decisions that need to be made on the contamination problem and the new environmental data required to make them).	Based on the objectives outlined in **Section 1.3**, the following decision / goals of the study are: 1. Have the contamination issues been resolved so as to remove potential human health and ecological exposure risk to a suitable level for the proposed land use and any off-site risks? 2. Has the landscaped area been suitably validated to confirm conformance to the RAP? 3. Is an Environmental Management Plan required for long-term management of contamination at the landscaped area following its remediation? 4. Is on-going monitoring at the landscaped area required post-remediation?
Step 3: Identify the information inputs (Identify the information needed to support any decision and specify which inputs require new environmental measurements).	Inputs to the decision making process include: ▪ The proposed end land use outlined in **Section 1.2**; ▪ Guidelines made or approved by the NSW EPA under the Contaminated Land Management Act 1997; ▪ Client information provided; ▪ Previous investigations performed at the landscaped area, summarised in **Section 3**; ▪ Soil validation sampling of remedial excavation surfaces including the identified contamination points; ▪ Sampling and laboratory analysis from stockpiled soil material for waste classification assessment; ▪ Laboratory analytical results of soil validation samples; and ▪ Assessment of analytical results in relation to the remediation criteria. At the end of the validation, a decision must be made regarding whether the environmental conditions are suitable for the proposed development, or if additional investigation or remedial works are required to make the landscaped area suitable.
Step 4: Define the boundaries of the study (Specify the spatial and temporal aspects of the environmental media that the data must represent to support decision)	The boundaries of the study are: ▪ Lateral – the intrusive investigation is limited to the lateral extent of the landscaped area, as shown in **Figure 2** in **Appendix A**; ▪ Vertical – from existing ground surface to the base of contaminated soil; and ▪ Temporal – Results are valid on the day of data / sample collection and remain valid as long as no changes occur on landscaped area or contamination (if present) does not migrate onto the landscaped area or on to the landscaped area from offsite sources.

DQO Step	Discussion
Step 5: Develop the analytical approach (To define the parameter of interest, specify the action level, and integrate previous DQO outputs into a single statement that describes a logical basis for choosing from alternative actions).	Parameters of interest include the laboratory results of primary and quality control soil analytical testing. Decision rules for soil and criteria exceedance are outlined as follows: ▪ If the laboratory quality assurance/ quality control data are within the acceptable ranges, the data will be considered suitable for use. ▪ The Practical Quantitation Limit (PQL) for all analyses is at or below the adopted criteria level; ▪ Soil: The laboratory soil test results will be considered to have met the adopted soil criteria when the following occur: – The laboratory reported result is below the investigation human health and ecological criteria for the landscaped area; – There is no asbestos in the surface; or for chemical analytes, – The calculated 95% Upper Confidence Level of the arithmetic mean (95%UCL) (where applicable) contaminant concentration does not exist in soil samples at concentrations in excess of Tier 1 Assessment Criteria; and – The standard deviation of the results is less than 50% of the relevant adopted criteria; and, – No single analytical result for a COPC should exceed 250% of the relevant investigation level or screening level, where applicable. ▪ RPDs for duplicate samples, where applicable, are within accepted limits. ▪ Further decisions are also required following any additional assessment. This may require updating of the RAP to include groundwater remediation or management. ▪ Soil concentrations of chemicals of concern that are below investigation/validation criteria made or approved by the NSW EPA will be treated as acceptable and indicative of suitability for the proposed land use(s).
Step 6: Specify performance or acceptance criteria (Specify the decision-maker's acceptable limits on decision errors, which are used to establish performance goals for limiting uncertainties in the data).	Decision errors are incorrect decisions caused by using data that is not representative of conditions due to sampling or analytical error. The two types of decision errors are: the sampling program does not detect the variability of a contaminant from point to point across the landscaped area; and errors made during sample collection, handling, preparation, analysis and data reduction. Decision errors will be minimised by the following: ▪ The field sampling design, frequency, and methodology, sample preservation techniques and laboratory analytical procedures will be conducted in accordance with accepted NSW EPA, NEPM (2013) and NATA accredited methodologies; ▪ A check of the field and laboratory works is to be made against the Data Quality Indicators for precision, accuracy, representativeness, completeness and comparability as outlined in NEPM (2013) Schedule B2, Site Characterisation and included in **Section 6.2**; ▪ A decision that soil is acceptable for the landscaped area use is based on calculation of the 95% Upper Confidence Level of the arithmetic mean (95%UCL) and standard deviation for contaminant concentration and comparison with the adopted soil criteria, where applicable. Therefore, the acceptable limit of a decision error is 5% that a conclusive statement may be a false positive or false negative. ▪ Sampling errors may occur when the sampling program does not adequately detect the variability of a contaminant from point to point across the landscaped area or is not representative. Some examples of this scenario include but are not limited to: – Restrictions in excavation depth due to refusal or due to underground services. – Proposed samples are not collected due to access being restricted to a given location.

DQO Step	Discussion
	Measurement errors can occur during sample collection, handling, preparation, analysis and data reduction. To address this the following measures are proposed: – Field staff to follow a standard procedure when undertaking samples, including decontamination of tools, removal of adhered soil to avoid false positives in results, collection of representative samples and use of appropriate sample containers and preservation methods. – Laboratories to follow a standard procedure when preparing samples for analysis and undertaking analysis. – Laboratories to report quality assurance/ quality control data for comparison with the DQIs established for the project.
Step 7: Develop the plan for obtaining data (Identify the most resource-effective sampling and analysis design for general data that are expected to satisfy the DQOs).	The work plan is designed to meet the project objectives in **Section 1.3** and the DQOs outlined above. To ensure resource-effective sampling, analysis and data collection that satisfied the DQOs, the following actions are to be taken: ▪ Written instructions will be used to guide field personnel in the required fieldwork activities; ▪ Representative soil samples will be collected from the landscaped area and analysed for validation and characterisation purposes; and ▪ Validation field works and analyses will be undertaken in accordance with Stantec Standard Operating Procedures. ▪ Soil remedial excavation is to be performed as per **Section 8**. Soil validation sampling is to be completed as per the methodology prescribed in **Section 11**. ▪ Review of the soil results will be undertaken to determine if further excavation and additional sampling are warranted.

6.2 Data Quality Indicators

To ensure that the investigation results were of an acceptable quality, the data set was assessed against the data quality indicators (DQIs) outlined in **Table 6-2**.

Table 6-2 Data Quality Indicators

QAQC Measure	Field Quality Indicator	Laboratory Quality Indicator
Precision: A quantitative measure of the variability (or reproducibility) of data.	SOPs are appropriate and complied with. Field duplicates and Blind field duplicates are collected and analysed at a rate of 5% (1 per 20 samples). Duplicates will not be collected for asbestos samples. Use of calibrated equipment.	Laboratory analyses of laboratory and inter-laboratory duplicates, field duplicates, laboratory prepared volatile trip spiles. Relative Percent Difference (RPD) calculation results: <30% Relative Percentage Difference (RPD). The RPD values are calculated using the following equation: $RPD = \frac{I\ C_O - C_R\ I}{[(C_O + C_R) / 2]} \times 100$ Where, C_O = Analyte concentration of the original sample C_R = Analyte concertation of the duplicate sample
Accuracy: A quantitative measure of the closeness of reported data to the "true" value.	SOPs are appropriate and complied with. Use of calibrated equipment. Field interlaboratory duplicates sampled and analysed at a rate of 1 per 20 samples. Duplicates will not be collected for asbestos samples. <30% Relative Percentage Difference (RPD)	Laboratory holds NATA-accreditation for the analyses. Laboratory limit of reporting is below the adopted investigation level. Laboratory analysis of: field blanks, rinsate blank, reagent blank, method blank, matrix spike, matrix spike duplicate, surrogate spike, reference material, laboratory control sample, laboratory-prepared spikes. The nominal acceptance limits on laboratory control samples are: Laboratory spikes:

QAQC Measure	Field Quality Indicator	Laboratory Quality Indicator
	Analysis of rinsate sample collected at rate of 1 per day for chemical contaminants. Trip spike and trip blanks were used. Trip spike / blank will not be collected for asbestos sampling.	70-130% recovery for metals 60-140% for organics Laboratory duplicates. If contaminant concentration is: < 10 x PQL, no RPD limit 10-20 x PQL, RPD is 0% to 50% >20 x PQL, RPD is 0% to 20% Laboratory surrogates: 60-140% recovery. Laboratory blanks: <PQL Laboratory control samples, 70-130% recovery
Representativeness: The confidence (expressed qualitatively) that data are representative of each media present on site and the conditions encountered in the field	Appropriate media sampled. Preservation and storage of samples upon collection and during transport to the laboratory occurs. Sampling is undertaken by an experienced sampler.	Blank samples run in parallel with field samples to confirm there are no unacceptable instances of laboratory artefacts. Review of RPD values for field and laboratory duplicates to provide an indication that the samples are generally homogeneous, with no unacceptable instances of significant sample matrix heterogeneities. Duplicates will not be collected for asbestos samples. The appropriateness of collection methodologies, handling, storage and preservation techniques will be assessed to ensure/confirm there was minimal opportunity for sample interference or degradation (i.e. volatile loss during transport due to incorrect preservation / transport methods). Rinsate samples used when sampling equipment is reused have analytical results <LOR.
Completeness: A measure of the amount of useable data from the data collected during the fieldwork program	All critical locations sampled. All samples collected (from grid and at depth). Standard operating practices (SOPs) appropriate and complied with. Sampling is undertaken by an experienced sampler. Suitable records of field work are documented. Completed laboratory sample chain-of-custody and documentation.	All critical samples are analysed according to the RAP. All applicable contaminants are analysed. Appropriate methods and PQLs are implemented. Sample documentation is complete. Samples are analysed within holding times.
Comparability: The confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event	Same SOP is used on each field occasion. Climatic conditions are documented. Experienced sampler Sample type, preservation and handling are consistent at sampling events. Use of calibrated equipment.	Sample analytical methods used (including clean-up) Sample PQLs (justify/quantify if different) Same laboratories are used and justification is given where differences occur. Same analytical methods, Practical Quantification Limits (PQLs), and units of measurement are used.

7 Remediation Options

7.1 Remediation Options Hierarchy

Contaminated site management strategies should reflect the need to protect all segments of the environment, both biological and physical (air, land and water, including groundwater). In accordance with the ASC NEPM, the preferred hierarchy of options for site clean-up and management of soil contamination is:

- On-site treatment of soil contamination, so that the risk associated with the contaminant is reduced to an acceptable level.
- Off-site treatment of excavated soil, so that the risk associated with the contaminant is reduced to an acceptable level, after which it is returned to the landscaped area.

If it is not possible for either of the above options to be implemented, then other options for consideration can include, for example:

- Removal of contaminated soil to an approved site or facility, and replacement with clean fill where necessary.
- Containment of the contamination on-site either in-situ with appropriate controls that reduce the risk to an acceptable level, or in an appropriately designed and managed containment facility.
- Adoption of a less sensitive land use or controls on site activities that will reduce the need for remedial worksites, there should be appropriate controls in place to control emissions to air, land and water.

Potential remediation options include:

- "Do Nothing" The 'do nothing' option involves not removing or addressing any of the identified impacts
- On-site treatment of soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable limit
- Off-site treatment of excavated soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable limit, after which the soil is returned to the landscaped area
- Removal of contaminated soil to an approved site or facility, and if necessary replacement with imported fill, and
- Isolation and management of the soil on-site by capping/containment within an appropriate barrier.

7.2 Remediation Options Evaluation

Stantec has identified and evaluated the potential remedial options listed in the hierarchy above to provide a recommended remedial strategy to address the asbestos impacted soils at the landscaped area. General description of the options are described in **Table 7-1** below and the evaluation process of each option is summarised in **Table 7-2**.

Table 7-1 Remedial Option Identification

Remedial Option	Description
Option 1: Do Nothing	This option involves not removing or addressing the identified impacted media with no action undertaken.
Option 2: Monitored Natural Attenuation	This alternative involves not removing or addressing the identified impacted media but includes periodic monitoring to track applicable concentrations with time, where applicable. Some contaminants are amenable to concentration, toxicity and/or mass reductions through natural processes such as volatilisation, dispersion, and biodegradation among others.
Option 3: On-site treatment of soil – Immobilisation Fixation/Stabilisation	This option involves mixing a reagent to the impacted media to solidify or fix the contaminants to make them chemically unavailable or immobile. This technology can be applied to contaminated material either in-situ or ex-situ.
Option 4: On-site treatment of soil – Soil Washing	This is an ex-situ treatment alternative which includes removing contaminants from soils and sediments by dissolving or suspending them in a water-based solution. The process utilises the difference in grain size and density of the sediment particles to separate the contaminants from the impacted media. The water-based solution used for the washing is then collected, treated and discharged or collected and disposed off-site.

Remedial Option	Description
Option 5: Off-site treatment of excavated soil – Immobilisation Fixation/Stabilisation	This option is the same as described in Option 3 but the impacted soil would be transported off-site prior to the stabilisation.
Option 6: Off-site treatment of excavated soil – Soil Washing	This option is the same as described in Option 4 but the impacted soil would be transported off-site prior to soil washing/treatment.
Option 7: Off-site disposal – Excavation and Disposal at Landfill	This alternative includes excavating the impacted soil from the landscaped area and transporting it to an appropriately licensed landfill.
Option 8: Isolation and management of the soil on-site by Above-ground Consolidation Encapsulation	This alternative includes consolidation of the impacted material above ground in engineered mounds, stockpiles or embankments which are isolated via barrier layers and clean material capping. This option would be undertaken in conjunction with encapsulation of in-situ material beneath a capping layer, where excess material is required to be managed to achieve design levels.
Option 9: isolation and management of the soil on-site by In-situ Encapsulation	This option includes installation of a capping layer over the impacted soils to isolate the material from potential receptors. This option can be undertaken in conjunction with other consolidation measures or off-site disposal if raising the level of the area is not appropriate. This alternative could be a standalone option or implemented in conjunction with another remedial alternative.

Table 7-2 Remediation Options Evaluation

Option	Description	Advantages	Disadvantages	Outcome
1	Do Nothing	▪ Elimination of remedial costs.	▪ Contaminated media has been identified at the landscaped area that must be addressed to minimize potential risks to human health and/or the environment; and ▪ Does not address the remediation goals listed in **Section 5**, and as such the land would remain unsuitable for the proposed use.	Considered unsuitable.
2	Monitored Natural Attenuation	▪ Reduction of remedial costs.	▪ The identified contaminants are not amenable to concentration reduction through natural processes in a timely manner; and ▪ Does not address the remediation goals listed in **Section 5**, and as such the land would remain a human health risk.	Considered unsuitable.
3	On-site Immobilisation Fixation/Stabilisation and re-use on-site	▪ Moderate cost when compared with offsite disposal; ▪ The operation and management costs are low, with minimal long-term maintenance.	▪ Some limitations with fully mixing the stabilisation reagent in media with a range of grain sizes; ▪ Requires excavation of the material with potential vegetation clearance; ▪ Would require segregation from growing mediums; ▪ Would require an Environmental Management Plan (EMP) for long-term monitoring and protection of the remediated soil. ▪ Would require bench-scale study requiring long time period to determine if methods employed are validated.	Considered unsuitable.
4	On-site Soil Washing and re-use on-site	▪ The material requiring remediation has varying grain sizes.	▪ Soil washing will not remove asbestos or waste materials; ▪ Would require bench-scale study. ▪ May require multi-stage process. ▪ Would require construction of a secure soil wash containment area. ▪ Would require liquid waste disposal and soil validation process.	Considered unsuitable.
5	Off-site Immobilisation Fixation/Stabilisation and re-use either on-site or off-site	▪ Would be completed at an appropriate facility. ▪ The operation and management costs are low, with minimal long-term maintenance.	▪ May require bench-scale study. ▪ Requires commitment from an EPA licenced treatment facility; ▪ Greater cost than Option 3 due to transportation and facility treatment costs. ▪ Requires substantially more testing to validate soils for re-use once treated. ▪ Requires waste treatment documentation to be complete.	Considered unsuitable.

Option	Description	Advantages	Disadvantages	Outcome
6	Off-site Soil Washing and re-use on-site or off-site	▪ The material requiring remediation has varying grain sizes. ▪ Would be completed at an appropriate facility.	▪ Soil washing will not remove asbestos or waste materials; and ▪ Requires commitment from an EPA licenced treatment facility; ▪ Would require bench-scale study. ▪ May require multi-stage process. ▪ Requires substantial more testing to validate soils for re-use once treated. ▪ Would require liquid waste disposal. ▪ Requires waste treatment documentation to be complete.	Considered unsuitable.
7	Excavation and Offsite Disposal at Landfill	▪ Relatively easy to implement and proven solution; ▪ Minimises potential risks to human health and environment; ▪ Sustainable long-term remediation option; ▪ Low ongoing operation and maintenance; ▪ Economically viable for smaller, localised areas of contamination with soils classified as general solid waste; and ▪ Removes liability for ongoing management.	▪ Costs of offsite disposal at a licenced facility; ▪ Costs to import soil for construction purposes (if required); ▪ Uses up landfill space; ▪ Higher energy expenditure and costs to transport off-site ▪ Requires waste documentation to be complete.	**Considered suitable**.
8	Above-ground consolidation and encapsulation	▪ Ease of implementation at the site; ▪ Reliable option at removing human health and ecological receptor pathways; ▪ The open space at the landscaped area could accommodate landscaped mounds or embankments; ▪ Moderate costs when compared with offsite disposal; ▪ The ongoing operation and maintenance have low costs as it requires minimal long-term monitoring; and ▪ Relatively sustainable.	▪ Contamination is not reduced, only isolated; ▪ Ongoing management required via legally enforceable Environmental Management Plan (EMP); ▪ Additional engineering of containment within final design and construction; ▪ Material would require excavation and relocation within the landscaped area and would be subject to approval from stakeholders / permitting / approvals; ▪ Requires separate civil/landscaping/engineering design to locate and accommodate the volume of soil to be encapsulated;	Potentially suitable but Option 9 preferred

Option	Description	Advantages	Disadvantages	Outcome
9	In-situ Encapsulation	▪ Easy implementation at site; ▪ Amenable to asbestos; ▪ Reliable option at removing human health and ecological receptor pathways; ▪ Moderate costs if used in conjunction with above-ground consolidation; ▪ The ongoing operation and maintenance have low costs as it requires minimal long-term monitoring; and ▪ Sustainable option.	▪ Contamination is not reduced, only isolated; ▪ Where applicable ongoing management required via legally enforceable Environmental Management Plan (EMP); ▪ Requires separate civil/landscaping/engineering design to locate and accommodate the volume of soil to be encapsulated; ▪ Although excavation may not be required for soils in some areas, ground treatments will be required (i.e. lateral confinement, marker layers).	**Considered suitable**.

7.3 Preferred Remediation Options

Based on the localised contamination previously identified onsite (**Section 4.3**) and the proposed continued land use as a landscaped area within a hospital setting, the following options are considered suitable to mitigate the human health risk:

- **Option 7** - excavation and offsite disposal; and/or
- **Option 9** - In-situ encapsulation

This RAP presents each option in the sections below for the Client's consideration.

On-site encapsulation for the contaminants of concern will require an Asbestos Management Plan and a legally enforceable long-term environmental management plan (EMP), however, the level of management is considered passive while the encapsulated areas are not disturbed. Routine inspections of the encapsulated areas, and an approval process for any planned disturbances will be required, as will be outlined in the EMP.

8 Remediation Methodology

8.1 Remediation Outline

As outlined above in **Section 7.3,** the remedial strategies suitable for the existing contamination is offsite disposal (Option 7) and/or in-situ encapsulation (Option 9), or a combination of the options.

Details of the two remedial strategies are outlined in the sections below and an outline for a Construction Environmental and Waste Management Plan (CEWMP) is included in **Section 9**. Potential risks to future workers can be managed through standard WHS practices which are detailed in **Section 10**. The validation plan including inspection regime is detailed in **Section 11**.

Should areas of previously unidentified contamination be encountered during the remediation and validation works, the requirement for additional investigation and remedial measures shall be assessed. If encountered during construction, the Unexpected Finds Protocol detailed in **Section 9.6** should be implemented. Details on the requirements during asbestos removal, including WHS measures, are included in **Section 9.4.**

If offsite disposal is selected as the preferred remediation option, prior to commencement or during remediation, additional sample collection and analysis will be required to confirm the waste classification of the material.

Due to the presence of asbestos in fill soil beneath pavement at sampling points BH506 and BH508 there is potential for asbestos to exist within shallow soil in nearby unpaved areas. Collection and analysis of soil samples in unpaved areas surrounding BH506 and BH508 is recommended, and if asbestos is confirmed to be present, the impact can be managed in accordance with this RAP.

The remedial strategy is designed to ensure that any complete source – pathway - receptor linkages to contaminated soil are mitigated to the extent practicable and/or eliminated.

The remedial approach would be performed jointly by a suitably qualified environmental consultant, occupational hygienist and licensed contractor and would be conducted in the following general sequence:

Option 7: Offsite Disposal;

1. Preliminaries and site establishment;
2. Vegetation pruning / removal;
3. Remedial excavation;
4. Stockpiling and waste classification;
5. Site validation;
6. Reporting (validation report).

Option 9: Onsite Encapsulation;

1. Preliminaries and site establishment;
2. Vegetation pruning / removal;
3. Confirmation of encapsulation area;
4. Onsite encapsulation concept;
5. Civil design of encapsulation;
6. Validation of encapsulation works;
7. Reporting (validation report and LTEMP document).

Details regarding each remediation stage, have been outlined below.

8.2 Option 7: Offsite Disposal

8.2.1 Preliminaries and Site Establishment

Prior to remediation works commencing, the following documentation must be prepared by the licenced contractor to ensure the specifics of excavation, and human health and environmental protection during all remediation works at the landscaped area:

- A Health and Safety Management Plan / Asbestos Removal Control Plan / Hazardous Materials Removal Control Plan and Safe Work Method Statement detailing the proposed works and site-specific control measures including decontamination requirements. All works involving asbestos or hazardous materials must be undertaken in accordance with approved plans, and the recommendations in **Section 9**. An assessment of the current interim controls should be conducted and amended controls put in place as necessary.
- A Soil Excavation, Encapsulation, and Disposal Management Plan (or similar) must be prepared to coordinate the works required to meet the remediation and validation requirements set out in this RAP. It is recommended that this plan is reviewed by the environmental consultant to flag any unresolved issues.
- A Construction Environmental Management Plan detailing the environmental controls required, including the temporary relocation of hospital related infrastructure (if required) so that the field works can be completed. Further details are provided in **Section 9**.
- A notification to SafeWork NSW of the Intention to Remove Friable and Non-Friable Asbestos must be lodged with sufficient notice time.
- Notification to stakeholders in accordance with DPIE protocols.

Site establishment including trimming of existing trees and shrubs, setup of amenities, decontamination areas, staging, and stockpile areas is to be undertaken as per a works plan agreed with relevant stakeholders.

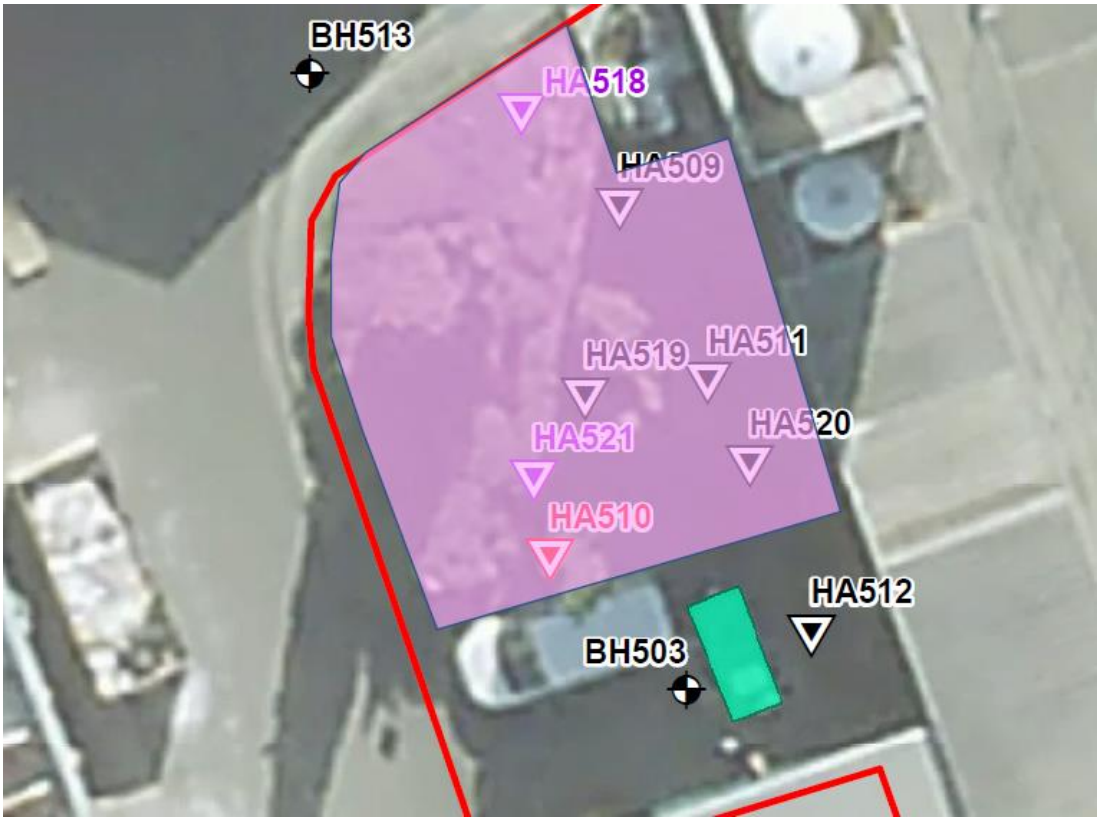
8.2.2 Vegetation Pruning / Removal

Due to the high likelihood of friable asbestos being disturbed during vegetation pruning and removal, and during remedial earthworks, the works must be done under controlled conditions with asbestos air monitoring completed.

8.2.3 Extent of Remedial Excavation

The landscaped area should be excavated and validated to the extent specified by the environmental consultant who is overseeing the validation. Based on current information the lateral extent of the landscaped area requiring remediation has been estimated below on and is represented by pink-shaded polygon.

Figure 8-1 Estimated Remediation Area (pink polygon)



The lateral extent of the remedial mechanical excavations will be within the confines of the landscape area (see pink polygon, also shown on **Figure 2**, **Appendix A**), subject to not encountering nearby hazardous and/or physical constraints not being encountered such as underground utilities, roads, buildings and structures.

Vertical excavation of asbestos contaminated material shall continue until the analytical results indicate compliance with the soil validation criteria. If results indicate that additional excavation is necessary, the vertical excavation shall be extended until the excavation surface samples indicate that the location is validated as meeting the criteria for each respective contaminant. Near site boundaries, excavations should extend to a safe distance so as to not undermine off-site lands or onsite assets such as utilities, footpaths, buildings and structures. To reduce the likelihood of unexpected finds, prior to commencement of excavation all subsurface utilities must be located and other constraints identified.

Where contamination extends to the landscaped area boundary and cannot be further excavated, an assessment of Duty to Report should be undertaken and suitable measures to stop contamination from re-entering the landscaped area should be designed, implemented, and validated.

8.2.4 Stockpiling and Waste Classification

Prior to being removed from the landscaped area, excavated soils must be classified in accordance with the EPA *Waste Classification Guidelines* (EPA 2014). Under these guidelines, fill or natural soils may be classified into the following groups: *General Solid Waste*, *Restricted Solid Waste* or *Hazardous Waste*, subject to chemical assessment using NATA-registered laboratory methods for total and leachable contaminant levels. Any soils containing asbestos would also be classified as *Special Waste (Asbestos)*.

In accordance with the *NSW Waste Regulation 2014*, waste soils must only be disposed to a waste facility that is appropriately licenced to receive the incoming waste.

Unexpected material may need to be segregated depending on the source of the waste, prior to conducting waste classification assessment. This approach is discussed in more detail under *Contingency Plan* in **Section 12**.

Stantec recommends excavation and stockpiling of each waste stream, soil type, fill type, and/or area followed by check sampling to confirm the final classification of material for off-site disposal. Where different soil types are mixed together, this can inadvertently lead to increased soil management and disposal costs.

Excavated soils should be stockpiled adjacent to the excavation on either hardstand, lined surfaces (i.e. with builders' plastic) or within skip bins (covered), prior to sampling the stockpile for waste classification purposes. Areas with known asbestos should be stockpiled separately and soils with known friable and bonded ACM should also be stockpiled separately. Stockpiles should be placed in a safe area that will not pose risk to human health, environment, potential off-site migrations, the localised terrain (i.e. slopes that may fail due to overburden pressures), and climatic conditions that could cause severe collapse, erosion, or run-off. Should the soils be placed on bare soil or un-lined surfaces then validation sampling and an inspection of the underlying soils will need to be undertaken following the removal of the stockpiled soil.

The stockpiled materials must be classified in accordance with the NSW EPA (2014) *Waste Classification Guidelines, Part 1: Classifying Waste*, prior to disposal offsite. The waste classification process in summary will include the following:

- Existing soil analyses results from boreholes or test pits completed as part of the DSI are to be used in the assessment;
- Collection of one sample per 25 m^3 of stockpiled material, as per NEPM (2013) guidelines. A minimum of three samples is required for waste classification purposes for stockpiles <25 m^3;
- A statistical analysis approach may be used for classification, with the collection of at least 10 samples;
- Laboratory Analysis of all collected soil samples for metals, TRHs, PAHs, BTEX, OC/OP pesticides, and PCBs and asbestos, considerate of results gathered during previous investigation within the Landscape Area. Leachability analysis for select analytes may be required should impacts exceed CT criteria (as outlined in the Waste Classification guidelines); and
- Preparation of a waste classification report per stockpile detailing the material sampled, analytical results and overall classification for offsite disposal purposes.

As noted in **Section 3.1**, the contaminated soils within the landscaped area have a preliminary waste classification of Special Waste (Asbestos)-General Solid Waste. Careful segregation of this material should be undertaken to avoid cross contamination. Failure to segregate could result in a larger volume being classified needlessly as Special Waste (Asbestos) resulting in unnecessary on-site management, excavation, transport and disposal costs. Asbestos waste must be reported and tracked via the NSW EPA's WasteLocate tracking program, in accordance with Clause 79 of the POEO (Waste) Regulation 2014.

General waste handling (including transport and loading) and management procedures are outlined in **Section 9.1.1**. Waste must be tracked and disposed offsite at appropriately licenced facilities in accordance with the NSW EPA requirements. As such, in accordance with the *Protection of the Environment Operations (POEO)* Waste Regulation 2014, a tracking register will need to be maintained along with the collation of waste weighbridge disposal dockets from the receiving facilities for validation purposes. An example of a suitable waste tracking template has been provided in **Appendix C**.

8.2.5 Site Validation

Upon removal of all contaminated soils, clearance inspection and validation of the remaining soils along the base and walls of excavations is to be completed, prior to the commencement of any backfilling or further excavation works. Validation must also include documentation that the contaminated soils were managed and placed in the appropriate location as approved in this RAP, either on-site or off-site

An asbestos clearance walkover and issuance of a certificate is to be undertaken on final excavated ground surfaces within the remediation excavation prior to backfilling and issued by a Competent Person as defined by the SafeWork NSW Code of Practice. This clearance certificate does not validate the excavation from a contamination perspective but indicates that the area meets WHS Regulation asbestos requirements to re-occupy the space for work. Following the clearance inspection and issuance of a clearance certificate, validation soil samples must be obtained by an environmental consultant to confirm that asbestos is not present in the soil that exceed human health criteria as set out in this RAP, and/or other stakeholder requirements that could be more conservative (i.e. no asbestos present).

For the off-site disposal option, additional soil samples and analyses will be required to:

- Validate the excavated soil surface where removal of asbestos contaminated soil and materials has occurred;
- Validate that sources of imported soil are suitable for the proposed public open space land use and is not a potential source of contamination.

8.2.6 Validation and Imported Material Sampling

The collection of validation soil samples will be based on a uniform grid pattern as well as judgemental targeted samples as necessary. Details of the validation sampling is provided in **Table 8-1** below.

Table 8-1 Soil Asbestos Validation Sampling Summary

Activity	Details
Primary Sampling Frequency	▪ Linear – 1 sampling location per 5m length. ▪ Vertical on side walls –1 sampling location per 0.5m depth of excavation or change in soil horizon. ▪ Base – 1 sample per 12.5m^2 (double density). ▪ Additional targeted samples as required based on identification via visual assessment of targets or areas of concern.
Quality Control Sampling Frequency	▪ Duplicate sample: 1 per 20 samples analysed. ▪ Triplicate sample: 1 per 20 samples analysed. ▪ Rinsate sample: Not required for asbestos validation. ▪ Trip blank: Not required for asbestos validation. ▪ Trip spike: Not required for asbestos validation.
Soil Sampling	▪ The exposed surface dimensions are to be measured in the field and a grid pattern overlaid prior to sampling. ▪ Soil samples are to be collected directly from the exposed soil surface at the designated grid or targeted location on the walls and bases of the excavated area; or where access to the exposed soil surface is not safe, then soil samples must be retrieved via an excavator and the validation sample subsequently retrieved from the excavator bucket (from soil that has not come in contact with the excavator bucket). ▪ Prior to collection of soil sample for laboratory analyses, the field screening method outlined in WA DoH (2009) must be conducted on-site, or in the laboratory. This involves: Visual assessment at each sample location; collection of a 10L soil sample per location that is then either sieved through 7mm sieve or spread onto a coloured tarp for visual assessment and identification of any asbestos fragments >7mm (i.e. ACM); and massing of the asbestos greater than 7 mm. ▪ Following the 10L screening process, a 500 mL (approx. 750 g) soil sample is to be collected from the origin of the 10 L soil sample in the excavated ground for laboratory analyses of friable asbestos. This 500 mL soil sample must not come from the 10L soil sample. ▪ This WA DoH process is to be conducted on soil samples from the walls and bases of the excavated area at the frequencies noted above, however, the frequency of the 10L field screening may be reduced where justified and documented by the environmental consultant on the basis that the risk is low and acceptable. ▪ All soil samples are to be handled using disposable nitrile gloves and transferred to laboratory provided glass jars and sampling bags. The soil samples are to be collected on the same day as excavation to ensure that contaminants prone to degradation / weathering (if applicable) are representative.
Laboratory Analyses	Primary and QAQC validation soil samples to be analysed for Asbestos speciation and quantification as per WA DoH. Primary and duplicate soil samples to be submitted to a National Association of Testing Authorities, Australia (NATA) accredited laboratory.
Soil Logging	Soils encountered during the investigation to be described and logged in accordance with Australian Standard AS 1726:2017 – Geotechnical site investigations.
Soil sample containers and holding times	Up to a 1kg resealable bags and/or 10 litre resealable plastic (polyethylene) container/no refrigeration/indefinite holding time. Asbestos fragments to be double bagged. Indefinite holding time.
Decontamination Procedure	Reusable sampling equipment such as hand tools (shovel, trowel, mattock), to be free of soil and matter by washing with potable water, clean wire brush, rinse with potable water.
Sample Preservation and Transport	Samples to be protected from crushing, breaking, grinding activities that would make them airborne following collection and during transit. No chemical preservation required. Samples are to be securely stored in a closed esky following collection and in transit to laboratory and to be managed under Chain of Custody management and documentation.

Activity	Details
Quality Control	Field duplicate samples are to be collected for QA/QC purposes, by carefully mixing the material and distributing evenly between sampling containers. Quality assurance (QA) and quality control (QC) procedures as outlined in **Section 6** will be adopted throughout the field sampling program to ensure sampling precision and accuracy.
Imported materials to backfill the excavated areas	Material imported to the landscaped area for the intention of engineering or landscaping purposes must meet the criteria set out in **Table 8-2** below and must be accompanied by suitable documentation. Classification documentation must include material source, site history summary, volume and descriptions, sampling methodology and laboratory analysis results and in the case of VENM, a certificate as per the NSW EPA VENM form. Each load of imported soils must be inspected by an appropriately experienced and suitably qualified environmental consultant to confirm that the material is consistent with the description of the accompanying Waste Classification or Resource Recovery report. In addition to meeting VENM or RRO sampling compliance requirements, any imported soil backfill materials must also be sampled and analysed at a minimum rate of one sample per 75 m^3 with at least three (3) samples per source. Material must also be considered geotechnically and aesthetically suitable by the validation environmental consultant and/or geotechnical engineer. A register of imported material is to be provided to and maintained by the validation environmental consultant which will include the origin of the material, classification type, volumes, date of importation, photographs and a description of imported material. Laboratory analysis must include the following contaminants analytes: ▪ For VENM: metals, TRHs, PAHs, BTEX, OC/OP pesticides, PCBs, asbestos, pH; and any other contaminants associated with the history of the source site; ▪ For RRO Compliance: As per the RRO and Exemption; metals, TRHs, PAHs, BTEX, OC/OP pesticides, PCBs, asbestos; and any other contaminants associated with the history of the source site; ▪ For leachability: ASLP (where requested by the environmental consultant) If the material does not have suitable properties, then the material should be rejected and not reinstated within the landscaped area.
	Soil sample containers and holding times: ▪ Asbestos – up to a 1kg resealable bags and/or 10 litre resealable plastic (polyethylene) container/no refrigeration/indefinite holding time. ▪ Metals - 250g glass jar / refrigeration 4oC / 6 months (maximum holding period). ▪ TRH/VOCs - 250g glass jar / refrigeration 4oC / 14 days (maximum holding period). ▪ PAH/OCP/OPP/PCB - 250g glass jar / refrigeration 4oC / 14 days (maximum holding period).
	Decontamination Procedure: Reusable sampling equipment such as hand tools (shovel, trowel, mattock), to be decontaminated by washing with phosphate free detergent (Decon 90) followed by a rinse with potable water.
	Sample Preservation and Transport: Samples will be placed directly into laboratory supplied containers and stored on ice in an ice box while on site and in transit to the laboratory under Chain of Custody documentation.

8.2.7 Validation Soil Criteria – Off-site Disposal Option

Specific adopted soil validation criteria for the landscaped area have been obtained from the NEPC 2013 and are further presented in **Table 8-1** to **Table 8-2** below. All retained soils and/or bedrock must be below the adopted criteria, ensuring the contaminated soils have been adequately removed such that there are no complete exposure pathways.

Soils remaining onsite must also comply with the aesthetic requirements provided in Section 3.6 of Schedule B1 of the NEPM (NEPC, 1999). The general assessment considerations include:

> The risk for a person to be injured by metal, glass or other sharp objects;

> That chemically discoloured soils or large quantities of various types of insert refuse, particularly if unsightly, may cause ongoing concerns to landscaped area users;

- The depth of any residue in relation to the final surface of the site; and
- The need for and practicality of any long-term management of foreign material.
- Soils remaining within the landscaped area should be such that at surface there is no detectable odour, identifiable staining or large quantities of inert waste.

Table 8-2 Soil Validation Criteria

Value	Guideline	Criteria
Human Health	NEPC, 2013, Schedule B1, Section 4, Table 7.	**For asbestos**: ▪ No asbestos for surface soils (top 100mm). ▪ HSL-C: for bonded ACM 0.02% w/w ▪ 0.001% w/w for friable asbestos in soil
Imported material	• NEPC, 2013, Schedule B1, Section 6, Tables 1A(1) and 1A(3); For asbestos: Section 4, Table 7. • NEMP 2.0 • NSW EPA Waste Classification Guidelines 2014, Virgin Excavated Natural Material (VENM) • NSW EPA Resource Recovery Order and Exemption	Imported material (backfill soils, topsoils, and mulches) from off-landscaped area to be used in the landscape areas must meet all of the following criteria: • Must be accepted in writing by the landowner. • Must be soils that are lawfully allowed to be transported to the landscaped area. **Human Health:** • Health Investigation Level (HIL) for Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths (HIL-C). • Health Screening Level (HSL) for Public open space (HSL-C). **Human Health For asbestos**: • No visible asbestos for surface soils. • HSL-C: for bonded ACM 0.02% w/w • 0.001% w/w for friable asbestos in soil **Ecological**: • Ecological Screening Level (ESL) for urban residential and public open space, coarse soil, 0-2m. • Ecological Investigation Level (EIL) for urban residential and public open space, aged, NSW setting, high traffic. • All aesthetic criteria noted in **Section 8.2.7** above. • pH from 5 to 9 (maximum average). • Must not contain acid sulphate soils. • Must not leach any contaminant above the adopted groundwater criteria for protection of aquatic ecosystems under Australian Standard Leaching Procedure (ASLP) and have a $Log_{10}Kd$ value greater than 3 (indicating a low capacity to leach). **And either** • VENM criteria as outlined under the NSW EPA Framework; or, • A NSW EPA Resource Recovery Order and Exemption. **And**, • All requirements set out by the project geotechnical engineer and landscape designer.

8.2.8 Validation Reporting

Following the completion of all remedial works, a Remediation and Site Validation Report must be prepared in accordance with the NSW EPA (2020) guidelines, detailing the following:

- A clear description of the remedial works undertaken, the validation carried out and the final condition of the landscaped area;
- Assess the results of the post-remediation testing against the remediation criteria stated in the RAP. Where these criteria have not been achieved, reasons must be stated and additional work proposed to achieve

the original objectives, or a management plan put in place. Should any unexpected finds be encountered during the works, then the unexpected finds protocol will need to be implemented, along with an addendum to this RAP; and

> The report will provide a conclusive statement regarding the status of the landscaped area with respect to risks to ecological and human receptors. In the event that residual contamination could not be removed, such as due to the presence of buildings and subsurface utilise, the Validation Report must specify any requirements for ongoing management and a management plan prepared (as necessary).

8.3 Option 9: Onsite Encapsulation

8.3.1 Preliminaries and Site Establishment

Prior to remediation works commencing, the following documentation must be prepared by the licenced contractor to ensure the specifics of excavation, on-site encapsulation, and human health and environmental protection during all remediation works at the landscaped area:

> A Health and Safety Management Plan / Asbestos Removal Control Plan / Hazardous Materials Removal Control Plan and Safe Work Method Statement detailing the proposed works and site-specific control measures including decontamination requirements. All works involving asbestos or hazardous materials must be undertaken in accordance with approved plans, and the recommendations in **Section 9**.

> A Soil Excavation, Encapsulation, and Disposal Management Plan (or similar with naming revised to meet the project objectives) must be prepared to coordinate the works required to meet the remediation and validation requirements set out in this RAP. It is recommended that this plan is reviewed by the environmental consultant to flag any unresolved issues.

> A Construction Environmental Management Plan detailing the environmental controls required, including the temporary relocation of hospital related infrastructure (if required) so that the field works can be completed. Further details are provided in **Section 9**.

> A notification to SafeWork NSW of the Intention to Remove Friable and Non-Friable Asbestos must be lodged with sufficient notice time.

> Notification to stakeholders in accordance with DPIE protocols.

Site establishment including trimming of existing trees and shrubs, setup of amenities, decontamination areas, staging, and stockpile areas is to be undertaken as per a works plan agreed with relevant stakeholders.

8.3.2 Vegetation Pruning / Removal

Following the trimming and removal of the existing shrubs and trees found within the landscaped area (as necessary).

Due to the high likelihood of friable asbestos being disturbed during vegetation pruning and removal the works must be done under controlled conditions with asbestos air monitoring completed.

8.3.3 Confirmation of Encapsulation Area

The locations of material requiring encapsulation should be confirmed by the following:

- A levels and features survey of the remediation area and immediate surrounds prior to disturbance to enable these features to be incorporated into the design and to determine proposed grading, design and construction requirements and any soil volumes that may need to be removed.
- Utility locate to identify any services in the area. Soils above and surrounding utilities to extent practical will need to be removed in accordance with **Section 8.2** to prevent future exposure to workers during potential utility repairs.

This information should be used to consider the feasibility and details of encapsulation and would require consultation with applicable stakeholders including HI and LHD.

8.3.4 Onsite Encapsulation Concept

The soil contaminated by asbestos may be managed by onsite in-situ encapsulation such that they are located beneath an appropriate cover that should include as a minimum, a marker layer, and clean asbestos-free approved material(s).

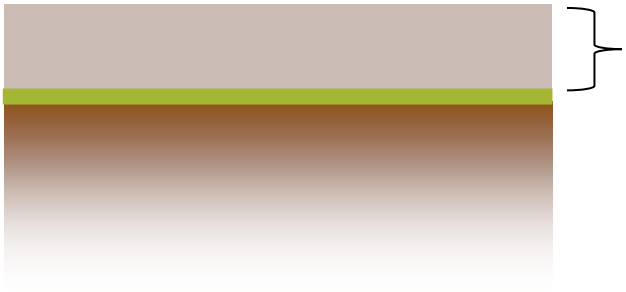
Given the hospital setting, the landscaped setting and the presence of both bonded and fibrous asbestos, a minimum 0.7m thick capping layer is recommended over the area. Where existing utilities are located within the proposed landscape remediation area, it is recommended that the remediation and validation approach outlined in **Section 8.2** is conducted.

Once the remediation area is prepared for placement of an encapsulation layer, the encapsulation works would consist of:

- Vertical and horizontal survey of the top and boundary of the contaminated ground surface;
- Placement and securing of a marker layer extending a minimum distance beyond the edges of the contaminated area (as per a final design) including along the vertical or sub-vertical slopes of utility trenches;
- Placement of a clean approved capping layer soil/material across and above the marker layer to the prescribed design thickness;
- Placement of surface finishing to final grades;
- Survey of final capped surface and boundary to confirm capping thickness is appropriate and meets the design requirements.

A schematic of the proposed capping is shown below as **Figure 8-1**.

Figure 8-1 Schematic of Capping



8.3.5 Civil Design of Encapsulation

A civil design of the proposed encapsulation must be prepared to ensure that grading, drainage, boundary/edge design, and utility conflicts are confirmed. As a capping layer on the existing grade will increase the site grade, this placement may not be appropriate and the design may require some excavation and disposal of soils, or other civil constructions (i.e. retaining structures) to meet the capping thickness design.

It is recommended that prior to construction, a design specification is prepared consistent with the clients civil and structural requirements for the proposed encapsulation area.

8.3.6 Validation of Encapsulation Works

Each element of the design and site works must be validated to ensure that they meet the RAP requirements and objectives. Hold Points should be in place at each of the Validation requirements as follows:

- Design approval including remediation design, landscaping, geotechnical, and structural designs (if any);
- Set-out and survey of contamination area;
- Site preparation;
- Results of any laboratory soil analyses;
- Approval of any imported capping materials (i.e. marker layer and soils, topsoils, mulches, plantings);
- Placement of capping layer;

- Survey of completed construction. The survey is to be compliant with NSW survey legislation;
- Any other Hold Points prescribed by other relevant stakeholders.

Capping layer construction works should be observed by the environmental consultant.

- Tracking of material and survey of final encapsulation construction including elevations and lateral extents should be managed by the remediation contractor and the information supplied to the environmental consultant for inclusion in the remediation and site validation report. Any discrepancies from the approved remediation design are to be justified by the remediation contractor.

Should reinstatement of remedial excavations require importation of backfill soils from off-site source(s), the imported materials must be deemed suitable prior to importation to the landscaped area and is to meet the criteria outlined in **Table 8-2**. Any validation sampling as part of this process is to be completed in accordance with the procedure outlined in **Table 8-1**.

8.3.7 Validation Reporting and LTEMP

Following the completion of all remedial works onsite, a Remediation and Site Validation Report must be prepared in accordance with the NSW EPA (2020) guidelines, detailing the following:

- A clear description of the remedial works undertaken, the validation carried out and the final condition of the landscaped area. Should any unexpected finds be encountered during the works, then the unexpected finds protocol will need to be implemented, along with an addendum to this RAP; and
- The report will provide a conclusive statement regarding the status of the landscaped area with respect to risks to ecological and human receptors.

As part of the Option 9 remedial strategy, a Long-Term Environmental Management Plan (LTEMP) is to be prepared by the environmental consultant in accordance with the NSW EPA guidelines. The LTEMP is to be reviewed by appropriate stakeholders and the appointed NSW EPA Accredited Site Auditor before it is submitted to Council.

9 Construction Environmental and Waste Management Plan

The following sections provide frameworks for a Construction Environmental and Waste Management Plan which identifies measures required to minimise the potential impact of works on the local environment, site workers and third parties. In all cases, environmental issues necessary permits and approvals must be managed by the Principal Contractor in accordance with good environmental management practices and as requested, periodic supervision and documentation by the appointed environmental consultant. The purpose of these measures is to prevent site workers, the public and environmental exposure to potential health risks associated with these works.

9.1 Stockpile Management

Soil placed in stockpiles are to be tracked according to the location of removal and location of stockpile. Stockpiles in place longer than 24 hours are to be placed on an impervious base away from steep slopes and in a location that will not be subject to run-off, compacted and covered with geofabric or similar.

Stockpiles are to be contoured to minimise the loss of material during rainfall, with upstream drainage and levee banks installed to divert water flows around the stockpile. Silt fencing is to be appropriately placed and installed to avoid sediment loading of stormwater drains and pipes. The installation of these controls is to be undertaken in accordance with the Landcom (2004) “Blue Book”.

The stockpile(s) should be clearly labelled, with stockpiles containing asbestos materials appropriately identified with warning signage. In the event that larger stockpiles of asbestos, an area can be lined with plastic and used as a stockpiling area. Any stockpiled asbestos impacted material should be dampened and covered with either geofabric layer or black plastic, which is to be disposed of as asbestos waste after completion of asbestos works.

The location, positioning, sizes, and management of stockpiles is to be made by the Site Manager in consideration of potential risks to humans, the local environment, to prevent potential off-site migration via run-off and air dispersion, and health, safety, environment, and security considerations.

9.1.1 Waste Management and Tracking

Any wastes generated as part of remediation and construction works will have to be classified in accordance with NSW EPA (2014) Waste Classification Guidelines and this report prior to disposal off-site.

Tracking of waste movements around the site and material transported off-site for disposal is a critical component to demonstrate the remedial strategy is being implemented appropriately. Waste tracking will be achieved through copies of weighbridge slips, tip dockets and consignment disposal confirmation (where appropriate, including NSW EPA WasteLocate), survey of stockpiled materials or excavations and photographic documentation of movements of soil around and off-site. A site log or a waste tracking software application shall be implemented and maintained by waste generator (or on their behalf). All waste stockpiles must be marked to enable the tracking of disposed loads against on-site origin and location of the waste. Such information should be provided to the site owner for reporting purposes. A suitably qualified environmental professional should be present on-site to oversee the remedial works to ensure that appropriate waste tracking procedures are employed.

Particular recommendations for potential Hazardous Waste are to be sought after from the environmental consultant.

All the tracking records should be maintained in a template similar to that provided in **Appendix C** and be reviewed by a competent person.

9.2 Excavation Water Management

It is not anticipated that the water table or dewatering will be required as part of the remediation works. Should any excavations or works accumulate water, or if dewatering is required, water contained or that collects in the soil excavations are to managed in accordance with the Local Water Authority and EPA disposal requirements. The details of the discharge/disposal requirements of any water that collects in the excavation will require further consideration during the remedial and validation works. Any water intended for disposal (either off-site or to stormwater/sanitary sewer) will require sampling to ensure it meets discharge water quality requirements.

9.3 Air and Dust

9.3.1 Odours

Due to the nature of impact on-site, it is not anticipated that excessive odours will result from remediation works. However, qualified and experienced technical staff will be on site during all excavation works and should excessive odour be generated as a result of the process, then on-site spraying of the excavated material with a suitable odour suppressant (i.e. Anotec) must be undertaken to minimise any odour. Other treatment options include:

- A reduction in the size of the excavation face that is open at any one time to reduce the surface area generating the odour;
- Location of any temporary stockpiles of impacted soil as far as possible (and in the predominant down wind direction) from sensitive receptors;
- Smothering of the odours by covering the portion of the site that is generating the odour; and
- Minimal spraying of the stockpiles and excavations to minimise volatile emissions.

9.3.2 Dust Control

The Principal Contractor will be responsible for ensuring that dust is managed during excavation, loading, carting, and stockpiling operations. Dust mitigation measures include; but are not limited to:

- Stockpile protection;
- Water application on stockpiles and access roads;
- Limiting the area of exposed excavations and surfaces;
- Wind fences around earthworks areas; and
- Air monitoring.

In the event that excessive dust is generated during any operations on-site, the works will cease and modifications to the process will be made before the operation is resumed. There must be no observable dust transported off-site.

9.4 Removal of Asbestos Waste

Based on results of previous investigations, fill materials and soils onsite contain asbestos.

Any asbestos removal activities are to be conducted in accordance with current legislation and the SafeWork NSW (2019) Code of Practice: *How to Safely Remove Asbestos* and SafeWork NSW (2014) *Managing Asbestos in or on Soil*. This includes:

- Preparation of an Asbestos Removal Control Plan (ARCP) by an appropriately licenced asbestos removal contractor;
- Notification and seeking of approvals from SafeWork NSW at least five business days prior to removal works commencing;
- Establishment of appropriate controls required for asbestos removal works for either friable or bonded asbestos. Asbestos controls for friable asbestos include:
  - Establish an exclusion zone, appropriately signed;
  - The exclusion zone will have one entry and exit point with a decontamination unit set-up;
  - The exclusion zone will have appropriate dust suppression (water misting) controls in place during the removal works;
  - Prior to entering the exclusion zone, appropriate PPE will need to be worn, including Tyvek coveralls (appropriate category and class), tyvek boot covers (or gumboots), half face or full-face respirator (recently fit tested), safety glasses and disposable nitrile gloves. All PPE will need to be wetted down and or discarded prior to leaving the exclusion zone;
- Removal conducted by an appropriately licenced asbestos removalist, Class A for friable;
- Asbestos air monitoring is to be undertaken for the duration of the removal of friable asbestos, which will be set-up by a Licenced Asbestos Assessor (LAA) and fibres will be counted by a NATA accredited

laboratory. Air monitoring is also recommended during pruning and vegetation removal and during the data gap investigation; and

- Independent competent person (bonded) or NSW Licensed Asbestos Assessor (friable) providing clearance and validation sampling at the end of the removal works.

Should additional asbestos be identified outside of the prescribed areas subject to remediation, then all works in the area must cease, with the Unexpected Finds Protocol (UFP) must be implemented with an additional Asbestos Removal Control Plan (ARCP) being prepared to guide future works in the area, including remediation of the identified asbestos contamination.

9.5 Acid Sulfate Soils Management (if required)

Acid Sulfate Soils (ASS) or Potential Acid Sulfate Soils (PASS) have not been identified at the site, therefore an Acid Sulfate Soils Management Plan is not required. During the remedial process if soils exposed display signs of ASS/PASS, sampling and laboratory analysis should be undertaken to ensure that soils are not ASS or PASS. Investigation and assessment for ASS/PASS should only be undertaken by a competent environmental professional as both field and laboratory procedures are required.

The following observations can be used for preliminary indications of ASS:

- Rust-coloured iron stains on drain surfaces;
- Butter-coloured jarosite present in surface spoil;
- Red, iron oxide mottling or corrosion of concrete and/or steel structures.

The following observations can be used for preliminary indications of PASS:

- Any soils that are naturally waterlogged;
- Mid to dark grey to dark greenish grey in colour; and
- Soft, buttery consistency of a clay.

ASS/PASS are not to be imported to the site.

9.6 Unexpected Finds

In the case that an environmental consultant is not available for oversight, workers are to be vigilant for observations of hazardous or biological materials that may be uncovered during excavations. Unexpected finds may include, but are not limited to, odour, visual contamination, ASS or PASS, deleterious material inclusions (i.e. biological matter), asbestos containing material, Underground Storage Tanks (USTs) or any other suspect materials. Any unexpected finds will be reported to the Contractor's on-site manager immediately. Additionally, the site owner/occupier should be informed as soon as practical following an unexpected find.

If hazardous or biological materials are uncovered / discovered during excavations the Contractor shall:

- Cease all work in that vicinity (and fence the area if safe to do so and appropriate);
- Remove workers from the vicinity;
- An experienced environmental consultant should be contacted to assess the potential risks associated with the Unexpected Finds and provide appropriate management options;
- Investigate the nature of the risk of the materials, determine the appropriate response and document the actions in accordance with contractual obligations.

In the event of a serious unexpected find, which could cause immediate harm to human health and/or the environment, the City of Sydney Council and the NSW EPA may need to be informed.

The risks posed by the removal works to Aboriginal or European heritage are expected to be minimal. However, in the event potential heritage items are encountered during excavations, works will cease and the Site Supervisor notified.

In the case of observations of biological, clinical and/or related waste (clinical waste, cytotoxic waste, pharmaceutical drug or medicine waste, and/or sharps waste) as defined in the NSW EPA Waste Classification Guidelines (2014) and/or defined by NSW Health (https://www.health.nsw.gov.au/environment/clinicalwaste/Pages/default.aspx) all works should stop. Clinical and related wastes discovered within soil (as buried) may be deemed an incident and may be subject to other legislative requirements regarding who must be informed if there is an incident. Stantec considers that

the highest risk area for potentially encountering this sort of contaminant are buildings currently and historically associated with pathology and clinical waste management. Mainly due to the type of activities that have been completed there.

9.7 Stormwater

9.7.1 Erosion and Sediment Control

Cleared areas and exposed excavations may promote erosion. The following erosion and sediment controls are to be implemented:

- Limiting the extent of cleared areas and exposed excavations;
- Backfilling of excavated areas as soon as practicable;
- Diversion of stormwater from active areas using hay bales or sediment fences;
- Covering of temporary stockpiles with plastic (HDPE) or geofabric and placement of silt socks around excavations when necessary;
- Covering open stormwater grates in the vicinity of stormwater pits and excavations with silt fences or other appropriate materials;
- Placement of stockpiles away from footpaths, roadways, kerbs, access ways, drainage lines, natural or man-made slopes, and property boundaries;
- Minimising translocation of contaminated soils throughout the site by ensuring excavator operators do not track over contaminated areas;
- If possible, a single vehicle entry and exit to minimise translocating soil; and
- Depending on the volume of soil to be excavated, rumble strips may be required at the site access in order to prevent contaminated soil being transported off-site.
- Additional preventative measures should be undertaken on the basis of severe climatic conditions.

9.7.2 Water Management

Stormwater runoff quality may be adversely affected in the event of rainfall. Hay bales or similar mitigation measures are to be placed near down-gradient stormwater entry points to prevent entry of contaminated sediment to stormwater, which may result from the project works.

Additional preventative measures should be undertaken on the basis of severe climatic conditions.

9.8 Noise

Hours of operation, noise control and noise generating activities are to comply with the Client and local Council requirements for the project.

9.9 Land Disturbance

Works may include excavation, loading, carting and stockpiling operations of associated soils. These works shall be carried out in an orderly manner to minimise impact to the surrounding residential properties.

- Excavation – the removal of soil shall be performed by the appointed licensed excavation contractor using appropriate methodology given the tight access requirements. If a transport truck is not on-site during excavation and soil will need to be temporarily stockpiled, no contaminated soils should be placed on areas validated as suitable for the proposed land use. In these locations, soil shall be excavated and placed on black plastic liners or on concrete surfaces in discrete stockpiles prior to off-site disposal. Stockpiles should be segregated for each potential contamination source.
- Loading and Carting – the loading of the stockpile material shall occur with an appropriately sized machinery to minimise and control potential transmission of dust. The trucks and trailers shall be covered for transport as deemed necessary, and shall meet any other statutory requirements.

9.10 General

The appointed Principal Contractor shall ensure compliance with relevant SafeWork NSW guidelines and Work Health and Safety Acts and Regulations. The Principal Contractor shall also ensure compliance with any amendments to the Act or Regulations during the project duration.

The Principal Contractor shall monitor and control the access of all persons to the site and ensure that no unauthorised persons enter the site during remedial works (wherever practicable). All site personnel and visitors will be inducted and shall wear appropriate personal protective equipment (PPE).

The appointed Principal Contractor shall undertake additional underground and overhead service location specifically in areas surrounding the remediation location.

Any open excavation(s) are to be barricaded in accordance with the NSW Work Health and Safety Act; Clause 16 (1) and the Construction Safety Regulation Section 73, as administered by SafeWork NSW.

The appointed Principal Contractor shall install warning signs on the barricades surrounding the excavations, including but not limited to: DANGER: OPEN EXCAVATIONS; DANGER: NO SMOKING.

9.10.1 Vehicles

The appointed Principal Contractor shall ensure all vehicles are suitably contained and covered in the transport of all debris, spoil, rubbish and materials to or from the site, such that spillage or contamination of adjoining and other areas or property shall be prevented.

Vehicles shall also be maintained to prevent the transfer of mud or wastes onto adjacent streets or other areas. If wheel treads contain significant quantities of site soils the contractor is to manually remove and dispose in stockpiles.

Measures shall be implemented to ensure no contaminated material is spilled onto public roadways or tracked off-site on vehicle wheels. Such measures could include the deployment of a vehicle washing/cleaning facility, which should be placed at a location before the site egress. The facility shall be capable of handling all vehicles and plant operating on site. Residue from the cleaning facility is to be deemed contaminated unless show by validation to be below Reportable Acceptance Criteria

9.10.2 Traffic Control

The Principal Contractor shall supply signs and safety cones; erect at the appropriate entry and exit points; and maintain these devices in good condition. Excavation works, stockpiles and other hazards, shall be individually barricaded at all times. The site is to be fully fenced to exclude the public.

On-site pedestrian traffic will be averted from the work areas and excavation by means of signage, fencing and safety barricading.

9.10.3 Refuse Disposal

All site refuse, including food, equipment wrappings, unused materials, etc. shall be handled and disposed of appropriately into a skip.

9.10.4 Site Security

The site shall be secured by a lockable fence around the perimeter of the site and access to the site is to be restricted. All excavations and above-ground remediation equipment will be barricaded with reflective barricades, with pertinent reflective signage. Keys to the gate will be restricted to approved personnel.

9.10.5 Roles and Responsibilities

9.10.5.1 Client

A summary of the client's role and responsibilities includes:

- Overall responsibility for the project development and outcomes of the RAP;
- Formal and agreed delegation of roles and responsibilities to agents as needed;
- Liaison with neighbours and other stakeholders;
- Engagement of environmental management consultant to oversee implementation of the RAP;
- Engagement of contractors to perform further investigation works, and any subsequent contaminated soil disposal and site rehabilitation works as required;
- Provision of health and safety measures for site personnel and the works area; and
- Maintain relevant records associated with the RAP.

9.10.5.1.1 Distribution of RAP

The RAP and any subsequent amendments must be distributed by the client to the following parties:

- Current Site Owner;
- City of Sydney Council and any other authority such as the EPA Accredited Site Auditor (if applicable); and
- Remediation Contractor responsible for remedial works, construction, demolition, management and maintenance of the site.

9.10.5.2 Principal Contractor

The Principal Contractor engaged for the management of impacted soils must:

- Notify SafeWork NSW of any asbestos removal works and receive any required permits and approvals from relevant project stakeholders;
- Undertake all works in compliance with the provisions of the RAP;
- Coordinate works with the Client, its agents, and Environmental Consultant;
- Liaison with site supervisor regarding progress of works;
- Report any environmental incidents and unexpected finds to the site supervisor;
- Collate all project documentation including landfill disposal dockets (where relevant); and
- Conduct works in accordance with the Site WH&S plan.

9.10.5.3 Environmental Consultant

A suitably qualified environmental consultant familiar with the implementation of environmental controls, NEPC 2013, NSW EPA contaminated guidelines made or approved under the CLM Act 1997 should be appointed to monitor implementation of this RAP. The Environmental Consultant's duties should include:

- Regular inspection of the site and site activities at critical moments, as required. Inspection times should be coordinated by the Principal Contractor;
- Completion of daily monitoring notes during field-based activities;
- Provision of on-site advice and direction with regard to implementation and compliance with the RAP;
- Liaison with site personnel/contractors and the client regarding progress of works;
- Provide and maintain a photographic record of works and results in addition to those made by the Principal Contractor and Site Manager;
- Identification, reporting and management of the rectification of any non-conformances with the RAP;
- Validation sampling;
- Preparation of the Remediation and Site Validation report; and
- Preparation of the LTEMP (where required).

10 Work Health and Safety

10.1 WHS Planning and Preparation

Prior to mobilising to complete the remedial works, the Principal Contractor and appointed remedial contractor will develop site and project specific Work Health and Safety Plans (WHSPs), Safe Work Method Statements (SWMS) and Job Safety Analyses for the scope of works to be undertaken. The WHS documentation will detail measures to mitigate potential risks to site workers, third parties and the local environment during the remedial works. General, minimal WHS procedures to be implemented during the remedial works are outlined as follows:

- Given that asbestos contamination was identified, excavation works to be undertaken pose potential for exposure via inhalation of dusts. Respirators, dust masks and disposable coveralls should be available and used on site for all works. The additional management practices detailed in **Section 9** or specified by a NSW licensed Asbestos removalist contractor should also be followed and included in the WHSPs.
- Given the nature of the proposed works which have identified asbestos in soils, air monitoring may be implemented under guidance of an occupational hygienist until deemed sufficient to cease in accordance with WHS Regulation 2017. This may involve the measurement of particulate matter, air fibres, and hazardous atmospheres.
- Potential exposure pathways for contaminants include dermal absorption (skin contact, ingestion) of dust. All workers should wear long sleeve trousers/shirts on-site. Gloves and safety glasses shall be worn by all workers involved in handling of potentially contaminated soils.
- Protective footwear (steel capped boots) to be worn on site at all times.
- Hearing protection should be worn during soil removal activities (or when working in the vicinity of heavy plant/machinery).
- Unauthorised access should be limited by ensuring that security gates are locked at the completion of each day's work.
- Excavations greater than 0.3m depth need to be "stepped" by the appointed civil contractor or otherwise made safe.
- Personnel are not to enter excavations (>1m depth) at any time.
- PPE shall be provided in sufficient quantities to provide for the duties of each on-site individual.

For bonded asbestos works, the minimum WHS and PPE requirements will be as follows:

- Respirator
- Boot covers or gumboots
- Nitrile gloves
- Dust suppression (water misting)
- Exclusion zone
- Signage
- Asbestos Air Monitoring (required due to friable asbestos detected)

10.2 Incident Management Plan

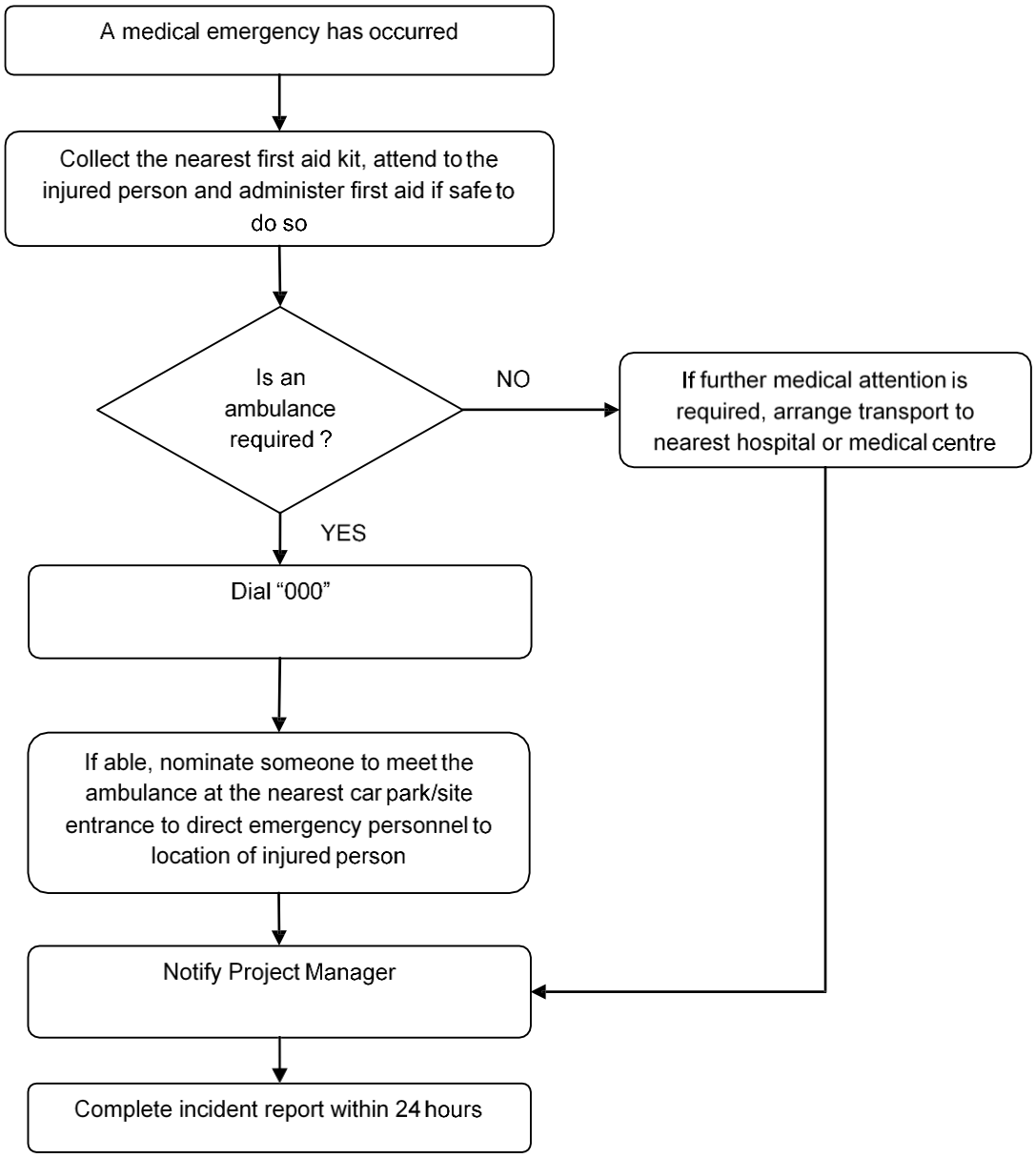
Emergency response includes pre-emergency planning, lines of authority and communication, emergency recognition and prevention, site control, evacuation routes, decontamination and first aid.

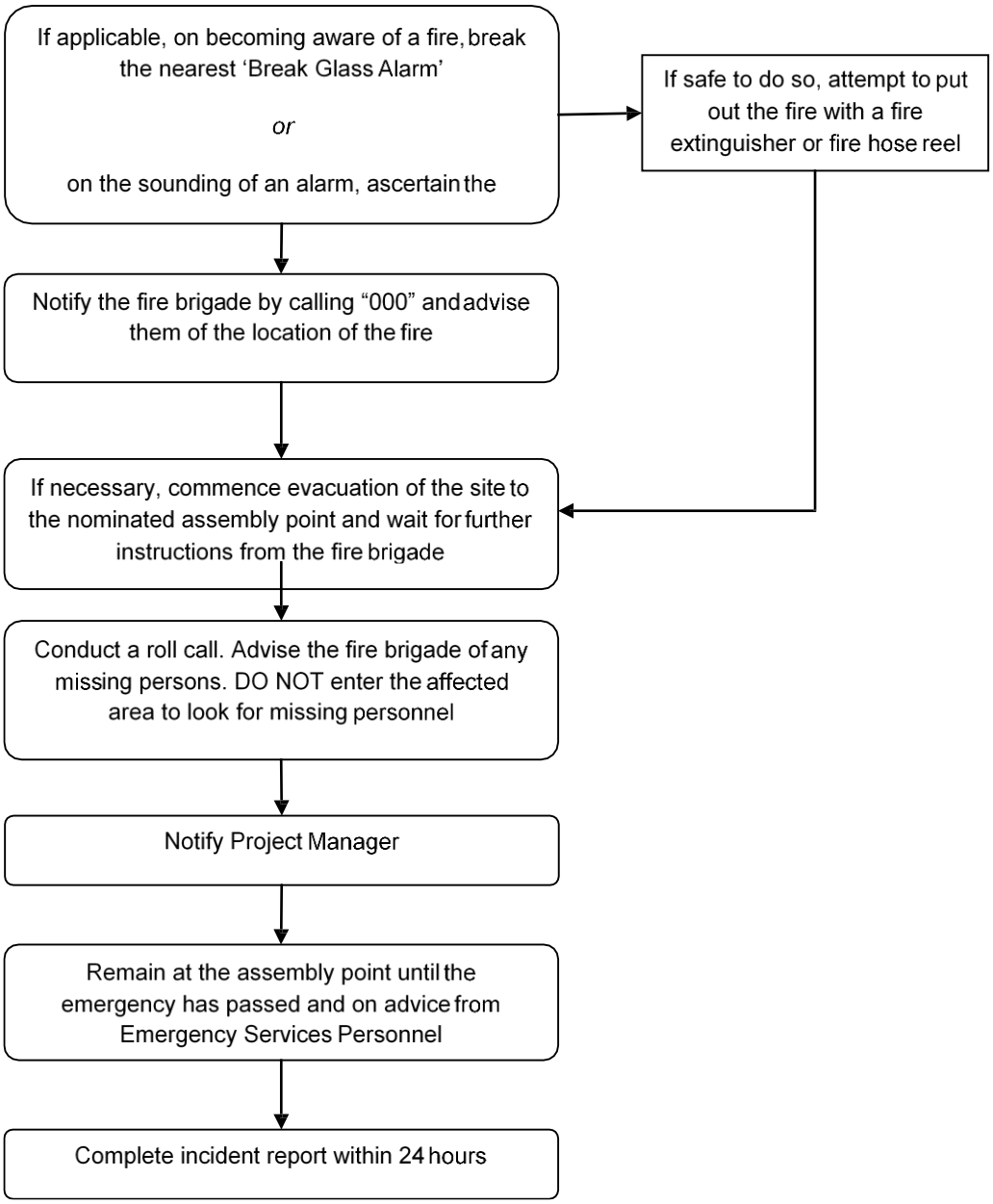
10.2.1 Medical Emergency/Serious Injury

In the event of an accident or an emergency situation involving a serious injury or medical emergency, immediate action must be taken by the first person to recognise the event (refer to flowchart below).

A portable and fully-stocked first aid kit shall be retained on site at all times.

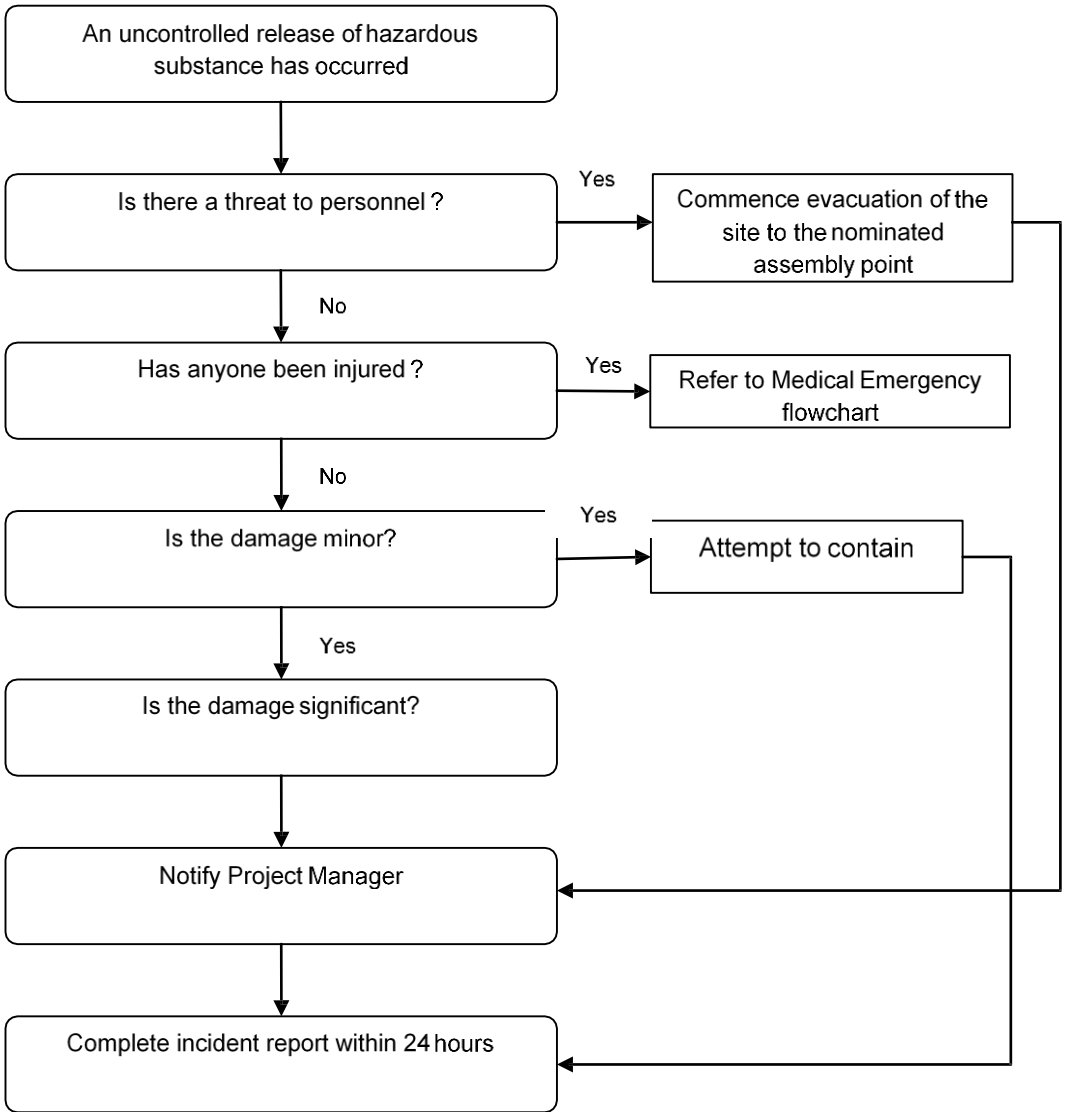
In the event of a fatality, the Police, Site Manager, and Project Manager shall be notified immediately.


A medical emergency has occurred
Collect the nearest first aid kit, attend to the injured person and administer first aid if safe to do so
Is an ambulance required ?
NO
If further medical attention is required, arrange transport to nearest hospital or medical centre
YES
Dial "000"
If able, nominate someone to meet the ambulance at the nearest car park/site entrance to direct emergency personnel to location of injured person
Notify Project Manager
Complete incident report within 24 hours


If applicable, on becoming aware of a fire, break the nearest 'Break Glass Alarm'
or
on the sounding of an alarm, ascertain the
If safe to do so, attempt to put out the fire with a fire extinguisher or fire hose reel
Notify the fire brigade by calling "000" and advise them of the location of the fire
If necessary, commence evacuation of the site to the nominated assembly point and wait for further instructions from the fire brigade
Conduct a roll call. Advise the fire brigade of any missing persons. DO NOT enter the affected area to look for missing personnel
Notify Project Manager
Remain at the assembly point until the emergency has passed and on advice from Emergency Services Personnel
Complete incident report within 24 hours

10.2.2 Environment Incident

In the event of an environmental incident, the actions outlined below shall be taken:



10.3 Incident Reporting

Stantec employees and sub-contractors are required to verbally report incidents, accidents and near-misses to the Project Manager immediately after an event has occurred. It is the responsibility of the Project Manger to notify the Client Representative immediately after the occurrence of an environmental incident and to forward the completed a written incident report within 24 hours. Additional investigations may be necessary should a serious incident occur.

10.4 Community Consultation

Stantec anticipates that community consultation will be required during the course of the remedial and validation works. Unless incorporated into other management documents, a detailed Community Consultation Plan may be developed to manage communications with third parties.

11 Contingency Plan

As with any remedial scope of work, unanticipated events or outcomes may be encountered during the remedial program. Stantec has developed contingencies throughout the RAP to mitigate risks associated with potential issues that may arise during the remedial works. Contingency items considered for the current remediation are summarised in **Table 12-1** noting that there may be other unforeseen circumstances that may arise during the course of the works.

Table 11-1 Remedial Works Contingency Plan

Potential Issue	Contingency Measure
Evidence of additional contamination not previously identified	A data gap is incorporated as an element of the proposed remedial approach. Further assessment involving intrusive investigations, sampling analysis and/or remediation may be required to quantify and delineate potential contamination outside of known areas. The COPC analytical suite may be adjusted based on the nature of the potential source. The Unexpected Finds Protocol (UFP, **Section 9.6**) will be communicated, implemented and followed during the construction phase of the project.
Greater than anticipated volumes of soil require management	Off-site soil disposal is scalable for large unexpected volumes of soil are produced. In the case of additional contaminated soil being identified and on-site containment is feasible, this may be undertaken subject to approval by the relevant authority.
Unintentional release of stockpiled soil or water drained from stockpile	Construction of appropriate erosion and sedimentation controls around stockpiles Spill equipment will be staged on-site during the remedial works. Weather forecasts will be monitored throughout the course of the remedial works to anticipate any significant storm events. Works may be suspended if large volumes of rain are anticipated. Soil stockpiles would be sufficiently covered prior to any storm event. Assess if off-site migrations cause Duty to Report.
Water ingress to excavation is unmanageable	Consider aggressive means to remove the water (multiple vacuum trucks) or below ground dewatering equipment. Consider installation of a physical barrier to block the water ingress.
Elevated COPC concentrations are encountered within remaining soils following remedial excavations	Following the validation sampling of the initial remedial excavations (walls and base), should contamination be identified to remain then additional excavation will be required to chase out the extent of contamination. Further validation sampling will be undertaken. This process will be repeated until soils are suitable to remain onsite.
Imported material is determined unsuitable	If identified prior to entry onto site, material is to be stopped at the site entrance and returned to point of origin. If emplaced prior to unsuitability is identified, material is to be isolated and demarcated. If stockpiled prior to removal offsite the stockpile should be lined to avoid contact with unimpacted ground surfaces. Any material leaving the site must undergo waste classification to allow for appropriate disposal offsite.

12 Regulatory Approvals / Licences

12.1 Regulatory Compliance Requirements

Regulations and sources of regulatory guidance relevant to this remediation programme relate to waste management, environment protection and occupational health and safety. All permits, approvals, and notifications are the responsibility of the remediation Principal Contractor.

12.1.1 Waste Management

The remediation program must comply with the following legislation and policies:

- *Waste Avoidance and Resource Recovery Act 2001*;
- *Protection of the Environment Operations (Waste) Regulation 2014*; and
- NSW EPA (2014) *Waste Classification Guidelines.*

12.1.2 Environmental Protection

The remediation of asbestos impacted soils and environmental media with elevated contamination concentrations, must be carried out in a manner compliant with national, state and local environmental regulations, including the:

- NSW Work Health and Safety Act 2011;
- NSW Work Health and Safety Regulation 2017;
- Protection of the Environment Operations Act 1997;
- SafeWork NSW Code of Practice – How to Safely Remove Asbestos 2019;
- State Environmental Planning Policy (SEPP) – Resilience and Hazard, 2021;
- Contaminated Land Management Act 1997; and
- National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013).

12.1.3 Planning Controls

Planning controls applicable to the proposed remediation are provided in the following:

- State Environmental Planning Policy (SEPP) (Transport and Infrastructure) 2021;
- Sydney Development Control Plan (DCP) 2012; and
- Sydney Local Environmental Plan (LEP) 2012.

The proposed remedial works are to be managed as Category 2 remediation as per the Resilience and Hazards SEPP definition subject to Client requirements or requirements set out in any Development or Ministerial Consent, if applicable, which requires the site to be treated as a Category 1 site.

13 Conclusions

Stantec was engaged by TSA Management (TSA) ("the Client"), on behalf of NSW Health Infrastructure (HI), to prepare a Remediation Action Plan (RAP) for the landscaped area located to the west of the Medical Gas Loading Bay Area (MGLBA), within the West Campus of the Royal Prince Alfred Hospital (RPA), Camperdown, NSW (the site), as shown in **Figure 1** and **2**, **Appendix A**. For ease of reference throughout the report, the subject area proposed for remediation has been designated as the 'landscaped area'.

This RAP has been requested by TSA to manage asbestos contaminated soils identified during investigations within the landscaped area where asbestos was found to exceed the adopted human health criteria.

This assessment follows on from a previous site investigation completed by Cardno during August 2022:

> Cardno (2023). DRAFT Detailed Site Investigation Report – Royal Prince Alfred Hospital, Building 28, West Campus, Job Reference 80022023_R001, Revision 0, dated 25 January 2023.

The current land use for the MGLBA comprises of landscaping, access roadways, a loading bay and medical gas storage area.

The purpose of the proposed remedial works is to mitigate the human health risk presented by the bonded and friable asbestos contaminated soils that currently exist within the landscaped area. It is considered that the identified risk could be managed as per the proposed remedial approaches (read below).

As outlined in **Section 7.3**, the remedial options considered to be suitable for the proposed ongoing land use as a landscaped area; are **Option 7** (excavation and offsite disposal) and **Option 9** (In-situ encapsulation). The following brief remediation strategy for each option is recommended for implementation, as appropriate:

Option 7: Offsite Disposal;

1. Preliminaries and site establishment;
2. Vegetation pruning / removal;
3. Remedial excavation;
4. Stockpiling and waste classification;
5. Site validation;
6. Reporting (validation report).

Option 9: Onsite Encapsulation;

1. Preliminaries and site establishment;
2. Vegetation pruning / removal;
3. Confirmation of encapsulation area;
4. Onsite encapsulation concept;
5. Civil design of encapsulation;
6. Validation of encapsulation works;
7. Reporting (validation report and LTEMP document).

Once all remediation works have been undertaken and the validation works have been completed successfully in accordance with this RAP, the site would be considered suitable for the ongoing land use as a landscaped area (open space).

14 References

Cardno (2023). Detailed Site Investigation Report – Royal Prince Alfred Hospital, Building 28, West Campus, Job Reference 80022023_R001, Revision 0, dated 25 January 2023.

Guideline on the Investigation Levels for Soil and Groundwater' of the *National Environment Protection (Assessment of Site Contamination) Measure* (NEPM) *1999* (NEPC, 1999) as varied May 2013 (the 'NEPM 2013').

NSW Department of Urban Affairs and Planning (2021) *Managing Land Contamination: Planning Guidelines: Resilience and Hazards SEPP,* 2021.

NSW EPA (1995) *Contaminated Site Sampling Design Guidelines*. New South Wales Environment Protection Authority (EPA), September 2017.

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

NSW EPA (2015) *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997*. NSW Environment Protection Authority, Sydney. September 2015.

NSW EPA (2020) *Consultants reporting on contaminated land, Contaminated Land Guidelines*, NSW Environment Protection Authority, Sydney, April 2020.

Limitations

This assessment has been undertaken in general accordance with the current "industry standards" for a Remediation Action Plan and contamination assessment for the purpose, objectives and scope identified in this report. These standards are set out in:

- National Environment Protection Measure (NEPM) - *Assessment of Site Contamination 1999* (NEPC, 1999) as varied May 2013 (the 'NEPM 2013').
- AS4482.1- 2005: Guide to the sampling and investigation of potentially contaminated soil Part 1: Non-volatile and semi-volatile compounds. Standards Australia (2005).

The scope of this assessment is limited to the scope identified in **Section 1.4**. The assessment that informs this RAP may not have identified contamination occurring in all areas of the landscaped area, or occurring after sampling was conducted. Subsurface conditions may vary considerably away from the sample locations where information has been obtained.

This Document has been provided by Stantec subject to the following limitations:

- This Document has been prepared for the particular purpose outlined in Stantec's proposal and no responsibility is accepted for the use of this Document, in whole or in part, in other contexts or for any other purpose.
- The scope and the period of Stantec's services are as described in Stantec's proposal, and are subject to restrictions and limitations. Stantec did not perform a complete assessment of all possible conditions or circumstances that may exist at the landscaped area referenced in the Document. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Stantec in regards to it.
- Conditions may exist which were undetectable given the limited nature of the enquiry Stantec was retained to undertake with respect to the Site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the landscaped area which have not been revealed by the investigation and which have not therefore been taken into account in the Document. Accordingly, additional studies and actions may be required.
- In addition, it is recognised that the passage of time affects the information and assessment provided in this Document. Stantec's opinions are based upon information that existed at the time of the production of the Document. It is understood that the services provided allowed Stantec to form no more than an opinion of the actual conditions of the Site at the time this Document was prepared and cannot be used to assess the effect of any subsequent changes in the quality of the landscaped area, or its surroundings, or any laws or regulations.
- Any assessments made in this Document are based on the conditions indicated from published sources and the investigation described. No warranty is included, either express or implied, that the actual conditions will conform exactly to the assessments contained in this Document.
- Where data supplied by the client or other external sources, including previous landscaped area investigation data, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by Stantec for incomplete or inaccurate data supplied by others.
- Stantec may have retained sub consultants affiliated with Stantec to provide services for the benefit of Stantec. To the maximum extent allowed by law, the Client acknowledges and agrees it will not have any direct legal recourse to, and waives any claim, demand, or cause of action against, Cardno's affiliated companies, and their employees, officers and directors.

This assessment report is not any of the following:

- An assessment of hazardous building materials.
- A sampling and analysis quality plan, preliminary site investigation or detailed site investigation.
- An assessment of Acid Sulfate Soils (ASS) within the Site or nearby.
- A Site Audit Report or Site Audit Statement as defined under the *Contaminated Land Management Act, 1997*.
- A detailed hydrogeological assessment in conformance with NSW DEC (2007) Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination.

- A Site Validation Report or Environmental Management Plan.
- An assessment of groundwater contaminants potentially arising from other sites or sources nearby.

APPENDIX

A

FIGURES

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PARRAMATTA ROAD
VICTORY LANE
HAMPSHIRE STREET
BRODRICK STREET
MARSDEN STREET
PIDCOCK STREET
BRIGGS STREET
HAMPSHIRE LANE
DUNBLANE STREET
LUCAS LANE
LUCAS STREET
MALLETT STREET
CHURCH STREET
MISSENDEN ROAD
JOHN HOPKINS DRIVE
LAMBIE DEW DRIVE
GROSE FARM LANE
BLACKBURN CIRCUIT
CADIGAL LANE
GLOUCESTER HOUSE DRIVE
DERBY PLACE
DERBY STREET
DERBY LANE
FOWLER STREET
FOWLER LANE
AUSTRALIA STREET
AUSTRALIA LANE
GIBBENS STREET
TOOTH LANE
MALLETT LANE
TOOTHS PLACE
DENISON STREET
ETON LANE
ETON STREET
GIBBENS LANE
ROSS STREET
SALISBURY ROAD
HOPETOUN LANE
HOPETOUN STREET
ROBERTS LANE
ROBERTS STREET
NORTHWOOD LANE
NORTHWOOD STREET
ROCHESTER STREET
FITZGERALD STREET
BROWN STREET
CARILLON AVENUE
O'CONNELL STREET
SUSAN STREET
AYLESBURY STREET
RAPER STREET
CAMPBELL STREET

Legend

- Site Boundary
- Medical Gas Bay Area
- Cadastre (NSW SS, 2022)

NSW GOVERNMENT Health Infrastructure

FIGURE 1

1:2,500 Scale at A3

m

0 50 100 150

Detailed Site Investigation - Medical Gas Bay Area
Site Locality Plan

ROYAL PRINCE ALFRED HOSPITAL - WEST CAMPUS

Cardno now Stantec

Map Produced by Stantec Australia Pty Ltd (WOL)
Date: 2022-10-10 | Project: 8002202601
Coordinate System: GDA2020 MGA Zone 56
Map: 80022026-GS-021-DSI_MedBay_Locality.mxd 01
Aerial imagery supplied by MetroMap (June, 2022)

EXISTING ROAD SURFACE TO BE SAW CUT & REMOVED TO EXTENT REQUIRED FOR NEW WORKS. MAKE GOOD ALL REMAINING SURFACES REFER TO FLOOR PLAN FOR DETAIL.

EXISTING TREES TO BE REMOVED

EXISTING TANK PROPOSED TO BE DEMOLISHED

EXISTING STRUCTURE ROOF, WALLS, STEEL WORK & SLAB TO BE DEMOLISHED TO 300mm BELOW EXISTING GROUND LEVEL. CAP & MAKE SAFE ALL SERVICES. MAKE GOOD ALL REMAINING SURFACES IN PREPARATION FOR NEW WORKS REFER TO FLOOR PLANS FOR DETAILS.

BH504
SV516
BH506
HA505
BH513
BH515
SV517
HA518
HA509
HA519
HA511
HA521
HA520
HA510
BH507
HA512
BH503
BH514
HA508

Medical Gas Bay Human Health Exceedances

Contaminant	HIL B Criteria	HIL C Criteria	Sample ID	Concentration
Asbestos bonded	0.04 % w/w	0.02 % w/w	BH506_0.3-0.5	0.08% w/w
			HA510_0.1-0.2	0.06% w/w
Asbestos <7mm	0.001 % w/w	0.001 % w/w	BH506_0.3-0.5	0.011% w/w
			HA508_0.15-0.25	0.054% w/w

Legend

- Medical Gas Bay Area
- Borehole - No Exceedance
- Borehole - Human Health Exceedance
- Hand Auger - No Exceedance
- Hand Auger - Human Health Exceedance
- Hand Auger - Asbestos Detected
- Area of Development
- Diesel AST
- Landscaped Area
- Trees For Removal
- Cadastre (NSW SS, 2022)

NSW GOVERNMENT Health Infrastructure

FIGURE 2

1:200 Scale at A3

m 0 5 10 15

Detailed Site Investigation - Medical Gas Bay Area Human Health Exceedances

ROYAL PRINCE ALFRED HOSPITAL - WEST CAMPUS

N

Stantec

Map Produced by Stantec Australia Pty Ltd (WOL)
Date: 2023-01-25 | Project: 8002202601
Coordinate System: GDA2020 MGA Zone 56
Map: 80022026-GS-030-DSI_MedBay_HumanExceedance.mxd 03
Aerial imagery supplied by MetroMap (June, 2022)

ROYAL PRINCE ALFRED HOSPITAL REDEVELOPMENT
CAMPUS INFRASTRUCTURE WORKS REF#5 PACKAGE
PROPOSED WESTERN CAMPUS MEDICAL GAS COMPOUND EXPANSION & ASSOCIATED WORKS

ARCHITECTURAL DRAWING LIST - REF7	
Sheet Number	Sheet Name
REF5-0000	REF5 - COVER SHEET
REF5-3201	REF5 - EXISTING OVERALL SITE PLAN
REF5-3202	REF5 - EXISTING SITE PLAN - WESTERN CAMPUS
REF5-3203	REF5 - DEMOLITION PLAN - WESTERN CAMPUS
REF5-3211	REF5 - PROPOSED LEVEL 1 PLAN - WESTERN CAMPUS
REF5-3212	REF5 - PROPOSED ROOF PLAN - WESTERN CAMPUS
REF5-3221	REF5 - ELEVATIONS

NOTES

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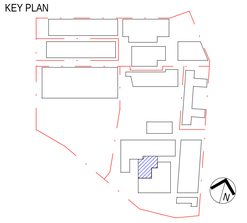
REV	DATE	AMENDMENT
C	17/01/23	REF5 DRAFT ISSUE
B	18/11/22	REF7 DRAFT ISSUE
A	16/11/22	REF7 DRAFT ISSUE

KEY PLAN



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PROJECT
ROYAL PRINCE ALFRED HOSPITAL
REDEVELOPMENT STAGE 1

PROJECT NO.
IA0251300

DRAWING TITLE
REF5 - COVER SHEET

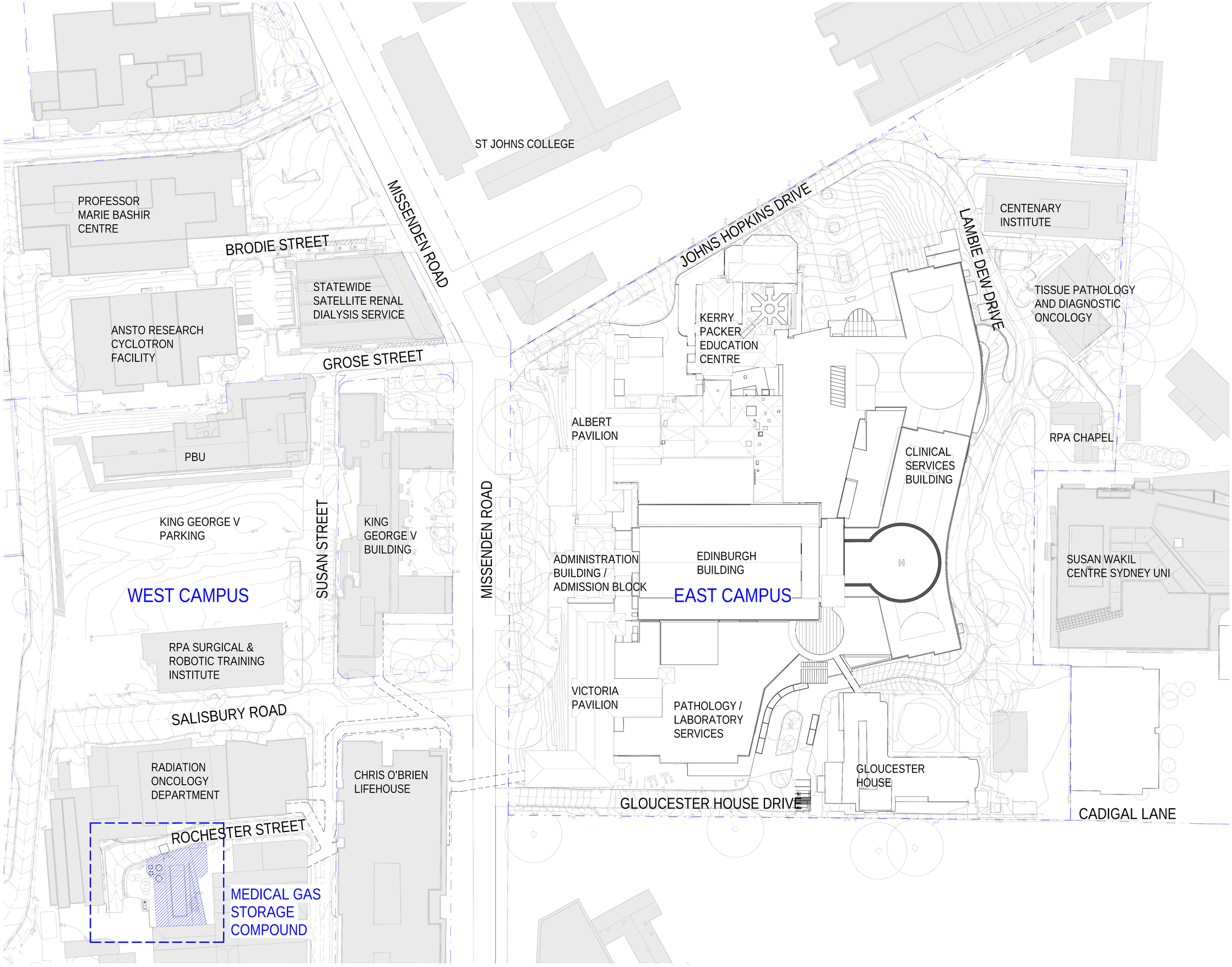
STATUS
DRAFT

DRAWN	DESIGNED
BL	DF
CHECKED	APPROVED
RG	CY

SCALE @ B1

DRAWING NO.
RPA-ARC-JAC-DRG-REF5-0000

REVISION
C



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A	16/11/22	REF7 DRAFT ISSUE

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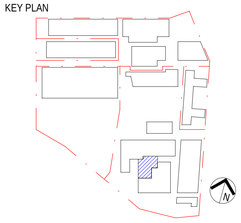

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PROJECT
ROYAL PRINCE ALFRED HOSPITAL
REDEVELOPMENT STAGE 1

PROJECT NO.
IA0251300

DRAWING TITLE
REF5 - EXISTING OVERALL SITE PLAN

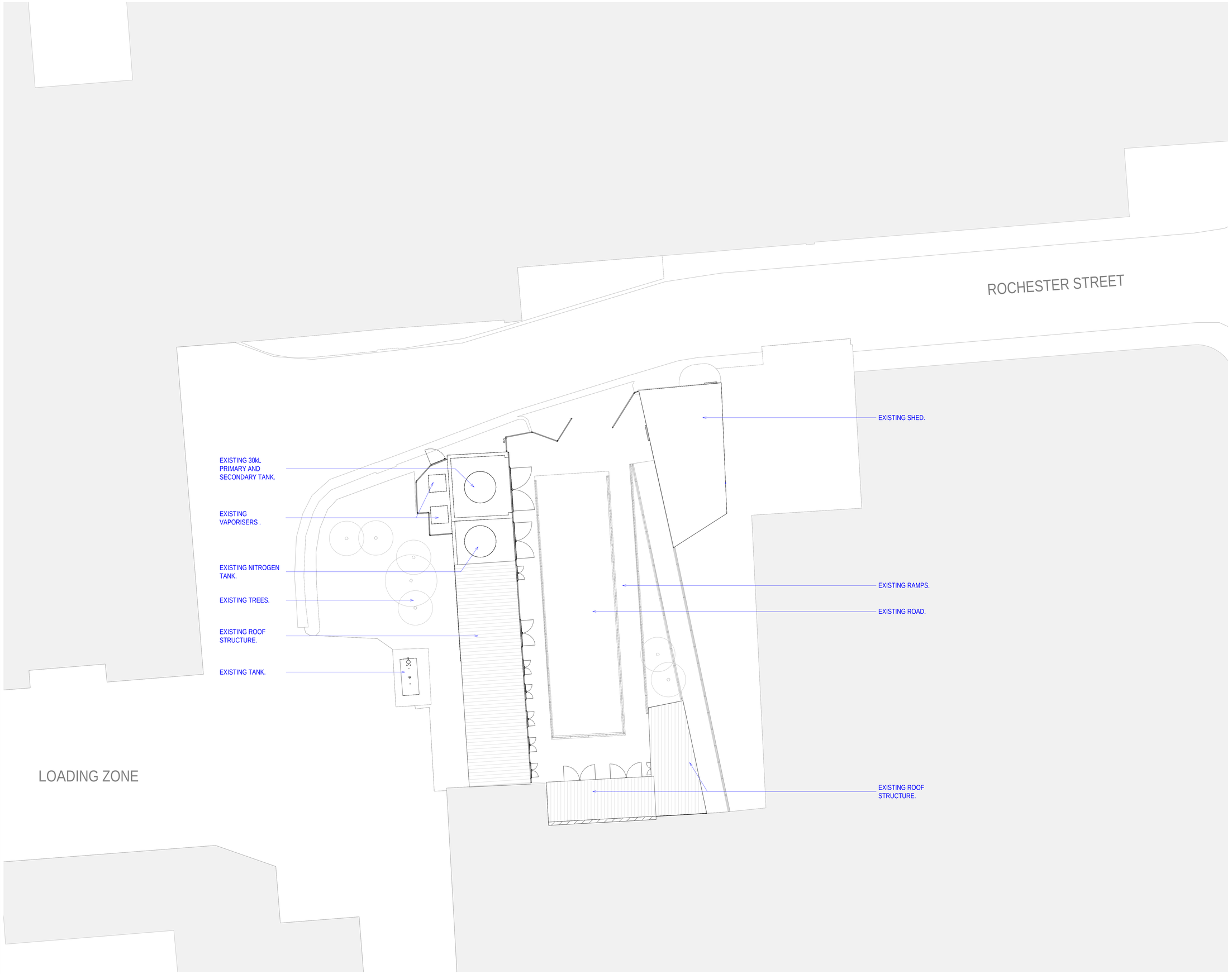
STATUS
DRAFT

DRAWN	DESIGNED
BL	DF
CHECKED	APPROVED
RG	CY

SCALE @ B1
1 : 500

DRAWING NO.
RPA-ARC-JAC-DRG-REF5-3201

REVISION
C



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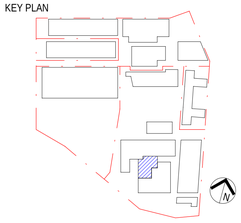
A	16/11/22	REF7 DRAFT ISSUE

KEY PLAN



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PROJECT
ROYAL PRINCE ALFRED HOSPITAL
REDEVELOPMENT STAGE 1

PROJECT NO.
IA0251300

DRAWING TITLE
REF5 - EXISTING SITE PLAN - WESTERN CAMPUS

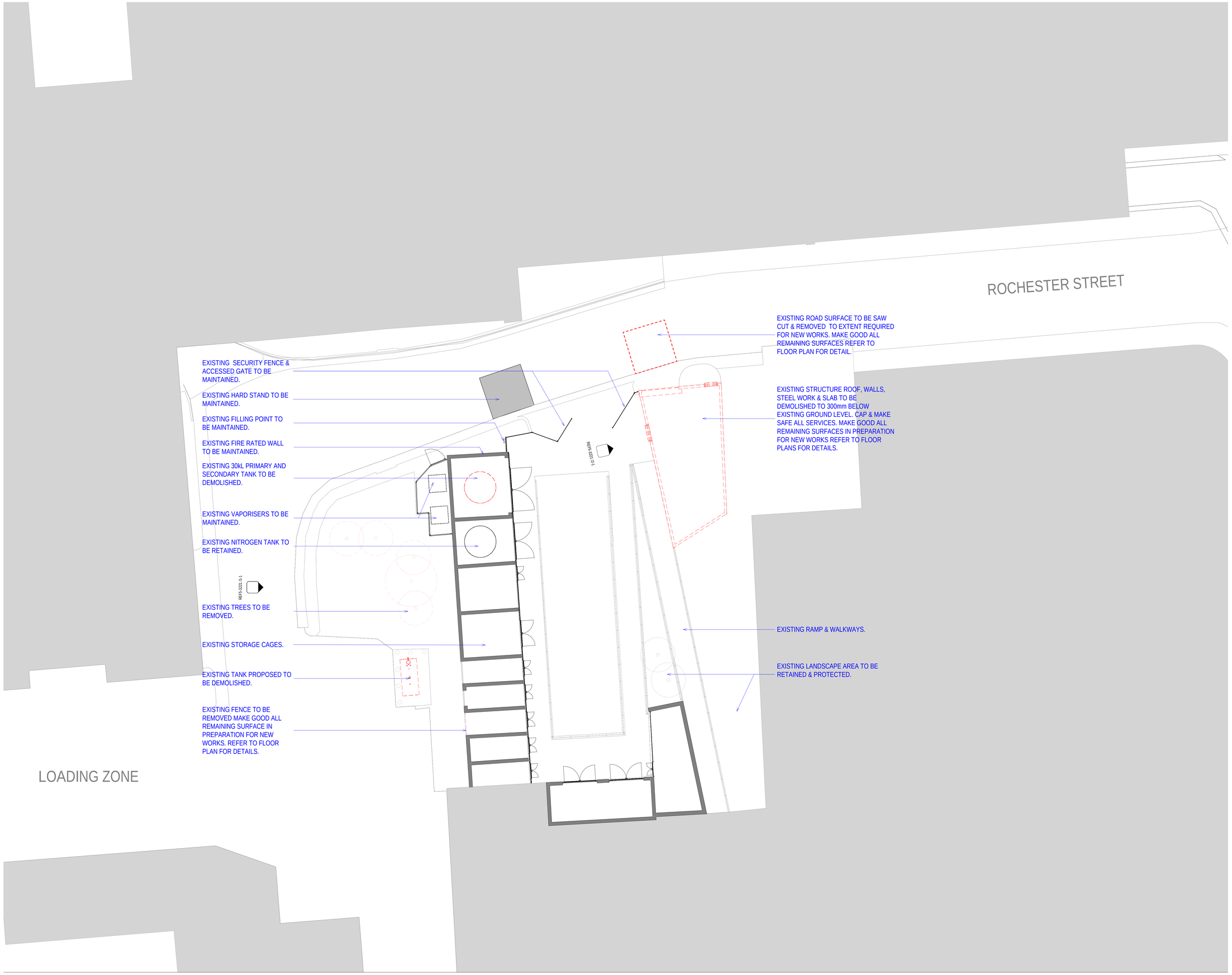
STATUS
DRAFT

DRAWN	DESIGNED
BL	DF
CHECKED	APPROVED
RG	CY

SCALE @ B1
1 : 100

DRAWING NO.
RPA-ARC-JAC-DRG-REF5-3202

REVISION
C



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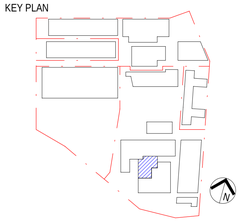
LEGEND

- BUILDING/ STRUCTURE RE-CONFIGURATION
  REFER RELEVANT SERVICES DRAWINGS
- DEMOLITION

REV	DATE	AMENDMENT
D	17/01/23	REF5 DRAFT ISSUE
C	23/11/22	REF7 DRAFT ISSUE
B	18/11/22	REF7 DRAFT ISSUE
A	16/11/22	REF7 DRAFT ISSUE

KEY PLAN



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PROJECT
ROYAL PRINCE ALFRED HOSPITAL
REDEVELOPMENT STAGE 1

PROJECT NO.
IA0251300

DRAWING TITLE
REF5 - DEMOLITION PLAN - WESTERN CAMPUS

STATUS
DRAFT

DRAWN	DESIGNED
BL	DF
CHECKED	APPROVED
RG	CY

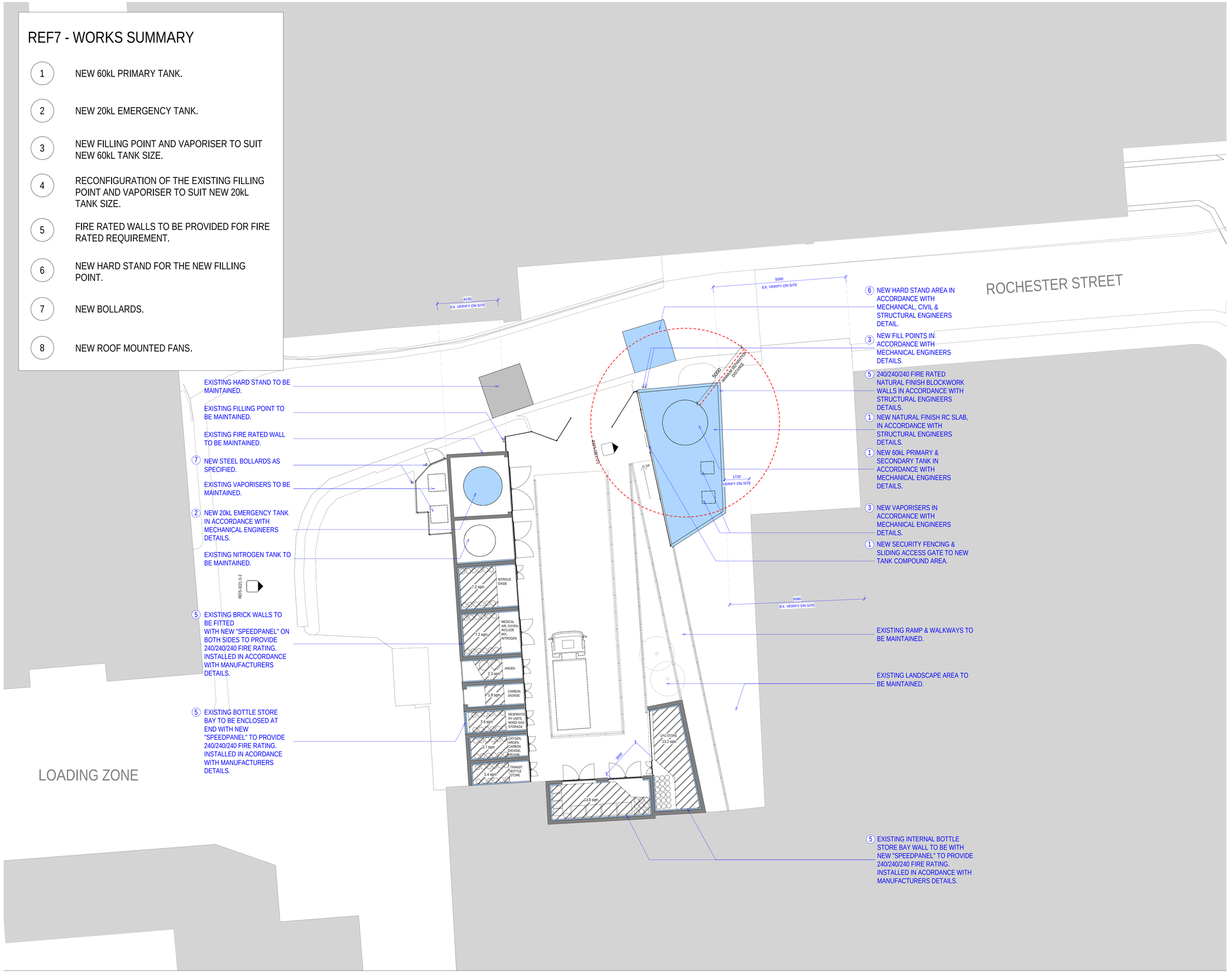
SCALE @ B1
1 : 100

DRAWING NO.
RPA-ARC-JAC-DRG-REF5-3203

REVISION
D

REF7 - WORKS SUMMARY

1. NEW 60kL PRIMARY TANK.
2. NEW 20kL EMERGENCY TANK.
3. NEW FILLING POINT AND VAPORISER TO SUIT NEW 60kL TANK SIZE.
4. RECONFIGURATION OF THE EXISTING FILLING POINT AND VAPORISER TO SUIT NEW 20kL TANK SIZE.
5. FIRE RATED WALLS TO BE PROVIDED FOR FIRE RATED REQUIREMENT.
6. NEW HARD STAND FOR THE NEW FILLING POINT.
7. NEW BOLLARDS.
8. NEW ROOF MOUNTED FANS.



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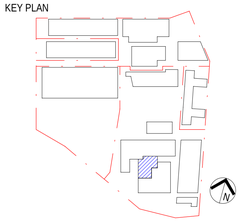
LEGEND

- BUILDING/ STRUCTURE RE-CONFIGURATION
  REFER RELEVANT SERVICES DRAWINGS
- DEMOLITION

REV	DATE	AMENDMENT
D	17/01/23	REF5 DRAFT ISSUE
C	23/11/22	REF7 DRAFT ISSUE
B	18/11/22	REF7 DRAFT ISSUE
A	16/11/22	REF7 DRAFT ISSUE

KEY PLAN



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PROJECT
ROYAL PRINCE ALFRED HOSPITAL REDEVELOPMENT STAGE 1

PROJECT NO.
IA0251300

DRAWING TITLE
REF5 - PROPOSED LEVEL 1 PLAN - WESTERN CAMPUS

STATUS
DRAFT

DRAWN	DESIGNED
BL	DF
CHECKED	APPROVED
RG	CY

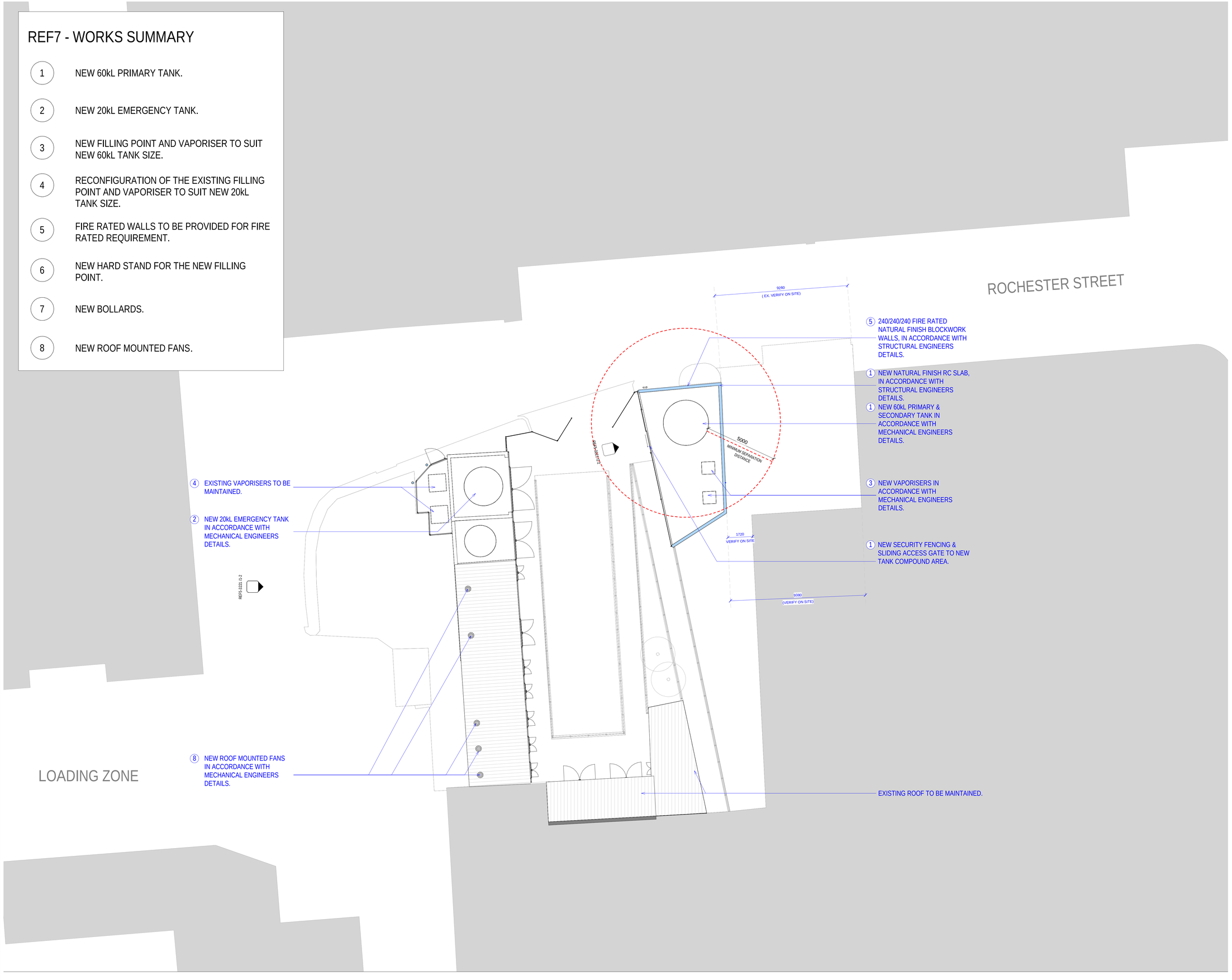
SCALE @ B1
1 : 100

DRAWING NO.
RPA-ARC-JAC-DRG-REF5-3211

REVISION
D

REF7 - WORKS SUMMARY

1. NEW 60kL PRIMARY TANK.
2. NEW 20kL EMERGENCY TANK.
3. NEW FILLING POINT AND VAPORISER TO SUIT NEW 60kL TANK SIZE.
4. RECONFIGURATION OF THE EXISTING FILLING POINT AND VAPORISER TO SUIT NEW 20kL TANK SIZE.
5. FIRE RATED WALLS TO BE PROVIDED FOR FIRE RATED REQUIREMENT.
6. NEW HARD STAND FOR THE NEW FILLING POINT.
7. NEW BOLLARDS.
8. NEW ROOF MOUNTED FANS.



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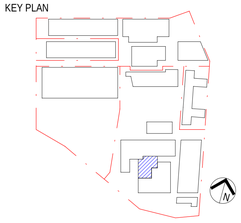
LEGEND

- BUILDING/ STRUCTURE RE-CONFIGURATION
  REFER RELEVANT SERVICES DRAWINGS
- DEMOLITION

REV	DATE	AMENDMENT
D	17/01/23	REF5 DRAFT ISSUE
C	23/11/22	REF7 DRAFT ISSUE
B	18/11/22	REF7 DRAFT ISSUE
A	16/11/22	REF7 DRAFT ISSUE

KEY PLAN



PROJECT MANAGER

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Sydney Local Health District

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PROJECT
ROYAL PRINCE ALFRED HOSPITAL
REDEVELOPMENT STAGE 1

PROJECT NO.
IA0251300

DRAWING TITLE
REF5 - PROPOSED ROOF PLAN - WESTERN CAMPUS

STATUS
DRAFT

DRAWN	DESIGNED
BL	DF
CHECKED	APPROVED
RG	CY

SCALE @ B1
1 : 100

DRAWING NO.
RPA-ARC-JAC-DRG-REF5-3212

REVISION
D

REF7 - WORKS SUMMARY

1. NEW 60kL PRIMARY TANK.
2. NEW 20kL EMERGENCY TANK.
3. NEW FILLING POINT AND VAPORISER TO SUIT NEW 60kL TANK SIZE.
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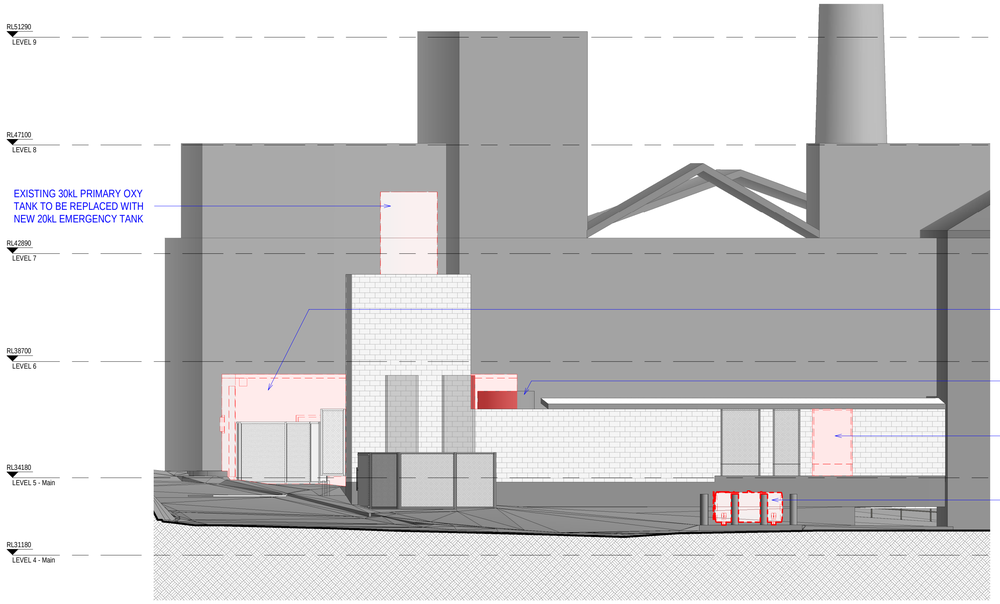
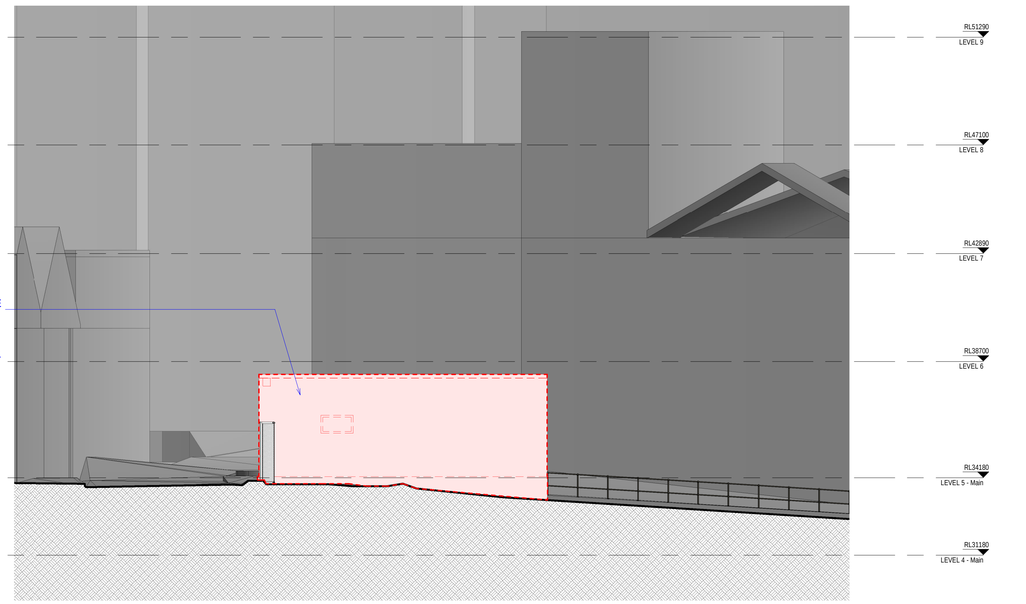
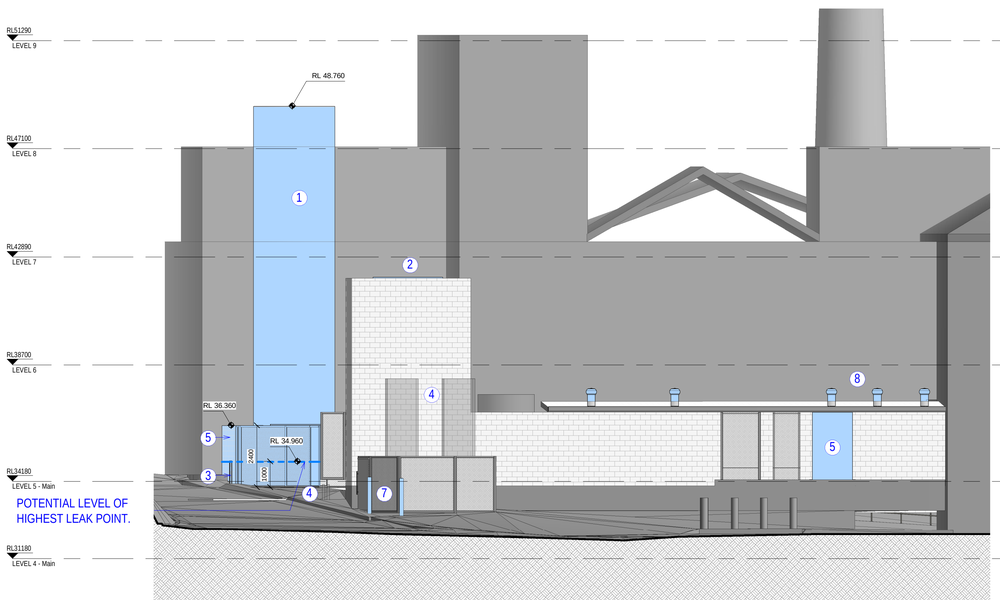
6. NEW HARD STAND FOR THE NEW FILLING POINT.
7. NEW BOLLARDS.
8. NEW ROOF MOUNTED FANS.



1-1 DEMOLITION ELEVATION 1
1 : 100



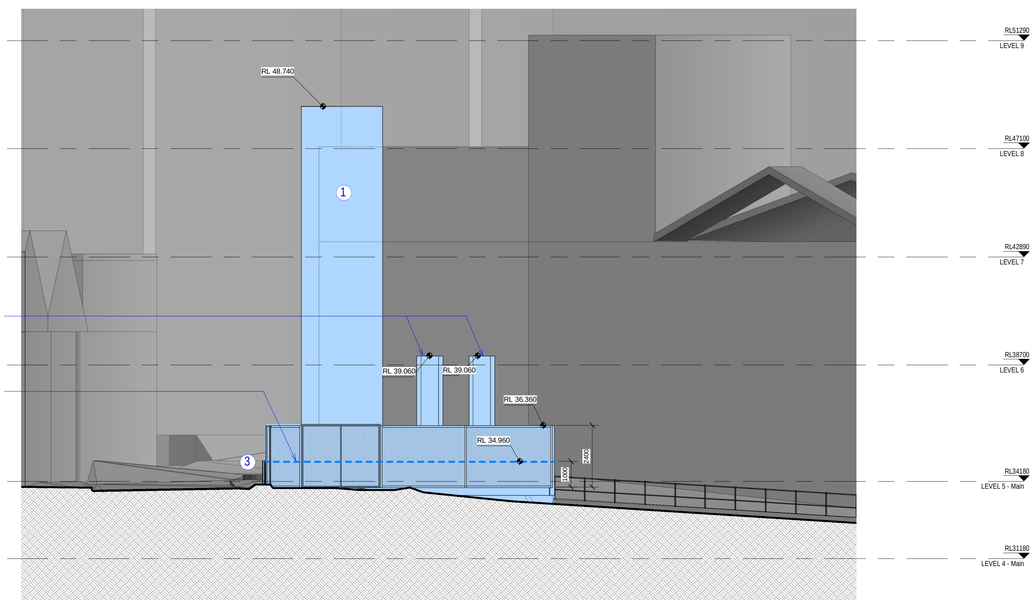
2-1 DEMOLITION ELEVATION 2
1 : 100



1-2 PROPOSED ELEVATION 1
1 : 100

NEW VAPORISERS IN ACCORDANCE WITH MECHANICAL ENGINEERS DETAILS.

POTENTIAL LEVEL OF HIGHEST LEAK POINT.



2-2 PROPOSED ELEVATION 2
1 : 100

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LEGEND

- BUILDING/ STRUCTURE RE-CONFIGURATION
REFER RELEVANT SERVICES DRAWINGS
- DEMOLITION

REV	DATE	AMENDMENT
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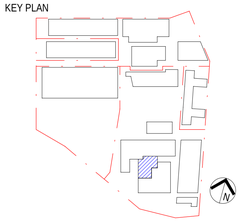
A	16/11/22	REF7 DRAFT ISSUE

KEY PLAN



PROJECT MANAGER

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NSW GOVERNMENT Health
Sydney Local Health District

NSW GOVERNMENT Health Infrastructure

ARCHITECT

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PROJECT
ROYAL PRINCE ALFRED HOSPITAL
REDEVELOPMENT STAGE 1

PROJECT NO.
IA0251300

DRAWING TITLE
REF5 - ELEVATIONS

STATUS
DRAFT

DRAWN	DESIGNED
BL	DF
CHECKED	APPROVED
RG	CY

SCALE @ B1
1 : 100

DRAWING NO.
RPA-ARC-JAC-DRG-REF5-3221

REVISION
D

APPENDIX

B

SUMMARY ANALYTICAL TABLES

Cardno

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Stantec

Site ID	Field ID	Location	Sample Depth Range	Material	Sampled Date						ES_EPA8100	EW_EPA418	EW_LEED_MA_1523	Particle Size			NA			Other
						% Moisture	Total +ve Chlorinated Hydrocarbons	Vic EPA IWRG 621 OCP (Total)	Vic EPA IWRG 621 Other CHC (Total)	TOTAL VOCS	Total PAH (NEPM/WHO 16)	TRH C37-C40	Perfluoro-n-hexadecanoic acid	% >75um	+75µm	Clay (<2 µm)	EXCHANGEABLE CALCIUM %	EXCHANGEABLE MAGNESIUM %	EXCHANGEABLE POTASSIUM %	Estimated Fibres
						%w/w	mg/kg	MG/KG	MG/KG	mg/kg	mg/kg	mg/kg	mg/kg	%	%	%	%	%	%	mg/kg
EQL						1	1.8	1	1.8	24	0.8	100	0.0032	1	1	0.1	0.1	0.1	0.1	100
NSW 2014 General Solid Waste CT1 (No Leaching)																				
NSW 2014 General Solid Waste SCC1																				
NSW 2014 General Solid Waste TCLP1 (mg/L)																				
NSW 2014 Restricted Solid Waste CT2 (No Leaching)																				
NSW 2014 Restricted Solid Waste SCC2																				
NSW 2014 Restricted Solid Waste TCLP1 (mg/L)																				
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	18.2	<1.8	<1	<1.8	<24	1.4	<100	<0.0032	-	-	-	-	-	-	<100
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	15	<1.8	<1	<1.8	<24	4.5	<100	-	-	-	-	-	-	-	-
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	15.8	<1.8	<1	<1.8	<24	<0.8	<100	-	-	-	-	-	-	-	>100
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<100
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	17.3	-	-	-	-	11	<100	-	-	-	-	-	-	-	-
	HA512_0.1-0.2	TCLP		Fill	23/09/2022															

Field ID	Solvents									TPH					CRC Care TPH Fractions						
	Methyl Ethyl Ketone	2-hexanone (MBK)	4-Methyl-2-pentanone	Acetone	Acrylonitrile	Allyl chloride	Carbon disulfide	MTBE	Vinyl acetate	C6 - C9	C10 - C14	C15 - C28	C29-C36	+C10 - C36 (Sum of total)	C6-C10	C10-C16	C16-C34	C34-C40	C10 - C40 (Sum of total)	F1: C6-C10 less BTEX	F2: >C10-C16 less NAPHTHALENE
	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
EQL	10	5	1	10	0.1	0.1	0.5	0.1	10	20	20	45	45	110	25	25	90	120	210	25	25
NSW 2014 General Solid Waste CT1 (No Leaching)	4000									650				10000							
NSW 2014 General Solid Waste SCC1	7200									650|6500				10000							
NSW 2014 General Solid Waste TCLP1 (mg/L)																					
NSW 2014 Restricted Solid Waste CT2 (No Leaching)	16000									2600				40000							
NSW 2014 Restricted Solid Waste SCC2	28800									2600				40000							
NSW 2014 Restricted Solid Waste TCLP1 (mg/L)																					
HA509_0.1-0.2	<10	<5	<1	<10	<0.1	<0.1	<0.5	<0.1	<10	<20	<20	<45	<45	<110	<25	<25	<90	<120	<210	<25	<25
HA509_0.3-0.4	<10	<5	<1	<10	<0.1	<0.1	<0.5	<0.1	<10	<20	<20	<45	<45	<110	<25	<25	<90	<120	<210	<25	<25
HA510_0.1-0.2	<10	<5	<1	<10	<0.1	<0.1	<0.5	<0.1	<10	<20	<20	<45	<45	<110	<25	<25	<90	<120	<210	<25	<25
HA511_0.1-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA512_0.1-0.2	-	-	-	-	-	-	-	-	-	<20	<20	<45	<45	<110	<25	<25	<90	<120	<210	<25	<25
HA512_0.1-0.2 (TCLP)																					

Site ID	Field ID	Location	Sample Depth Range	Material	Sampled Date	BTEX								MAH								
						Naphthalene (VOC)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Total BTEX	Xylene Total	1,2,4-trimethylbenzene	1,3,5-trimethylbenzene	Isopropylbenzene	n-butylbenzene	n-propylbenzene	p-isopropyltoluene	sec-butylbenzene	Styrene	tert-butylbenzene
						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
EQL						0.1	0.1	0.1	0.1	0.2	0.1	0.6	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
NSW 2014 General Solid Waste CT1 (No Leaching)							10	288	600				1000								60	
NSW 2014 General Solid Waste SCC1							18	518	1080				1800								108	
NSW 2014 General Solid Waste TCLP1 (mg/L)																						
NSW 2014 Restricted Solid Waste CT2 (No Leaching)							40	1152	2400				4000								240	
NSW 2014 Restricted Solid Waste SCC2							72	2073	4320				7200								432	
NSW 2014 Restricted Solid Waste TCLP1 (mg/L)																						
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.6	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.6	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.6	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.6	<0.3	-	-	-	-	-	-	-	-	-
	HA512_0.1-0.2	TCLP		Fill	23/09/2022																	

Field ID	Location	Metals											
		Arsenic	Cadmium	Calcium	Chromium (III+VI)	Copper	Lead	Magnesium	Mercury	Nickel	Potassium	Sodium	Zinc
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL		1	0.3	2	0.5	0.5	1	2	0.05	0.5	2	2	2
NSW 2014 General Solid Waste CT1 (No Leaching)		100	20		100		100		4	40			
NSW 2014 General Solid Waste SCC1		500	100		1900		1500		50	1050			
NSW 2014 General Solid Waste TCLP1 (mg/L)		5	1				5		0.2	2			
NSW 2014 Restricted Solid Waste CT2 (No Leaching)		400	80		400		400		16	160			
NSW 2014 Restricted Solid Waste SCC2		2000	400		7600		6000		200	4200			
NSW 2014 Restricted Solid Waste TCLP1 (mg/L)		20	4				20		0.8	8			
HA509_0.1-0.2	HA509	3	<0.3	-	6.8	18	36	-	0.06	4.9	-	-	80
HA509_0.3-0.4	HA509	6	<0.3	-	13	36	71	-	0.09	11	-	-	89
HA510_0.1-0.2	HA510	3	<0.3	-	6.3	17	24	-	0.07	3.1	-	-	75
HA511_0.1-0.2	HA511	-	-	-	-	-	-	-	-	-	-	-	-
HA512_0.1-0.2	HA512	11	0.4	-	24	44	160	-	0.56	11	-	-	240
HA512_0.1-0.2	TCLP						0.06						

Field ID	Location	Asbestos							Organic			
		Asbestos Identification	Asbestos in soil (>7mm ACM)	Asbestos in soil (<7mm AF/FA)	Asbestos in soil (>2mm to <7mm AF/FA)	Mass ACM	Mass Asbestos in AF	Mass Asbestos in FA & AF	Organic Matter %	TOC	Naphthalene	2-methylnaphthalene
		Comment	%w/w	%w/w	%w/w	g	g	g	%w/w	%	mg/kg	mg/kg
EQL			0.01	0.001	0.001	0.001	0.00001	0.00001	0.1	0.05	0.1	0.1
NSW 2014 General Solid Waste CT1 (No Leaching)												
NSW 2014 General Solid Waste SCC1												
NSW 2014 General Solid Waste TCLP1 (mg/L)												
NSW 2014 Restricted Solid Waste CT2 (No Leaching)												
NSW 2014 Restricted Solid Waste SCC2												
NSW 2014 Restricted Solid Waste TCLP1 (mg/L)												
HA509_0.1-0.2	HA509	No asbestos detected	<0.01	<0.001	<0.001	<0.001	<0.00001	<0.00001	-	-	<0.1	<0.1
HA509_0.3-0.4	HA509	-	-	-	-	-	-	-	-	-	<0.1	<0.1
HA510_0.1-0.2	HA510	Chrysotile & crocidolite asbestos found	0.06	<0.001	<0.001	2.16	<0.00001	<0.00001	-	-	<0.1	<0.1
HA511_0.1-0.2	HA511	-	<0.01	<0.001	<0.001	<0.001	<0.00001	<0.00001	-	-	-	-
HA512_0.1-0.2	HA512	-	-	-	-	-	-	-	-	-	<0.1	<0.1
HA512_0.1-0.2	TCLP											

Table: Preliminary Waste Classification Results for Sampling Locations HA509 to HA512 ONLY

						PAH																					Phenols
						1-Methylnaphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(k)fluoranthene	Benzo(b+j)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-c,d)pyrene	Dibenzo(a,h)anthracene	Benzo(g,h,i)perylene	Benzo(a)pyrene TEQ (Zero LOR)	Benzo(a)pyrene TEQ (Half LOR)_1	Benzo(a)pyrene TEQ (Full LOR)	PAHs (Sum of total)	Phenols
						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
EQL						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	0.5	0.5	0.5	0.8	0.5
NSW 2014 General Solid Waste CT1 (No Leaching)																		0.8							200	
NSW 2014 General Solid Waste SCC1																		10								
NSW 2014 General Solid Waste TCLP1 (mg/L)																		0.04								
NSW 2014 Restricted Solid Waste CT2 (No Leaching)																		3.2								
NSW 2014 Restricted Solid Waste SCC2																		23								
NSW 2014 Restricted Solid Waste TCLP1 (mg/L)																		0.16								
Site ID	**Field ID**	**Location**	**Sample Depth Range**	**Material**	**Sampled Date**																					
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.2	0.2	0.1	0.1	<0.1	0.2	0.1	0.1	<0.1	0.1	<0.2	<0.3	0.2	1.4	<0.5
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	0.3	0.1	0.7	0.7	0.4	0.4	0.2	0.5	0.5	0.4	<0.1	0.4	0.6	0.7	0.7	4.5	<0.5
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.2	<0.8	<0.5
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	<0.1	0.1	<0.1	<0.1	0.8	0.3	1.8	1.9	1	0.9	0.4	1.1	1.1	0.6	0.2	0.7	1.5	1.5	1.5	11	-
	HA512_0.1-0.2	TCLP		Fill	23/09/2022													<0.0001								

						Organochlorine Pesticides																									Organophosphorous Pesticides										Pesticides		
						2,4-DDT	4,4-DDE	a-BHC	Aldrin	b-BHC	Chlordane (cis)	gamma-Chlordane	d-BHC	DDD	DDT	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor	o,p-DDD	o,p'-DDE	trans-Nonachlor	Azinophos methyl	Bromophos-ethyl	Chlorpyrifos	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenitrothion	Malathion	Methidathion	Isodrin	Mirex	Parathion
						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	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL						0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.5	0.5	0.5	0.2	0.2	0.2	0.5	0.1	0.1	0.2
NSW 2014 General Solid Waste CT1 (No Leaching)																	60	60	60														4										
NSW 2014 General Solid Waste SCC1																	108	108	108														7.5										
NSW 2014 General Solid Waste TCLP1 (mg/L)																																											
NSW 2014 Restricted Solid Waste CT2 (No Leaching)																	240	240	240														16										
NSW 2014 Restricted Solid Waste SCC2																	432	432	432														30										
NSW 2014 Restricted Solid Waste TCLP1 (mg/L)																																											
Site ID	**Field ID**	**Location**	**Sample Depth Range**	**Material**	**Sampled Date**																																						
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.5	<0.1	<0.1	<0.2
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.5	<0.1	<0.1	<0.2
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.5	<0.1	<0.1	<0.2
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HA512_0.1-0.2	TCLP		Fill	23/09/2022																																						

						Polychlorinated Biphenyls										VOCs			Chlorinated Hydrocarbons																															
						Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arochlor 1260	Arochlor 1268	Aroclor 1262	PCBs (Sum of total)	2-Nitropropane	cis-1,4-Dichloro-2-butene	trans-1,4-Dichloro-2-butene	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,1-dichloroethene	1,1-dichloropropene	1,2,3-trichloropropane	1,2-dibromo-3-chloropropane	1,2-dichloroethane	1,2-dichloropropane	1,3-dichloropropane	2,2-dichloropropane	Bromochloromethane	Bromodichloromethane	Bromoform	Carbon tetrachloride	Chlorodibromomethane	Chloroethane	Chloroform	Chloromethane	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Dibromomethane	Dichloromethane	Hexachlorobutadiene	Trichloroethene	Tetrachloroethene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Vinyl chloride
						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	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
EQL						0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	1	10	1	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	0.1	0.1	0.1	1	0.1	1	0.1	0.1	0.1	0.5	0.1	0.1	0.1	0.1	0.1	0.1
NSW 2014 General Solid Waste CT1 (No Leaching)															<50				200	600	26	24		14				10							10			120					172		10	14			4
NSW 2014 General Solid Waste SCC1															<50				360	1080	46.8	43.2		0.7				0.5							18			126					8.6		18	25.2			7.2
NSW 2014 General Solid Waste TCLP1 (mg/L)																																																	
NSW 2014 Restricted Solid Waste CT2 (No Leaching)															<50				800	2400	104	96		56				40							40			480					688		40	56			16
NSW 2014 Restricted Solid Waste SCC2															<50				1440	4320	187.2	172.8		100				72							72			864					1240		72	100.8			28.8
NSW 2014 Restricted Solid Waste TCLP1 (mg/L)																																																	
Site ID	**Field ID**	**Location**	**Sample Depth Range**	**Material**	**Sampled Date**																																												
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<1	<10	<1	<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	<0.1	<0.1	<0.1	<1	<0.1	<1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<1	<10	<1	<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	<0.1	<0.1	<0.1	<1	<0.1	<1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<1	<10	<1	<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	<0.1	<0.1	<0.1	<1	<0.1	<1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HA512_0.1-0.2	TCLP		Fill	23/09/2022																																												

Halogenated Hydrocarbons

Site ID	Field ID	Location	Sample Depth Range	Material	Sampled Date	1,2,3-trichlorobenzene	1,2,4-trichlorobenzene	1,2-dibromoethane	1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	2-chlorotoluene	4-chlorotoluene	Bromobenzene	Bromomethane	Chlorobenzene	Dichlorodifluoromethane	Iodomethane	Trichlorofluoromethane
						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
EQL						0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	1	5	1
NSW 2014 General Solid Waste CT1 (No Leaching)									86		150					2000			
NSW 2014 General Solid Waste SCC1									4.3		7.5					3600			
NSW 2014 General Solid Waste TCLP1 (mg/L)																			
NSW 2014 Restricted Solid Waste CT2 (No Leaching)									344		600					8000			
NSW 2014 Restricted Solid Waste SCC2									620		1080					14400			
NSW 2014 Restricted Solid Waste TCLP1 (mg/L)																			
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	<5	<1
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	<5	<1
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	<5	<1
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HA512_0.1-0.2	TCLP		Fill	23/09/2022														

Perfluorocarbons

Field ID	2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	8:2 Fluorotelomer sulfonate	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	Perfluorobutanoic acid (PFBA)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonic acid (PFOS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluoropentanoic acid (PFPeA)	Sum of PFAS	Perfluorodecanesulfonic acid (PFDS)	Sum of PFHxS and PFOS
	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
EQL	0.016	0.0016	0.008	0.016	0.008	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.008	0.008	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.08	0.0016	0.0016
NSW 2014 General Solid Waste CT1 (No Leaching)																										
NSW 2014 General Solid Waste SCC1																										
NSW 2014 General Solid Waste TCLP1 (mg/L)																										
NSW 2014 Restricted Solid Waste CT2 (No Leaching)																										
NSW 2014 Restricted Solid Waste SCC2																				7.2	7.2					
NSW 2014 Restricted Solid Waste TCLP1 (mg/L)																										
HA509_0.1-0.2	<0.016	<0.0016	<0.008	<0.016	<0.008	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.008	<0.008	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.08	<0.0016	<0.0016
HA509_0.3-0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA510_0.1-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA511_0.1-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA512_0.1-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA512_0.1-0.2 (TCLP)																										

	Perfluorooctanoate (PFOA)
	mg/kg
EQL	0.0008
NSW 2014 General Solid Waste CT1 (No Leaching)	
NSW 2014 General Solid Waste SCC1	
NSW 2014 General Solid Waste TCLP1 (mg/L)	
NSW 2014 Restricted Solid Waste CT2 (No Leaching)	
NSW 2014 Restricted Solid Waste SCC2	72
NSW 2014 Restricted Solid Waste TCLP1 (mg/L)	

Site ID	Field ID	Location	Sample Depth Range	Material	Sampled Date	
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	<0.0008
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	-
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	-
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	-
	HA512_0.1-0.2	TCLP		Fill	23/09/2022	

						ES_EPA8100	EW_EPA418	Solvents									
	% Moisture	Total +ve Chlorinated Hydrocarbons	Vic EPA IWRG 621 OCP (Total)	Vic EPA IWRG 621 Other CHC (Total)	TOTAL VOCS	Total PAH (NEPM/WHO 16)	TRH C37-C40	Methyl Ethyl Ketone	2-hexanone (MBK)	4-Methyl-2-pentanone	Acetone	Acrylonitrile	Allyl chloride	Carbon disulfide	MTBE	Vinyl acetate
	%w/w	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
EQL	1	1.8	1	1.8	24	0.8	100	10	5	1	10	0.1	0.1	0.5	0.1	10
NEPM 2013 HIL, Recreational C																
NEPM 2013 HIL, Residential B																
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour Intrusion, Clay																
0-1m																
1-2m																
2-4m																
>4m																
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour Intrusion, Sand																
0-1m																
1-2m																
2-4m																
>4m																
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Clay																
0-1m																
1-2m																
2-4m																
>4m																
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Sand																
0-1m																
1-2m																
2-4m																
>4m																
NEPM 2013 Soil HSL Residential A&B, for Vapour Intrusion, Clay																
0-1m																
1-2m																
2-4m																
>4m																
NEPM 2013 Soil HSL Residential A&B, for Vapour Intrusion, Sand																
0-1m																
1-2m																
2-4m																
>4m																
NEPM 2013 Management Limits, C/I, Fine Soil																
NEPM 2013 Management Limits, R/P&POS, Fine Soil																

Site ID	Field ID	Location	Sample Depth Range	Material	Sampled Date															
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	18.2	<1.8	<1	<1.8	<24	1.4	<100	<10	<5	<1	<10	<0.1	<0.1	<0.5	<0.1	<10
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	15	<1.8	<1	<1.8	<24	4.5	<100	<10	<5	<1	<10	<0.1	<0.1	<0.5	<0.1	<10
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	15.8	<1.8	<1	<1.8	<24	<0.8	<100	<10	<5	<1	<10	<0.1	<0.1	<0.5	<0.1	<10
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	17.3	-	-	-	-	11	<100	-	-	-	-	-	-	-	-	-

	TPH					CRC Care TPH Fractions							BTEX								MAH									
	C6 - C9	C10 - C14	C15 - C28	C29-C36	+C10 - C36 (Sum of total)	C6-C10	C10-C16	C16-C34	C34-C40	C10 - C40 (Sum of total)	F1: C6-C10 less BTEX	F2: >C10-C16 less NAPHTHALENE	Naphthalene (VOC)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Total BTEX	Xylene Total	1,2,4-trimethylbenzene	1,3,5-trimethylbenzene	Isopropylbenzene	n-butylbenzene	n-propylbenzene	p-isopropyltoluene	sec-butylbenzene	Styrene	tert-butylbenzene
	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
EQL	20	20	45	45	110	25	25	90	120	210	25	25	0.1	0.1	0.1	0.1	0.2	0.1	0.6	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
NEPM 2013 HIL, Recreational C																													
NEPM 2013 HIL, Residential B																													
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour Intrusion, Clay																													
0-1m											310	NL		4	NL	NL				NL									
1-2m											480	NL		6	NL	NL				NL									
2-4m											NL	NL		9	NL	NL				NL									
>4m											NL	NL		20	NL	NL				NL									
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour Intrusion, Sand																													
0-1m											260	NL		3	NL	NL				230									
1-2m											370	NL		3	NL	NL				NL									
2-4m											630	NL		3	NL	NL				NL									
>4m											NL	NL		3	NL	NL				NL									
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Clay																													
0-1m											NL	NL		NL	NL	NL				NL									
1-2m											NL	NL		NL	NL	NL				NL									
2-4m											NL	NL		NL	NL	NL				NL									
>4m											NL	NL		NL	NL	NL				NL									
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Sand																													
0-1m											NL	NL		NL	NL	NL				NL									
1-2m											NL	NL		NL	NL	NL				NL									
2-4m											NL	NL		NL	NL	NL				NL									
>4m											NL	NL		NL	NL	NL				NL									
NEPM 2013 Soil HSL Residential A&B, for Vapour Intrusion, Clay																													
0-1m											50	280		0.7	480	NL				110									
1-2m											90	NL		1	NL	NL				310									
2-4m											150	NL		2	NL	NL				NL									
>4m											290	NL		3	NL	NL				NL									
NEPM 2013 Soil HSL Residential A&B, for Vapour Intrusion, Sand																													
0-1m											45	110		0.5	160	55				40									
1-2m											70	240		0.5	220	NL				60									
2-4m											110	440		0.5	310	NL				95									
>4m											200	NL		0.5	540	NL				170									
NEPM 2013 Management Limits, C/I, Fine Soil	800	1000				800	1000	5000	10000																				
NEPM 2013 Management Limits, R/P&POS, Fine Soil	800	1000				800	1000	3500	10000																				

Site ID	Field ID	Location	Sample Depth Range	Material	Sampled Date																										
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	<20	<20	<45	<45	<110	<25	<25	<90	<120	<210	<25	<25	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.6	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	<20	<20	<45	<45	<110	<25	<25	<90	<120	<210	<25	<25	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.6	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	<20	<20	<45	<45	<110	<25	<25	<90	<120	<210	<25	<25	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.6	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	<20	<20	<45	<45	<110	<25	<25	<90	<120	<210	<25	<25	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.6	<0.3	-	-	-	-	-	-	-	-	-

	Metals									Asbestos						
	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Magnesium	Mercury	Nickel	Zinc	Asbestos identification	Asbestos in soil (>7mm ACM)	Asbestos in soil (<7mm AF/FA)	Asbestos in soil (>2mm to <7mm AF/FA)	Mass ACM	Mass Asbestos in AF	Mass Asbestos in FA & AF
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	Comment	%w/w	%w/w	%w/w	g	g	g
EQL	1	0.3	0.5	0.5	1	2	0.05	0.5	2		0.01	0.001	0.001	0.001	0.00001	0.00001
NEPM 2013 HIL, Recreational C	300	90		17000	600		80	1200	30000		0.02	0.001	0.001			
NEPM 2013 HIL, Residential B	500	150		30000	1200		120	1200	60000		0.04	0.001	0.001			
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour Intrusion, Clay																
0-1m																
1-2m																
2-4m																
>4m																
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour Intrusion, Sand																
0-1m																
1-2m																
2-4m																
>4m																
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Clay																
0-1m																
1-2m																
2-4m																
>4m																
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Sand																
0-1m																
1-2m																
2-4m																
>4m																
NEPM 2013 Soil HSL Residential A&B, for Vapour Intrusion, Clay																
0-1m																
1-2m																
2-4m																
>4m																
NEPM 2013 Soil HSL Residential A&B, for Vapour Intrusion, Sand																
0-1m																
1-2m																
2-4m																
>4m																
NEPM 2013 Management Limits, C/I, Fine Soil																
NEPM 2013 Management Limits, R/P&POS, Fine Soil																

Site ID	Field ID	Location	Sample Depth Range	Material	Sampled Date													
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	3	<0.3	6.8	18	36	-	0.06	4.9	80	No asbestos detected	<0.01	<0.001	<0.001	<0.001	<0.00001	<0.00001
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	6	<0.3	13	36	71	-	0.09	11	89	-	-	-	-	-	-	-
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	3	<0.3	6.3	17	24	-	0.07	3.1	75	Chrysotile & crocidolite asbestos found	0.06	<0.001	<0.001	2.16	<0.00001	<0.00001
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	No asbestos detected	<0.01	<0.001	<0.001	<0.001	<0.00001	<0.00001
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	11	0.4	24	44	160	-	0.56	11	240	-	-	-	-	-	-	-

	PAH																							Phenols
	Naphthalene	2-methylnaphthalene	1-Methylnaphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(k)fluoranthene	Benzo(b+j)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-c,d)pyrene	Dibenzo(a,h)anthracene	Benzo(g,h,i)perylene	Benzo(a)pyrene TEQ (Zero LOR)	Benzo(a)pyrene TEQ (Half LOR)	Benzo(a)pyrene TEQ (Full LOR)	PAHs (Sum of total)	Phenols
	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
EQL	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	0.1	0.1	0.5	0.5	0.5	0.8	0.5
NEPM 2013 HIL, Recreational C																				3		300	
NEPM 2013 HIL, Residential B																				4		400	
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour Intrusion, Clay																							
0-1m	NL																						
1-2m	NL																						
2-4m	NL																						
>4m	NL																						
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour Intrusion, Sand																							
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1-2m	NL																						
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NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Clay																							
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NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Sand																							
0-1m	NL																						
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NEPM 2013 Soil HSL Residential A&B, for Vapour Intrusion, Clay																							
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2-4m	NL																						
>4m	NL																						
NEPM 2013 Soil HSL Residential A&B, for Vapour Intrusion, Sand																							
0-1m	3																						
1-2m	NL																						
2-4m	NL																						
>4m	NL																						
NEPM 2013 Management Limits, C/I, Fine Soil																							
NEPM 2013 Management Limits, R/P&POS, Fine Soil																							

Site ID	Field ID	Location	Sample Depth Range	Material	Sampled Date																				
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.2	0.2	0.1	0.1	<0.1	0.2	0.1	0.1	<0.1	0.1	<0.2	<0.3	0.2	1.4	<0.5
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	0.1	0.7	0.7	0.4	0.4	0.2	0.5	0.5	0.4	<0.1	0.4	0.6	0.7	0.7	4.5	<0.5
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.2	<0.8	<0.5
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.8	0.3	1.8	1.9	1	0.9	0.4	1.1	1.1	0.6	0.2	0.7	1.5	1.5	1.5	11	-

	Organochlorine Pesticides																								
	2,4-DDT	4,4-DDE	a-BHC	Aldrin	b-BHC	Chlordane (cis)	gamma-Chlordane	d-BHC	DDD	DDT	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor	o,p-DDD	o,p'-DDE	trans-Nonachlor
	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
EQL	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
NEPM 2013 HIL, Recreational C															20				10		10	400			
NEPM 2013 HIL, Residential B															20				10		15	500			
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour Intrusion, Clay																									
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NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour Intrusion, Sand																									
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NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Clay																									
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NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Sand																									
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NEPM 2013 Soil HSL Residential A&B, for Vapour Intrusion, Clay																									
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NEPM 2013 Soil HSL Residential A&B, for Vapour Intrusion, Sand																									
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NEPM 2013 Management Limits, C/I, Fine Soil																									
NEPM 2013 Management Limits, R/P&POS, Fine Soil																									

Site ID	Field ID	Location	Sample Depth Range	Material	Sampled Date																							
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

	Organophosphorous Pesticides										Pesticides			Polychlorinated Biphenyls									VOCs		
	Azinophos methyl	Bromophos-ethyl	Chlorpyrifos	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenitrothion	Malathion	Methidathion	Isodrin	Mirex	Parathion	Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arochlor 1260	Arochlor 1268	Aroclor 1262	PCBs (Sum of total)	2-Nitropropane	cis-1,4-Dichloro-2-butene	trans-1,4-Dichloro-2-butene
	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
EQL	0.2	0.2	0.2	0.5	0.5	0.5	0.2	0.2	0.2	0.5	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	1	10	1	1
NEPM 2013 HIL, Recreational C			250									20											1			
NEPM 2013 HIL, Residential B			340									20											1			
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour Intrusion, Clay																										
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NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour Intrusion, Sand																										
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NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Clay																										
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NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Sand																										
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NEPM 2013 Soil HSL Residential A&B, for Vapour Intrusion, Clay																										
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NEPM 2013 Soil HSL Residential A&B, for Vapour Intrusion, Sand																										
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NEPM 2013 Management Limits, C/I, Fine Soil																										
NEPM 2013 Management Limits, R/P&POS, Fine Soil																										

Site ID	Field ID	Location	Sample Depth Range	Material	Sampled Date																							
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	<0.2	<0.2	<0.2	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.5	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<1	<10	<1	<1
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	<0.2	<0.2	<0.2	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.5	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<1	<10	<1	<1
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	<0.2	<0.2	<0.2	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.5	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<1	<10	<1	<1
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

	Chlorinated Hydrocarbons																				
	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,1-dichloroethene	1,1-dichloropropene	1,2,3-trichloropropane	1,2-dibromo-3-chloropropane	1,2-dichloroethane	1,2-dichloropropane	1,3-dichloropropane	2,2-dichloropropane	Bromochloromethane	Bromodichloromethane	Bromoform	Carbon tetrachloride	Chlorodibromomethane	Chloroethane	Chloroform	Chloromethane
	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
EQL	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	0.1	0.1	1	0.1	1
NEPM 2013 HIL, Recreational C																					
NEPM 2013 HIL, Residential B																					
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour Intrusion, Clay																					
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NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour Intrusion, Sand																					
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NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Sand																					
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NEPM 2013 Soil HSL Residential A&B, for Vapour Intrusion, Clay																					
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NEPM 2013 Soil HSL Residential A&B, for Vapour Intrusion, Sand																					
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NEPM 2013 Management Limits, C/I, Fine Soil																					
NEPM 2013 Management Limits, R/P&POS, Fine Soil																					

Site ID	Field ID	Location	Sample Depth Range	Material	Sampled Date																				
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	<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	<0.1	<0.1	<1	<0.1	<1
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	<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	<0.1	<0.1	<0.1	<1	<0.1	<1
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	<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	<0.1	<0.1	<0.1	<1	<0.1	<1
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

											Halogenated Hydrocarbons													
	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Dibromomethane	Dichloromethane	Hexachlorobutadiene	Trichloroethene	Tetrachloroethene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Vinyl chloride	1,2,3-trichlorobenzene	1,2,4-trichlorobenzene	1,2-dibromoethane	1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	2-chlorotoluene	4-chlorotoluene	Bromobenzene	Bromomethane	Chlorobenzene	Dichlorodifluoromethane	Iodomethane	Trichlorofluoromethane
	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
EQL	0.1	0.1	0.1	0.5	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	1	0.1	1	5	1
NEPM 2013 HIL, Recreational C																								
NEPM 2013 HIL, Residential B																								
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour Intrusion, Clay																								
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NEPM 2013 Management Limits, C/I, Fine Soil																								
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Site ID	Field ID	Location	Sample Depth Range	Material	Sampled Date																						
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.5	<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	<1	<0.1	<1	<5	<1
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.5	<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	<1	<0.1	<1	<5	<1
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.5	<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	<1	<0.1	<1	<5	<1
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

					Asbestos						
					Asbestos Identification	Asbestos in soil (>7mm ACM)	Asbestos in soil (<7mm AF/FA)	Asbestos in soil (>2mm to <7mm AF/FA)	Mass ACM	Mass Asbestos in AF	Mass Asbestos in FA & AF
					Comment	%w/w	%w/w	%w/w	g	g	g
EQL						0.01	0.001	0.001	0.001	0.00001	0.00001
NEPM 2013 HIL, Commercial/Industrial D							0.001	0.001			
NEPM 2013 HIL, Recreational C							0.001	0.001			
NEPM 2013 HIL, Residential B							0.001	0.001			
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour Intrusion, Clay											
0-1m											
1-2m											
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NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour Intrusion, Sand											
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NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Clay											
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NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Sand											
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NEPM 2013 Soil HSL Residential A&B, for Vapour Intrusion, Clay											
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NEPM 2013 Soil HSL Residential A&B, for Vapour Intrusion, Sand											
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NEPM 2013 Management Limits, C/I, Fine Soil											
NEPM 2013 Management Limits, R/P&POS, Fine Soil											

Site ID	Field ID	Location	Sample Depth Range	Sampled Date							
304100230.001.013	HA518_0.2	HA518	0.2	22/11/2022	No asbestos detected	<0.01	<0.001	<0.001	<0.001	<0.00001	<0.00001
304100230.001.013	HA518_0.3	HA518	0.3	22/11/2022	Amosite asbestos found as approx. 3-4 x 0.5mm loose fibre bundle	<0.01	<0.001	<0.001	<0.001	<0.00001	0.0013
304100230.001.013	HA519_0.2	HA519	0.2	22/11/2022	No asbestos detected	<0.01	<0.001	<0.001	<0.001	<0.00001	<0.00001
304100230.001.013	HA519_0.3	HA519	0.3	22/11/2022	No asbestos detected	<0.01	<0.001	<0.001	<0.001	<0.00001	<0.00001
304100230.001.013	HA520_0.2	HA520	0.2	22/11/2022	No asbestos detected	<0.01	<0.001	<0.001	<0.001	<0.00001	<0.00001
304100230.001.013	HA520_0.3	HA520	0.3	22/11/2022	No asbestos detected	<0.01	<0.001	<0.001	<0.001	<0.00001	<0.00001
304100230.001.013	HA521_0.2	HA521	0.2	22/11/2022	No asbestos detected	<0.01	<0.001	<0.001	<0.001	<0.00001	<0.00001
304100230.001.013	HA521_0.3	HA521	0.3	22/11/2022	Amosite asbestos found as approx. 3x1x1mm spongy fibrous material	<0.01	<0.001	<0.001	<0.001	<0.00001	0.0006

												ES_EPA8100	EW_EPA418	Solvents									
							% Moisture	Total +ve Chlorinated Hydrocarbons	Vic EPA IWRG 621 OCP (Total)*	Vic EPA IWRG 621 Other CHC (Total)*	TOTAL VOCS	Total PAH (NEPM/WHO 16)	TRH C37-C40	Methyl Ethyl Ketone	2-hexanone (MBK)	4-Methyl-2-pentanone	Acetone	Acrylonitrile	Allyl chloride	Carbon disulfide	MTBE
							%w/w	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
EQL							1	1.8	1	1.8	24	0.8	100	10	5	1	10	0.1	0.1	0.5	0.1
NEPM 2013 EIL Comm./Ind., low pH, CEC, clay content - aged																					
0-2m																					
NEPM 2013 EIL UR/POS, low pH, CEC, clay content - aged																					
0-2m																					
NEPM 2013 ESL Comm./Ind., Coarse soil																					
0-2m																					
NEPM 2013 ESL UR/POS, Coarse Soil																					
0-2m																					
PFAS NEMP 2020 Industrial/ commercial (HIL D)																					
PFAS NEMP 2020 Public open space (HIL C)																					
PFAS NEMP 2020 Residential with minimal opportunities for soil access (HIL B)																					
Site ID	**Field ID**	**Location**	**Sample Depth Range**	**Material**	**Sampled Date**																
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022		18.2	<1.8	<1	<1.8	<24	1.4	<100	<10	<5	<1	<10	<0.1	<0.1	<0.5	<0.1
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022		15	<1.8	<1	<1.8	<24	4.5	<100	<10	<5	<1	<10	<0.1	<0.1	<0.5	<0.1
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022		15.8	<1.8	<1	<1.8	<24	<0.8	<100	<10	<5	<1	<10	<0.1	<0.1	<0.5	<0.1
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022		17.3	-	-	-	-	11	<100	-	-	-	-	-	-	-	-

								TPH						CRC Care TPH Fractions							
								Vinyl acetate	C6 - C9	C10 - C14	C15 - C28	C29-C36	+C10 - C36 (Sum of total)	C6-C10	C10-C16	C16-C34	C34-C40	C10 - C40 (Sum of total)	F1: C6-C10 less BTEX	F2: >C10-C16 less NAPHTHALENE
								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
EQL								10	20	20	45	45	110	25	25	90	120	210	25	25
NEPM 2013 EIL Comm./Ind., low pH, CEC, clay content - aged																				
0-2m																				
NEPM 2013 EIL UR/POS, low pH, CEC, clay content - aged																				
0-2m																				
NEPM 2013 ESL Comm./Ind., Coarse soil																				
0-2m																1700	3300		215	170
NEPM 2013 ESL UR/POS, Coarse Soil																				
0-2m																300	2800		180	120
PFAS NEMP 2020 Industrial/ commercial (HIL D)																				
PFAS NEMP 2020 Public open space (HIL C)																				
PFAS NEMP 2020 Residential with minimal opportunities for soil access (HIL B)																				
Site ID	**Field ID**	**Location**	**Sample Depth Range**	**Material**	**Sampled Date**															
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	<10	<20	<20	<45	<45	<110	<25	<25	<90	<120	<210	<25	<25
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	<10	<20	<20	<45	<45	<110	<25	<25	<90	<120	<210	<25	<25
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	<10	<20	<20	<45	<45	<110	<25	<25	<90	<120	<210	<25	<25
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	-	<20	<20	<45	<45	<110	<25	<25	<90	<120	<210	<25	<25

						BTEX								MAH									
						Naphthalene (VOC)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Total BTEX	Xylene Total	1,2,4-trimethylbenzene	1,3,5-trimethylbenzene	Isopropylbenzene	n-butylbenzene	n-propylbenzene	p-isopropyltoluene	sec-butylbenzene	Styrene	tert-butylbenzene
						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
EQL						0.1	0.1	0.1	0.1	0.2	0.1	0.6	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
NEPM 2013 EIL Comm./Ind., low pH, CEC, clay content - aged																						
0-2m																						
NEPM 2013 EIL UR/POS, low pH, CEC, clay content - aged																						
0-2m																						
NEPM 2013 ESL Comm./Ind., Coarse soil																						
0-2m							75	135	165				180									
NEPM 2013 ESL UR/POS, Coarse Soil																						
0-2m							50	85	70				105									
PFAS NEMP 2020 Industrial/ commercial (HIL D)																						
PFAS NEMP 2020 Public open space (HIL C)																						
PFAS NEMP 2020 Residential with minimal opportunities for soil access (HIL B)																						
Site ID	**Field ID**	**Location**	**Sample Depth Range**	**Material**	**Sampled Date**																	
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.6	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.6	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.6	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.6	<0.3	-	-	-	-	-	-	-	-	-

						Metals												
						Arsenic	Cadmium	Calcium	Chromium (III+VI)	Copper	Lead	Magnesium	Mercury	Nickel	Potassium	Sodium	Zinc
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL						1	0.3	2	0.5	0.5	1	2	0.05	0.5	2	2	2
NEPM 2013 EIL Comm./Ind., low pH, CEC, clay content - aged																	
0-2m						160			720	340	1800			550			1500
NEPM 2013 EIL UR/POS, low pH, CEC, clay content - aged																	
0-2m						100			440	240	1100			320			980
NEPM 2013 ESL Comm./Ind., Coarse soil																	
0-2m																	
NEPM 2013 ESL UR/POS, Coarse Soil																	
0-2m																	
PFAS NEMP 2020 Industrial/ commercial (HIL D)																	
PFAS NEMP 2020 Public open space (HIL C)																	
PFAS NEMP 2020 Residential with minimal opportunities for soil access (HIL B)																	
Site ID	**Field ID**	**Location**	**Sample Depth Range**	**Material**	**Sampled Date**												
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	3	<0.3	-	6.8	18	36	-	0.06	4.9	-	-	80
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	6	<0.3	-	13	36	71	-	0.09	11	-	-	89
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	3	<0.3	-	6.3	17	24	-	0.07	3.1	-	-	75
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	11	0.4	-	24	44	160	-	0.56	11	-	-	240

							Asbestos						
							Asbestos Identification	Asbestos in soil (>7mm ACM)	Asbestos in soil (<7mm AF/FA)	Asbestos in soil (>2mm to <7mm AF/FA)	Mass ACM	Mass Asbestos in AF	Mass Asbestos in FA & AF
							Comment	%w/w	%w/w	%w/w	g	g	g
EQL								0.01	0.001	0.001	0.001	0.00001	0.00001
NEPM 2013 EIL Comm./Ind., low pH, CEC, clay content - aged													
0-2m													
NEPM 2013 EIL UR/POS, low pH, CEC, clay content - aged													
0-2m													
NEPM 2013 ESL Comm./Ind., Coarse soil													
0-2m													
NEPM 2013 ESL UR/POS, Coarse Soil													
0-2m													
PFAS NEMP 2020 Industrial/ commercial (HIL D)													
PFAS NEMP 2020 Public open space (HIL C)													
PFAS NEMP 2020 Residential with minimal opportunities for soil access (HIL B)													
Site ID	**Field ID**	**Location**	**Sample Depth Range**	**Material**	**Sampled Date**								
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022		No asbestos detected	<0.01	<0.001	<0.001	<0.001	<0.00001	<0.00001
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022		-	-	-	-	-	-	-
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022		Chrysotile & crocidolite asbestos found	0.06	<0.001	<0.001	2.16	<0.00001	<0.00001
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022		No asbestos detected	<0.01	<0.001	<0.001	<0.001	<0.00001	<0.00001
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022		-	-	-	-	-	-	-

						PAH																
						Naphthalene	2-methylnaphthalene	1-Methylnaphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(k)fluoranthene	Benzo(b+j)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-c,d)pyrene	Dibenzo(a,h)anthracene
						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
EQL						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	0.1
NEPM 2013 EIL Comm./Ind., low pH, CEC, clay content - aged																						
0-2m						370																
NEPM 2013 EIL UR/POS, low pH, CEC, clay content - aged																						
0-2m						170																
NEPM 2013 ESL Comm./Ind., Coarse soil																						
0-2m																			1.4			
NEPM 2013 ESL UR/POS, Coarse Soil																						
0-2m																			0.7			
PFAS NEMP 2020 Industrial/ commercial (HIL D)																						
PFAS NEMP 2020 Public open space (HIL C)																						
PFAS NEMP 2020 Residential with minimal opportunities for soil access (HIL B)																						
Site ID	**Field ID**	**Location**	**Sample Depth Range**	**Material**	**Sampled Date**																	
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.2	0.2	0.1	0.1	<0.1	0.2	0.1	0.1	<0.1
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	0.1	0.7	0.7	0.4	0.4	0.2	0.5	0.5	0.4	<0.1
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.8	0.3	1.8	1.9	1	0.9	0.4	1.1	1.1	0.6	0.2

Table: Results against ecological health and PFAS criteria

											Phenols							
						Benzo(g,h,i)perylene	Benzo(a)pyrene TEQ (Zero LOR)	Benzo(a)pyrene TEQ (Half LOR)_1	Benzo(a)pyrene TEQ (Full LOR)	PAHs (Sum of total)	Phenols	2,4-DDT	4,4-DDE	a-BHC	Aldrin	b-BHC	Chlordane (cis)	gamma-Chlordane
						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
EQL						0.1	0.5	0.5	0.5	0.8	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1
NEPM 2013 EIL Comm./Ind., low pH, CEC, clay content - aged																		
0-2m																		
NEPM 2013 EIL UR/POS, low pH, CEC, clay content - aged																		
0-2m																		
NEPM 2013 ESL Comm./Ind., Coarse soil																		
0-2m																		
NEPM 2013 ESL UR/POS, Coarse Soil																		
0-2m																		
PFAS NEMP 2020 Industrial/ commercial (HIL D)																		
PFAS NEMP 2020 Public open space (HIL C)																		
PFAS NEMP 2020 Residential with minimal opportunities for soil access (HIL B)																		
Site ID	**Field ID**	**Location**	**Sample Depth Range**	**Material**	**Sampled Date**													
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	0.1	<0.2	<0.3	0.2	1.4	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	0.4	0.6	0.7	0.7	4.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	<0.1	<0.2	<0.3	<0.2	<0.8	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	0.7	1.5	1.5	1.5	11	-	-	-	-	-	-	-	-

						Organochlorine Pesticides																		
						d-BHC	DDD	DDT	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor	o,p-DDD	o,p'-DDE
						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
EQL						0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
NEPM 2013 EIL Comm./Ind., low pH, CEC, clay content - aged																						
0-2m								640														
NEPM 2013 EIL UR/POS, low pH, CEC, clay content - aged																						
0-2m								180														
NEPM 2013 ESL Comm./Ind., Coarse soil																						
0-2m																						
NEPM 2013 ESL UR/POS, Coarse Soil																						
0-2m																						
PFAS NEMP 2020 Industrial/ commercial (HIL D)																						
PFAS NEMP 2020 Public open space (HIL C)																						
PFAS NEMP 2020 Residential with minimal opportunities for soil access (HIL B)																						
Site ID	**Field ID**	**Location**	**Sample Depth Range**	**Material**	**Sampled Date**																	
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

									Organophosphorous Pesticides											Pesticides					
							trans-Nonachlor	Azinophos methyl	Bromophos-ethyl	Chlorpyrifos	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenitrothion	Malathion	Methidathion	Isodrin	Mirex	Parathion	Arochlor 1016	Arochlor 1221	Arochlor 1232
							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
EQL							0.1	0.2	0.2	0.2	0.5	0.5	0.5	0.2	0.2	0.2	0.5	0.1	0.1	0.2	0.2	0.2	0.2
NEPM 2013 EIL Comm./Ind., low pH, CEC, clay content - aged																									
0-2m																									
NEPM 2013 EIL UR/POS, low pH, CEC, clay content - aged																									
0-2m																									
NEPM 2013 ESL Comm./Ind., Coarse soil																									
0-2m																									
NEPM 2013 ESL UR/POS, Coarse Soil																									
0-2m																									
PFAS NEMP 2020 Industrial/ commercial (HIL D)																									
PFAS NEMP 2020 Public open space (HIL C)																									
PFAS NEMP 2020 Residential with minimal opportunities for soil access (HIL B)																									
Site ID	**Field ID**	**Location**	**Sample Depth Range**	**Material**	**Sampled Date**																				
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022		<0.1	<0.2	<0.2	<0.2	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.5	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022		<0.1	<0.2	<0.2	<0.2	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.5	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022		<0.1	<0.2	<0.2	<0.2	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.5	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

						Polychlorinated Biphenyls							VOCs									
						Arochlor 1242	Arochlor 1248	Arochlor 1254	Arochlor 1260	Arochlor 1268	Aroclor 1262	PCBs (Sum of total)	2-Nitropropane	cis-1,4-Dichloro-2-butene	trans-1,4-Dichloro-2-butene	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,1-dichloroethene
						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
EQL						0.2	0.2	0.2	0.2	0.2	0.2	1	10	1	1	0.1	0.1	0.1	0.1	0.1	0.1
NEPM 2013 EIL Comm./Ind., low pH, CEC, clay content - aged																					
0-2m																					
NEPM 2013 EIL UR/POS, low pH, CEC, clay content - aged																					
0-2m																					
NEPM 2013 ESL Comm./Ind., Coarse soil																					
0-2m																					
NEPM 2013 ESL UR/POS, Coarse Soil																					
0-2m																					
PFAS NEMP 2020 Industrial/ commercial (HIL D)																					
PFAS NEMP 2020 Public open space (HIL C)																					
PFAS NEMP 2020 Residential with minimal opportunities for soil access (HIL B)																					
Site ID	**Field ID**	**Location**	**Sample Depth Range**	**Material**	**Sampled Date**																
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<1	<10	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<1	<10	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<1	<10	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

						Chlorinated Hydrocarbons														
						1,1-dichloropropene	1,2,3-trichloropropane	1,2-dibromo-3-chloropropane	1,2-dichloroethane	1,2-dichloropropane	1,3-dichloropropane	2,2-dichloropropane	Bromochloromethane	Bromodichloromethane	Bromoform	Carbon tetrachloride	Chlorodibromomethane	Chloroethane	Chloroform	Chloromethane
						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
EQL						0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	1
NEPM 2013 EIL Comm./Ind., low pH, CEC, clay content - aged																				
0-2m																				
NEPM 2013 EIL UR/POS, low pH, CEC, clay content - aged																				
0-2m																				
NEPM 2013 ESL Comm./Ind., Coarse soil																				
0-2m																				
NEPM 2013 ESL UR/POS, Coarse Soil																				
0-2m																				
PFAS NEMP 2020 Industrial/ commercial (HIL D)																				
PFAS NEMP 2020 Public open space (HIL C)																				
PFAS NEMP 2020 Residential with minimal opportunities for soil access (HIL B)																				
Site ID	**Field ID**	**Location**	**Sample Depth Range**	**Material**	**Sampled Date**															
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

						cis-1,2-dichloroethene	cis-1,3-dichloropropene	Dibromomethane	Dichloromethane	Hexachlorobutadiene	Trichloroethene	Tetrachloroethene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Vinyl chloride
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL						0.1	0.1	0.1	0.5	0.1	0.1	0.1	0.1	0.1	0.1
NEPM 2013 EIL Comm./Ind., low pH, CEC, clay content - aged															
0-2m															
NEPM 2013 EIL UR/POS, low pH, CEC, clay content - aged															
0-2m															
NEPM 2013 ESL Comm./Ind., Coarse soil															
0-2m															
NEPM 2013 ESL UR/POS, Coarse Soil															
0-2m															
PFAS NEMP 2020 Industrial/ commercial (HIL D)															
PFAS NEMP 2020 Public open space (HIL C)															
PFAS NEMP 2020 Residential with minimal opportunities for soil access (HIL B)															
Site ID	**Field ID**	**Location**	**Sample Depth Range**	**Material**	**Sampled Date**										
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-

						Halogenated Hydrocarbons														
						1,2,3-trichlorobenzene	1,2,4-trichlorobenzene	1,2-dibromoethane	1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	2-chlorotoluene	4-chlorotoluene	Bromobenzene	Bromomethane	Chlorobenzene	Dichlorodifluoromethane	Iodomethane	Trichlorofluoromethane
						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
EQL						0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	1	5	1
NEPM 2013 EIL Comm./Ind., low pH, CEC, clay content - aged																			
0-2m																			
NEPM 2013 EIL UR/POS, low pH, CEC, clay content - aged																			
0-2m																			
NEPM 2013 ESL Comm./Ind., Coarse soil																			
0-2m																			
NEPM 2013 ESL UR/POS, Coarse Soil																			
0-2m																			
PFAS NEMP 2020 Industrial/ commercial (HIL D)																			
PFAS NEMP 2020 Public open space (HIL C)																			
PFAS NEMP 2020 Residential with minimal opportunities for soil access (HIL B)																			
Site ID	**Field ID**	**Location**	**Sample Depth Range**	**Material**	**Sampled Date**														
304100230.001.013	HA509_0.1-0.2	HA509	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	<5	<1
304100230.001.013	HA509_0.3-0.4	HA509	0.3-0.4	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	<5	<1
304100230.001.013	HA510_0.1-0.2	HA510	0.1-0.2	Fill	23/09/2022	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	<5	<1
304100230.001.013	HA511_0.1-0.2	HA511	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-
304100230.001.013	HA512_0.1-0.2	HA512	0.1-0.2	Fill	23/09/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX

C

WASTE TRACKING TEMPLATE

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Table 14-1 Example Waste Tracking Template

Waste Classification Certificate Reference	Waste Category	Site Area	Stockpile ID	Volume (T)	Date Disposed	Truck Rego	Disposal Facility	EPL	Date Received	Tonnage Received

About Cardno

Cardno is a professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASX:CDD].

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