

Decommissioning of the National Research Cyclotron Facility, Camperdown

Application Number: 01575

Commencement Date:
09/12/2022

Status: Locked

1. About the project

1.1 Project details

1.1.1 Project title *

Decommissioning of the National Research Cyclotron Facility, Camperdown

1.1.2 Project industry type *

Commonwealth

1.1.3 Project industry sub-type

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1.1.4 Estimated start date *

01/02/2027

1.1.4 Estimated end date *

30/06/2028

1.2 Proposed Action details

1.2.1 Provide an overview of the proposed action, including all proposed activities. *

The proposed action is for the full decommissioning of the National Research Cyclotron Facility (NRCF), operated by the Australian Nuclear Science and Technology Organisation (ANSTO) at 81 Missenden Road, Camperdown NSW, Australia. The NRCF is located near the Royal Prince Alfred (RPA) Hospital within the

grounds of the Sydney Local Health District (SLHD). The NRCF operated for ~10 years until 2021 when the site moved to a permanent state of shutdown. The project area is 0.35 hectares and the disturbance footprint (which is the building footprint to be demolished) is 0.17 hectares.

Central to NRFC is a 18 Megaelectron Volt (MeV) proton cyclotron, a small machine which acts as a particle accelerator to produce a small number of niche radioisotopes, such as Carbon-11 and Fluorine-18, used primarily for research purposes and in radiopharmaceuticals. This cyclotron was commissioned in 2012. Research into new radiopharmaceuticals and the production of nuclear medicines are now wholly carried out from ANSTO's Lucas Heights campus in southern Sydney.

Prior to the commissioning of the 18MeV cyclotron, a larger 30 MeV cyclotron (known as the National Medical Cyclotron) operated in the building from 1990 until decommissioning in 2011. This cyclotron was removed, however most of the supporting infrastructure remained in situ for operation with the 18 MeV cyclotron. The decommissioning of the 30 MeV cyclotron was referred to the Minister for the Environment in 2010 - see EPBC referral 2010/5645.

ANSTO is a lease holder of the building which houses the cyclotron facility. As part of its lease obligations with SLHD, ANSTO is required to decommission the facility (including the removal of the cyclotron, all supporting infrastructure, building shell and concrete slab). The site will then be returned to Sydney Local Health District. The future use of the site will be incorporated into SLHD's master planning for the RPA Hospital campus.

ANSTO will be required to seek a licence to decommission the NRCF from the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).

ANSTO has characterised the facility for the waste streams which will be produced and disposed as recyclable wastes or landfill waste, meeting the requirements of the International Atomic Energy Agency (IAEA) General Safety Requirements Part 3 (**Ref 1 - IAEA General Safety Requirements Part 3**) and the NSW EPA Waste Classification Guidelines Parts 1 (**Ref 2 - Waste Classification Guidelines Part 1: Classifying waste**) and 3 (**Ref 3 - Waste classification guidelines Part 3: Waste containing radioactive material**).

Some equipment and supporting infrastructure will be retained by ANSTO and transported to Lucas Heights, NSW, including the 18MeV Cyclotron and the nine (9) hot cells. The remaining infrastructure and demolition waste will be disposed via recycling routes or as landfill where there are no alternative reuse/recycling options. Some areas within the facility, particularly the existing cyclotron vault, have been characterised by ANSTO as having elevated levels of radioactivity, and as a result will be decommissioned and wastes disposed appropriately to meet the requirements of the set by ARPANSA and the NSW Environment Protection Agency (EPA). Wastes which will be reused by ANSTO, or recycled or disposed to landfill will be transported by road.

Key Activities

The key activities involved with the establishment of the NMF will be (**Att A - DRAFT Decommissioning Plan – October 2024, page 8**):

- Removal of the 18MeV cyclotron and transport to the Lucas Heights Campus for storage prior to disposal.
- Removal and disposal of the liquid waste tanks in the basement.
- Removal and disposal of all service and ancillary equipment (e.g. active ventilation, stack etc.)
- Standard demolition works for the building structures/systems determined by characterization to be radiologically exempt and free from radiological contamination.
- Transporting of radiological contamination-free waste to a recycling facility.
- Installation of an enclosure over the vault structure.
- Packaging of activated, transport to an authorized facility and disposed as restricted waste.
- Final radiation surveys necessary to meet the requirements for release from regulatory control.

- Handover to the SLHD.

ANSTO has identified the following activities as likely to have minor impacts to the environment and is the basis for this referral. Further information on these potential impacts and the control measures is provided in section 4 of this referral and **Att B - EPBC Act Referral Self-Assessment on Impacts to the Environment for the Decommissioning of the ANSTO Camperdown Facility**.

Activity: Demolition of building.

Impact: Emissions of radioactive and chemical contaminants into the environment.

The decommissioning of the NRCF will inherently produce dusts through the demolition of the building.

Demolition activities will be undertaken by a suitably qualified and experienced Principal Contractor who will be managed by ANSTO. Before commencing the construction work, the Principal Contractor will be required to complete and implement a project /construction environmental management plan. Mitigation measures will include, but not limited to dust suppression methods, tenting of the facility at certain times, and sediment controls

Activity: Transport of wastes for recycling or landfill

Impact: Contaminants released into the environment from inappropriate containment of wastes.

There is a risk that restricted wastes transported by truck to Kemps Creek Waste Management Facility, and low-level solid radioactive waste to ANSTO Lucas Heights, and equipment to ANSTO Lucas Heights for repurposing could be released to the environment because of inappropriate containers and covering of the wastes in transit, and in the event of a vehicular accident.

Wastes will be transported by suitably licenced transporting companies and in suitable and approved containers for the types of waste.

Activity: Increase demand on surrounding road infrastructure during the site preparation and construction phases.

Impact: It is estimated approximately 300 heavy vehicle movements will be conducted throughout all stages of the demolition.

Most of the activity will occur over a 3-month period during weekdays. A traffic management plan will be prepared for the preparation, demolition, and waste disposal activities.

1.2.2 Is the project action part of a staged development or related to other actions or proposals in the region?

No

1.2.6 What Commonwealth or state legislation, planning frameworks or policy documents are relevant to the proposed action, and how are they relevant? *

Australian Nuclear Science and Technology Organisation Act 1987 (ANSTO Act)

ANSTO is a statutory body of the Commonwealth. Commonwealth land is not subject to state or territory law (Section 52(2) of the Australian Constitution). As such, NSW legislation does not apply and approvals by State or local authorities are not required.

The *Australian Nuclear Science and Technology Organisation Act 1987* (ANSTO Act) establishes ANSTO, its functions and the general regulatory environment it is bound by. Section 7A of the ANSTO Act stipulates that State (i.e. NSW) law does not apply to the organisation, its property or transactions or anything done by

or on behalf of the organisation. This includes the use or proposed use of land or premises, or the environmental consequences of the use of the land or premises. The project is not subject to formal consent from The City of Sydney Council.

Notwithstanding, ANSTO must comply with Commonwealth environmental legislation, including the:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and relevant regulatory framework; and,
- *Australian Radiation Protection and Nuclear Safety Act 1998* (ARPANS Act), administered by the ARPANSA.

Environment Protection and Biodiversity Conservation Act 1999

ANSTO has reviewed the proposed action its potential impacts to the environment against the requirements of Part 3 of the EPBC Act, specifically with regards to whether the proposed action may have a significant impact on matters of national environmental significance (MNES), and consequently whether the proposed action should be referred to the Minister for the Environment. To assist in informing ANSTO's view on whether the proposed action should be referred, ANSTO consulted the following documents:

- **Ref 4 - Significant Impact Guidelines 1.1 - Matters of National Environmental Significance**
- **Ref 5 - Significant impact guidelines 1.2 - Actions on, or impacting upon, Commonwealth land and Actions by Commonwealth Agencies.**

ANSTO has completed a self-assessment on the potential impacts to both MNES and actions by the Commonwealth (**Att B - EPBC Act Referral Self-Assessment on Impacts to the Environment for the Decommissioning of the ANSTO Camperdown Facility**). In summary, the self-assessment found that the proposed action triggers the requirement for referral under s.28 Actions by Commonwealth Agencies. ANSTO has self-assessed the impacts and does not believe the impacts are likely to be significant toward the environment and should not be considered as a controlled action. Further details are provided section 4 of this referral and in **Att B - EPBC Act Referral Self-Assessment on Impacts to the Environment for the Decommissioning of the ANSTO Camperdown Facility**.

Australian Radiation Protection and Nuclear Safety Act 1998

In accordance with the ARPANS Act, the action will be the subject of an application to ARPANSA for a licence to decommission the Camperdown facility. While the Camperdown facility has not produced radioisotopes since 2021, the facility is currently operating and being maintained in accordance with ARPANSA operating licence F0251 as a prescribed radiation facility.

ARPANSA's objective, as expressed in the ARPANS Act, is 'to protect the health and safety of people, and to protect the environment, from the harmful effects of radiation'. To meet that principal objective, a framework for regulation of the Commonwealth's radiation and nuclear activities has been developed which reflects best international best practice in radiation and nuclear regulation, and is consistent with the requirements for radiation protection and nuclear safety of the Australian State and Territory regulatory authorities.

Within that regulatory framework, ARPANSA's Operations Services Branch:

- assesses applications for licences against accepted standards for radiation protection and nuclear safety;
- makes recommendations to the CEO on the issuing of licences;
- undertakes inspections of licenced activities to confirm compliance with legislative requirements; and
- takes any enforcement actions necessary to ensure compliance, safety of people and protection of the environment.

To ensure compliance with ARPANSA environmental protection requirements, ANSTO regularly monitors its liquid, gaseous and solid waste discharges with the objective of minimising its environmental footprint and maintaining compliance with the regulation. This is overseen by ANSTO's Environmental Monitoring team.

ANSTO collaborates and shares information openly with the public (**Ref 6 - Local Environmental Monitoring**) as well as government owned statutory corporations such as the Sydney Water Corporation for authorised discharge of trade waste, noting the discharge of trade waste from Camperdown is conducted as part of ANSTO's Waste Management Services processes in accordance with **Att C - Sydney Water Trade Waste Agreement #4423**. This discharge consent is periodically reviewed to provide assurance that ANSTO's discharges remain within authorised radiological and non-radiological limits and pose no threat to the environment.

NSW Environmental Protection Agency

While the decommissioning of the NRCF will be conducted in compliance with ARPANSA and EPBC legislation, waste disposal activities will need to comply with NSW EPA requirements, primarily NSW EPA Waste Classification Guidelines Parts 1 (**Ref 2 - Waste Classification Guidelines Part 1: Classifying waste**) and 3 (**Ref 3 - Waste classification guidelines Part 3: Waste containing radioactive material**). To correctly classify the waste streams from the demolition of the NRCF, ANSTO has conducted a detailed characterisation of the facility. The waste transport consignees and waste accepting facilities will be required to hold the appropriate EPA licences to handle the wastes. ANSTO will ensure waste receipts are collected for each waste consignment and maintained as records.

1.2.7 Describe any public consultation that has been, is being or will be undertaken regarding the project area, including with Indigenous stakeholders. Attach any completed consultation documentations, if relevant. *

This project will undergo several unique stakeholder engagement tasks during the planning phases, which will be aimed at specific audiences relating to particular important themes and decisions. The following stakeholders have been identified and will be consulted at varying times throughout the project.

- Sydney Local Health District, surrounding business community University of Sydney resident colleges, local residents, staff patients and visitors.
 - ANSTO and SLHD have set up a combined communications working group specifically for stakeholder management and consulted. The group meets regularly as per the agreed Terms of Reference for the working group.
- Public Works Committee (PWC)
 - ANSTO have submitted a PWC referral for the project to the Department of Finance. Feedback from the department is that EPBC approval must be completed before the submission is referred to the Committee.
- Federal Government
 - Communication to the relevant federal members of parliament will be coordinated by ANSTO's Government Affairs team.
- ARPANSA
 - Any public consultation as required by the ARPANS Act and Regulations will be coordinated by ANSTO's Regulatory and Governance team.
- Eora Nation / Central Metropolitan Aboriginal Land Council representatives.
- NSW EPA
- ANSTO's Regulatory and Governance team will lead consultation with NSW EPA
- NSW emergency services
- Australia Federal Police
- Transport regulators (including the National Heavy Vehicle Regulator and Transport for NSW)
- Sydney City Council
- Relevant waste management facilities
- Comcare and Safework NSW.

1.3.1 Identity: Referring party

Privacy Notice:

Personal information means information or an opinion about an identified individual, or an individual who is reasonably identifiable.

By completing and submitting this form, you consent to the collection of all personal information contained in this form. If you are providing the personal information of other individuals in this form, please ensure you have their consent before doing so.

The Department of Climate Change, Energy, the Environment and Water (the department) collects your personal information (as defined by the Privacy Act 1988) through this platform for the purposes of enabling the department to consider your submission and contact you in relation to your submission. If you fail to provide some or all of the personal information requested on this platform (name and email address), the department will be unable to contact you to seek further information (if required) and subsequently may impact the consideration given to your submission.

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See our Privacy Policy to learn more about accessing or correcting personal information or making a complaint. Alternatively, email us at privacy@awe.gov.au.

☒ **Confirm that you have read and understand this Privacy Notice ***

1.3.1.1 Is Referring party an organisation or business? *

Yes

Referring party organisation details	
ABN/ACN	47956969590
Organisation name	AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION
Organisation address	178 New Illawarra Road, Lucas Heights NSW 2234
Referring party details	
Name	Michael Baker

Job title	Manager, Regulatory Affairs and Compliance - Environment and Sustainability
Phone	0429155994
Email	mhb@ansto.gov.au
Address	178 New Illawarra Road, Lucas Heights NSW 2234

1.3.2 Identity: Person proposing to take the action

1.3.2.1 Are the Person proposing to take the action details the same as the Referring party details? *

No

1.3.2.2 Is Person proposing to take the action an organisation or business? *

Yes

Person proposing to take the action organisation details	
ABN/ACN	47956969590
Organisation name	AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION
Organisation address	178 New Illawarra Road, Lucas Heights NSW 2234
Person proposing to take the action details	
Name	Jakob Vujcic
Job title	General Manager, Regulatory and Governance
Phone	02 9717 3844
Email	vujcicj@ansto.gov.au
Address	New Illawarra Road, Lucas Heights NSW 2234

1.3.2.14 Are you proposing the action as part of a Joint Venture? *

No

1.3.2.15 Are you proposing the action as part of a Trust? *

No

1.3.2.17 Describe the Person proposing the action's history of responsible environmental management including details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against the Person proposing to take the action. *

ANSTO has a strong track record of environmental stewardship largely due to its investment in an environmental management system (EMS). The processes, procedures and minimum requirements for environmental protection prescribed within ANSTO's EMS will underpin all the actions conducted during this work ensuring that there is no significant impact to the environment. ANSTO's commitment to minimising its environmental footprint is detailed within the ANSTO Health, Safety, Community and Environmental Policy (**Att D - Health Safety Community and Environment Policy**).

The process for identifying, risk assessing, controlling and reviewing environmental aspects and environmental compliance obligations is embedded within all business processes throughout ANSTO.

ANSTO is subject to strict ongoing radiological environmental regulation by the ARPANSA. To comply with the ARPANS Act, ANSTO is required to obtain approval from ARPANSA for Plans and Arrangements, including for under a decommissioning licence. Such plans are periodically reviewed and updated by ANSTO. ANSTO's commitment to the environment is also demonstrated through its continued certification to the international environmental management standard, ISO14001. Part of this commitment is through the ongoing resourcing the Environmental Monitoring Group which provides regular ongoing monitoring of emissions from ANSTO.

In addition, ANSTO has demonstrated its ability to work with government departments to ensure environmental safety outcomes are met. For example, ANSTO has ensured full compliance with the 29 conditions applied following the approval of the construction of the Open Pool Australian Light-water (OPAL) nuclear reactor in 1999 by the then Minister for the Environment and Heritage.

ANSTO's Environmental Sustainability Strategy (**Ref 7 - ANSTO Environmental Sustainability Strategy**) outlines the organisation's high-level environmental goals and targets. This Strategy includes long-term, ambitious objectives which seek to significantly reduce ANSTO's greenhouse gas emissions, water consumption and waste production. The Strategy also includes objectives to improve ecological outcomes within ANSTO's Bushland Perimeter.

In 1992, ANSTO was subject to action under the NSW Environmental Planning and Assessment Act 1979 in the NSW Land and Environment Court. The action related to a breach of NSW planning law. No adverse environmental impacts were alleged or found.

Previous EPBC referrals submitted are provided below:

2023/9756 - 2025 OPAL Spent Fuel Shipment

2023/9748 - New nuclear medicine manufacture and production facility at Lucas Heights

2022/9352 - Phase A HIFAR Decommissioning

2022/9355 - Legacy Mineral Sands Remediation and Disposal

2021/9025 - Intermediate Level Solid Waste Storage Facility

2021/8998 - Return of Australian Intermediate Level Radioactive Waste from the UK
 2016/7841- Transport of OPAL Spent Fuel to France in 2018
 2016/7733 - Extension and upgrade waste management facilities, Lucas Heights
 2015/7437 - Transport of intermediate level radioactive waste to Lucas Heights
 2012/6697 - Synroc Waste Treatment Facility
 2012/6598 - ANSTO Nuclear Medicine Mo99 Facility
 2012/6564 - Interim Waste Storage Facility
 2010/5645 - Decommissioning of NMC and Camperdown Facility
 2008/4615 - Decommissioning of Moata Research Reactor
 2008/4459 - Construction of Nuclear Materials Store
 2007/3672 - Shipment of Spent Nuclear Fuel to USA
 2006/2740 - Upgrade Of Nuclear Production Equipment
 2003/1114 - Extension to Lucas Heights production building
 2001/405 - Placement of fill excavated from the site for the Replacement Research Reactor
 2001/342 - Waste Treatment and Packaging Building

1.3.2.18 If the person proposing to take the action is a corporation, provide details of the corporation's environmental policy and planning framework

ANSTO's commitment to the protection of the environment from its activities is directed by the ANSTO Health, Safety, Community and Environmental Policy (**Att D - Health Safety Community and Environment Policy**).

For construction, decommissioning or maintenance activities, ANSTO has in place a planning framework to ensure activities such as the Proposed Activity, are conducted to prevent harm to the environment (detailed in **Att E - AP-5400 Project Environmental Protection Requirements**).

Initially, all construction and decommissioning projects must complete a screening checklist (**Att F - AF-1376 Project Environmental Planning Checklist**) to determine what degree of regulatory approvals may be required, and what further environmental planning is required. It is at this stage, the self-assessment to determine whether an EPBC Referral is conducted.

Prior to the commencement of works, ANSTO will prepare a Project/ Construction Environmental Management Plan (**Att G - AF-5947 Project - Construction Environmental Management Plan**) to identify and mitigate the components within the site preparation and construction phase which may have an impact on the environment.

For specific tasks, a Safe Work Method and Environmental Statement (**Att H - AF-2315 Safe Work Method and Environmental Statement (SWMES)**) will be completed which may provide further information on the identification and mitigation of specific hazards to the environment.

1.3.3 Identity: Proposed designated proponent

1.3.3.1 Are the Proposed designated proponent details the same as the Person proposing to take the action? *

Yes

Proposed designated proponent organisation details

ABN/ACN	47956969590
Organisation name	AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION
Organisation address	178 New Illawarra Road, Lucas Heights NSW 2234

Proposed designated proponent details

Name	Jakob Vujcic
Job title	General Manager, Regulatory and Governance
Phone	02 9717 3844
Email	vujcicj@ansto.gov.au
Address	New Illawarra Road, Lucas Heights NSW 2234

1.3.4 Identity: Summary of allocation

✔ Confirmed Referring party's identity

The Referring party is the person preparing the information in this referral.

ABN/ACN	47956969590
Organisation name	AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION
Organisation address	178 New Illawarra Road, Lucas Heights NSW 2234
Representative's name	Michael Baker
Representative's job title	Manager, Regulatory Affairs and Compliance - Environment and Sustainability
Phone	0429155994
Email	mhb@ansto.gov.au

Address

178 New Illawarra Road, Lucas Heights NSW 2234

✔ Confirmed Person proposing to take the action's identity

The Person proposing to take the action is the individual, business, government agency or trustee that will be responsible for the proposed action.

ABN/ACN	47956969590
Organisation name	AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION
Organisation address	178 New Illawarra Road, Lucas Heights NSW 2234
Representative's name	Jakob Vujcic
Representative's job title	General Manager, Regulatory and Governance
Phone	02 9717 3844
Email	vujcicj@ansto.gov.au
Address	New Illawarra Road, Lucas Heights NSW 2234

✔ Confirmed Proposed designated proponent's identity

The Person proposing to take the action is the individual or organisation proposed to be responsible for meeting the requirements of the EPBC Act during the assessment process, if the Minister decides that this project is a controlled action.

Same as Person proposing to take the action information.

1.4 Payment details: Payment exemption and fee waiver

1.4.1 Do you qualify for an exemption from fees under EPBC Regulation 5.23 (1) (a)? *

No

1.4.3 Have you applied for or been granted a waiver for full or partial fees under Regulation 5.21A? *

No

1.4.5 Are you going to apply for a waiver of full or partial fees under EPBC Regulation 5.21A?

No

1.4.7 Has the department issued you with a credit note? *

No

1.4.9 Would you like to add a purchase order number to your invoice? *

No

1.4 Payment details: Payment allocation

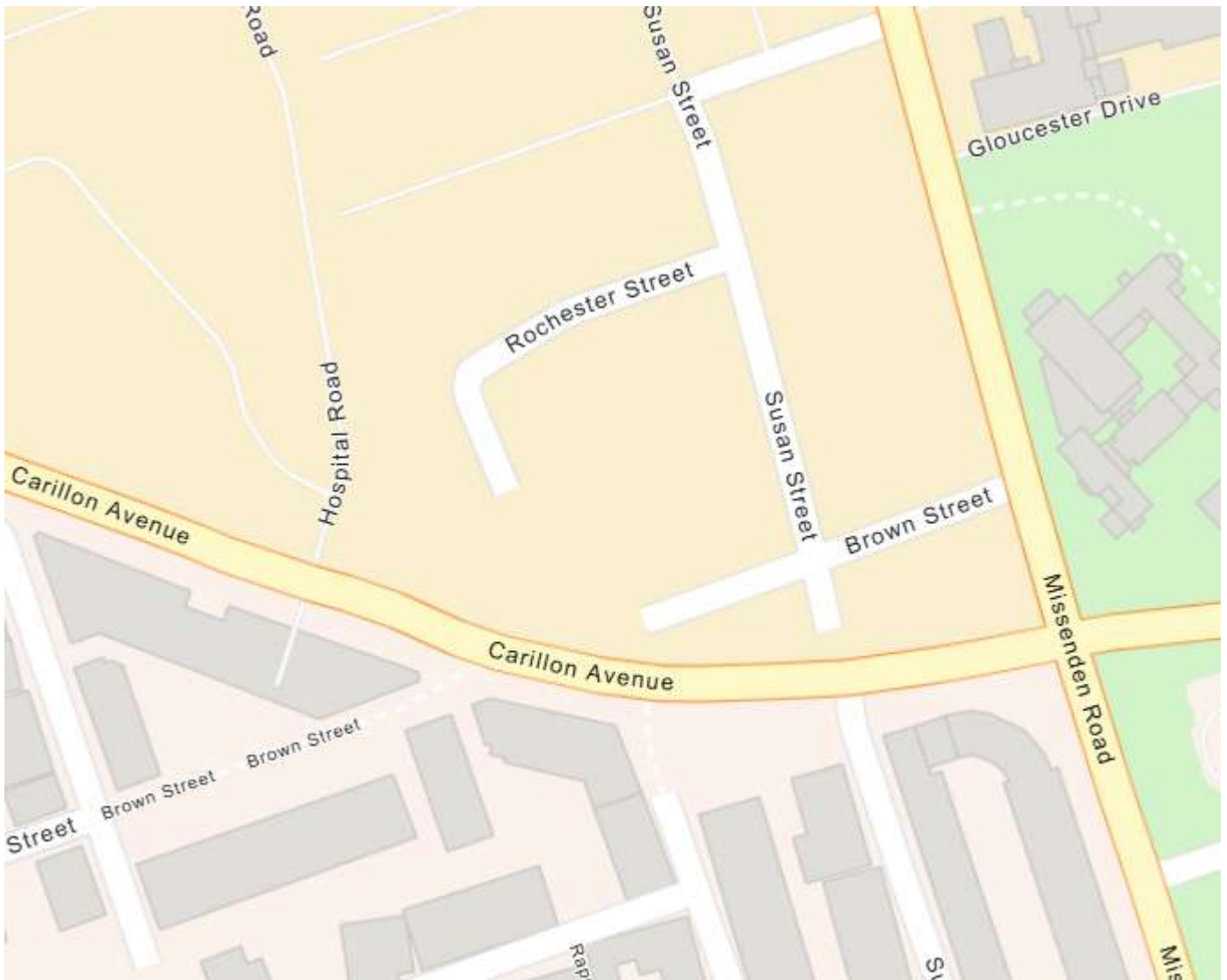
1.4.11 Who would you like to allocate as the entity responsible for payment? *

Referring party

2. Location

2.1 Project footprint





Disturbance Footprint (0.17 Ha)
Project Area (0.35 Ha)

Maptaskr © 2025 -33.888821, 151.182998

Powered By Esri - Sources: Esri, TomTom, Garmin, F...

2.2 Footprint details

2.2.1 What is the address of the proposed action? *

81 Missenden Road, Camperdown NSW 2050

2.2.2 Where is the primary jurisdiction of the proposed action? *

New South Wales

2.2.3 Is there a secondary jurisdiction for this proposed action? *

No

2.2.5 What is the tenure of the action area relevant to the project area? *

The Camperdown Cyclotron facility at 81 Missenden Road, Camperdown NSW is an ANSTO operated facility in a building and land leased from the NSW Health department. The facility is covered by the ANSTO Act.

ANSTO's lease with SLHD will expire June 2029 in which ANSTO must return the land back to SLHD in accordance with the agreed end state as set out in the Lease agreement.

3. Existing environment

3.1 Physical description

3.1.1 Describe the current condition of the project area's environment.

Camperdown Facility

The NRCF is located on leased land at 81 Missenden Rd, Camperdown NSW, approximately 5 km southwest of the Sydney central business district (**Att I – Site location maps**). The facility consists of a 2-story building with a basement and equipped underground transfer system to the Royal Prince Alfred Hospital running eastward along Grose Street outside of the leased premises. The current cyclotron facility was commissioning 2011 with the installation of the 18 MeV cyclotron. As mentioned in section 1.1.1, prior to the current cyclotron and associated infrastructure, the building housed the 30 MeV National Medical Cyclotron (NMC), jointly operated by ANSTO and the Royal Prince Alfred Hospital. The NMC and the building were constructed from 1987 and operational from 1991. The original cyclotron was decommissioning in 2010 (see EPBC referral 2010/5645 - Decommissioning of NMC and Camperdown Facility). Prior to the NMC, the area was used for light industrial / warehousing by the Royal Prince Alfred Hospital (**Att J – Historical Site Assessment for Camperdown Facility, pp. 2-4**)

The NRCF is immediately located within the Royal Prince Alfred hospital precinct of the Sydney Local Health District and as such is highly trafficable with pedestrians and vehicles. The facility is located in proximity to commercial, high density residential, educational (e.g. the University of Sydney) and sporting facilities.

The entirety of the project's delineated boundaries, including the cyclotron facility, adjacent thoroughfares, and the designated waste management site, have been fully established and operational.

A due diligence soil contamination assessment was conducted by Getex in April 2022 (**Att K – GETEX Due Diligence Contamination Assessment, page 6**). No gross contamination from the samples taken from the site were above investigation levels. Further analysis of radiological contamination from these sample was conducted by ANSTO – the radioactivity in the soil samples was commensurate with worldwide background soil concentrations (**Att L - Certificate of Analysis - radioactivity in soil samples, page 1**).

Road transport from Camperdown to Kemps Creek and Lucas Heights

The decommissioning strategy for the facility will include utilising local, major state and highway roads for the conveyance of dismantled equipment and waste materials. The designated transport route to the Kemps Creek waste management facility and ANSTO's Lucas Heights facility will incorporate a network of primary roads, potentially traversing both residential and commercial zones. Additionally, the route is planned to navigate through or near water catchment regions and watercourses, employing well-established roads, expressways, and motorways. The transport routes will likely pass near to remnant native bushland. The ecological condition of these road verges will vary between highly degraded / highly weed infested, to minimally disturbed parklands. The approved packaging and coverings for the waste and reusable equipment will employ controls to significantly minimise the risk of any release of contaminants to the environment as a result of the normal transport activity or in the event of an accident.

The transport of waste to the Kemps Creek facility will be conducted by a suitably licenced waste transporter, licenced to transport restricted waste.

The transport of low level radioactive solid waste and reusable equipment will be transported to the LHSTC by ANSTO staff using ANSTO heavy vehicles. These activities will be conducted in accordance with **Ref 8 – Radiation Protection Series C-2 ARPANSA Code for the Safe Transport of Radioactive Material, rev 1**).

Further information relating to the packaging and transport of equipment and wastes is detailed in **Att A - DRAFT Decommissioning Plan – October 2024, pages 54-57**.

Kemps Creek Waste Management Facility

The Kemps Creek facility is a waste collection and management facility licenced by the NSW Environment Protection Authority (EPA). The facility is of highly degraded nature. ANSTO understands the facility is operated to contain and treat surface and groundwater contaminants to prevent contamination to the wider environment.

ANSTO Lucas Heights Science and Technology Centre (LHSTC)

ANSTO's Lucas Heights Science and Technology Centre is situated approximately 29 km to the south-west of the Sydney CBD. The nearest suburban areas are Engadine (1.7 km away), Barden Ridge (2.6 km away), and Heathcote (3.2 km away). The OPAL nuclear reactor is situated within the LHSTC. The LHSTC is of a highly disturbed nature, as a result of the establishment of the site in the in the mid-1950's, which involved the clearing of the site to near-bedrock. The LHSTC is situated on Commonwealth land and is not subject to NSW State environmental legislation (refer section 7A ANSTO 1987) and local planning provisions.

The current condition of the environment relative to the LHSTC is that of a well-maintained urban campus fit for car, truck and pedestrian thoroughfare.

The low level solid radioactive waste will be stored in the appropriate ARPANSA licensed waste storage facility for the type and activity of waste. Other reusable equipment being transported to Lucas Heights will be stored and repurposed in a safe manner to avoid any impact to the local environment.

3.1.2 Describe any existing or proposed uses for the project area.

The Camperdown Cyclotron Facility is currently non-operational, before its decommissioning, it was instrumental in the production of short half-life radiopharmaceuticals ideal for detection and treatment within the industry.

Upon decommissioning, stewardship of the land will transition to the Sydney Local Health District (NSW Health), which will be responsible for determining its subsequent utilization.

In preparation for this transfer, ANSTO has conducted a thorough assessment of the site to identify any potential land contamination (**Att K – GETEX Due Diligence Contamination Assessment** and **Att L - Certificate of Analysis - radioactivity in soil samples**). The results of this assessment found no observable contamination above typical values in the region.

During the decommissioning of the facility, if contamination is found to have been as a result of ANSTO operations, ANSTO will undertake necessary remediation efforts to address any detected contamination and restore the land. Any remediation of the land required for radiological contamination will be conducted in accordance with ARPANSA clearance requirements.

3.1.3 Describe any outstanding natural features and/or any other important or unique values that applies to the project area.

There are no outstanding natural features and/or any other important or unique values of national environmental significance within the cyclotron facility.

The transport route will be along highways and main roads none of which contain outstanding natural features and/or any other important or unique values of national significance. Prior to transport approval of the route will be provided by the National Heavy Vehicle Regulator (NHVR) and Transport for NSW.

3.1.4 Describe the gradient (or depth range if action is to be taken in a marine area) relevant to the project area.

Generally, the relief of the landscape surrounding the project area slopes down from the east to the west (**Att M - Civil Stormwater Engineering Services – Erosion and Sediment Control Report, Page 5**). The project area is situated on flat, level ground that is not within any marine area. There is stormwater infrastructure present surrounding the battery limits of the site.

The project is required to have a sediment and erosion plan in place to ensure any decommissioned derived waste does not infiltrate the stormwater system.

3.2 Flora and fauna

3.2.1 Describe the flora and fauna within the affected area and attach any investigations of surveys if applicable.

Vegetation mapping and plant communities

There are no remnant native stands of vegetation within or in proximity to the project area. The flora identified within the project area consists of planted ornamental native and introduced species including:

- *Eucalyptus radiata* (Narrow-leaf peppermint)
- *Nandina domestica* (Oriental bamboo)
- *Callistemon viminalis* (Weeping bottlebrush)

Due to the highly urbanised nature of the area, native fauna is very limited. Sporadic sightings of possums (brush-tail and ring-tail) are possible. Avian species likely to be found near the project area include: Australian raven, masked lapwing, willie wag-tail, wattlebirds, noisy minor, pied currawong, Australian magpie, magpie lark, Australian white ibis, and silver gull.

The waste and equipment transportation routes to the Kemps Creek Waste Management Facility (restricted and free release waste) in western Sydney and to ANSTO's Lucas Heights facility (reusable equipment and low level solid radioactive waste) in south-west Sydney will generally be along state main roads and motorways. These transport routes have not yet been determined however will likely take the most straight-forward route avoiding tunnels for any waste/items considered hazardous. Along these transport routes, there are sections of native bushland close to the road verges. These include (**Ref 9 - The Native Vegetation of the Sydney Metropolitan Area - Version 3.1**):

Camperdown to Lucas Heights

- PCT835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (not EPBC listed, low confidence)
- PCT920 - Mangrove Forests in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion (not EPBC listed, low confidence)
- PCT1776 - Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast (not EPBC listed, medium confidence)
- PCT1787 - Red Bloodwood - Scribbly Gum - Stringybark open forest on sandstone ridges along the western side of the Woronora and Hornsby plateaus (not EPBC listed, medium confidence)
- PCT1845 - Smooth-barked Apple - Red Bloodwood - Blackbutt tall open forest on shale sandstone transition soils in eastern Sydney (not EPBC listed, medium confidence)

Camperdown to Kemps Creek

- PCT849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (EPBC listed, medium confidence)

All wastes and equipment will be transported in the appropriate approved containers and vehicles licenced to transport the goods, refer to **Att A - DRAFT Decommissioning Plan – October 2024, pages 54-57** for a high-level of description of the transport containers to be utilised for each waste type. ANSTO considers it very unlikely that contaminants will be introduced to the environment as a result of the transport activities.

The Lucas Heights campus where waste storage facilities exist would best be described as containing cultivated grasses, garden beds and sporadic native and introduced trees. Fauna sighted in the project area include common species of snakes (Red Bellied Black and Eastern Brown), goanas, and birds (Masked Lapwing and Magpies being common).

3.2.2 Describe the vegetation (including the status of native vegetation and soil) within the project area.

There is no soil or vegetation of national environmental significance within the cyclotron facility.

The vegetation surrounding the facility is limited to ornamental shrubs with two medium-sized eucalypts (*Eucalyptus radiata*) likely planted around the time of the construction of the NMC.

The soil landscape is characterised Residual, Blacktown Soil Landscape. This type of landscape is characterized by gently undulating rises on Wianamatta Group shales and Hawkesbury Shale, local relief to 30 m, slopes usually <5% and broad rounded crests and ridges with gently inclined slopes. This landscape contains cleared Eucalypt woodland and tall open-forest (dry sclerophyll forest). The soils comprise of shallow to moderately deep (<100 cm) Red and Brown Podzolic Soils on crests, upper slopes and well-drained areas. Deep Yellow Podzolic Soils and Soloths on lower slopes and in areas of poor drainage. The limitations to development are moderately reactive highly plastic subsoil, low soil fertility and poor soil drainage. Fill material consisted of dark brown and brown loose and clayey loam fill, orange/yellow sand and reddish-brown clays within instances of crushed rock and . at depths ranging 0.0-1.35mbgl. Across the Site the natural soil horizons were reddish brown clays, dark red clays and white clays with minor instances of red shale rock at depths of 0.25m to 5.0m (**Att K – GETEX Due Diligence Contamination Assessment, page 12**)

The bedrock underlying the Site to be Ashfield Shale of the Wianamatta Group consisting of laminate and dark grey siltstone and Bringelly Shale which consists of shale, with occasional calcareous claystone, laminate and coal. This unit is occasionally underlain by claystone and laminite lenses within the Hawkesbury Sandstone such as at Duffys Forest (**Att K – GETEX Due Diligence Contamination Assessment, page 12**).

A Soil Contamination Assessment has been undertaken by Getex to assess for the presence of widespread/gross soil contamination. Soil samples were taken from 11 locations which were then analysed for a broad range of identified potential contaminants. This assessment determined the following (**Att K – GETEX Due Diligence Contamination Assessment, page 6**):

1. Some of the samples exhibited elevated pH levels marginally above the accepted criteria. This presents a low potential risk to current and future receptors.
2. The belowground presence of widespread/gross soil contamination was not identified from the concentrations detected for all contaminants.
3. No identified contamination would preclude the continued present Commercial/Industrial use under the current conditions.

The transport route will be along highways and main roads none of which contain soil or vegetation of national significance. Prior to transport approval of the route will be provided by the National Heavy Vehicle Regulator (NHVR) and Transport NSW.

3.3 Heritage

3.3.1 Describe any Commonwealth heritage places overseas or other places recognised as having heritage values that apply to the project area.

No Commonwealth heritage places have been identified that are in proximity to the project area, or any proposed transport routes for reusable instruments/infrastructure or waste arising from the decommissioning of the facility.

The nearest listed Commonwealth heritage place to the project area is the Pymont Post Office, approximately 2.5 km to the north-east of the project area. No activities are expected to have direct or indirect impact to this heritage place.

The Cubbitch Barta National Estate Area is located adjacent to the broader Lucas Heights Science and Technology Centre, which will be the end-location of the transportation route of reusable instruments/infrastructure from the project area. The exact storage locations of these have not been ultimately determined, however it is highly likely these will be transported and stored in existing ARPANSA licensed facilities within ANSTO, over 500 metres to the north of the Cubbitch Barta National Estate Area. All items to be returned to Lucas Heights will be immobilised and do not present a risk of contamination to the surrounding environment, both during transportation to and storage at Lucas Heights. No direct or indirect impacts are expected to this heritage place.

3.3.2 Describe any Indigenous heritage values that apply to the project area.

ANSTO Conducted a search of the Aboriginal Heritage Information Management System (AHIMS). No Indigenous heritage sites or values have been identified within 200 metres of the project area. There are two sites identified approximately 850 metres from the site. It is not foreseeable that these sites will be impacted by the proposed action. Without controls, the proposed action would have the potential to produce small amounts of airborne or waterborne low-level radioactive and chemical contaminants. Inherently, these impacts would be unlikely to impact these sites. With the controls which are being proposed by the project such as dust mitigation, sediment control and waste transport containers (**Att A - DRAFT Decommissioning Plan – October 2024, pages 47-49, 54-57, 75**), it is very unlikely there will be any impact on Indigenous heritage values.

The AHIMS search result will not be published due to sensitivity requirements expressed by the NSW Government – AHIMS Web Services.

As described in relation to Commonwealth heritage places, the Cubbitch Barta National Estate Area is located adjacent to the broader Lucas Heights site, which will be the end-location of the transportation route of reusable instruments/infrastructure from the project area. The instruments/infrastructure to be returned to Lucas Heights are to be held in facilities within the established Lucas Heights Science and Technology Centre. All items to be returned to Lucas Heights will be immobilised and do not present a risk of contamination to the surrounding environment, both during transportation to and storage at Lucas Heights. No direct or indirect impacts are expected to this heritage place.

3.4 Hydrology

3.4.1 Describe the hydrology characteristics that apply to the project area and attach any hydrological investigations or surveys if applicable. *

Generally, the relief of the land slopes down from the east to the west (**Att M - Civil Stormwater Engineering Services – Erosion and Sediment Control Report, Page 5**), towards Johnston’s Creek (**Ref 10 – Johnstons Creek Catchment: Floodplain Risk Management Plan, Fig. 2**). Locally, surface runoff from the site is expected to drain to the north into the Johnston’s Creek Catchment stormwater drainage system (**Att K – GETEX Due Diligence Contamination Assessment, page 13**). The Johnston’s Creek Catchment drains into Sydney Harbour, at Rozelle Bay. There are no water reservoirs within the near vicinity to the NRCF. No groundwater was observed through the soil sampling program (down to a depth of 5 m - **Att K – GETEX Due Diligence Contamination Assessment, page 22**). There are two in-use registered monitoring bores within 500 m of the NRCF, both approximately 400 m to the north-east (**Att K – GETEX Due Diligence Contamination Assessment, page 13**). It is highly unlikely these bores will be impacted by the proposed action.

During the planning stage, the project has engaged a civil stormwater consultant to provide an erosion and sediment control report and plan (**Att M – Erosion and Sediment Control**). This plan investigates the existing stormwater system within the immediate area along with outlining sediment and erosion controls to mitigate any environmental impacts encountered throughout the decommissioning phase of the project. This plan will be further developed through the engagement of the Principal Contractor.

A site visit was undertaken on 8 October 2024 to identify the existing site’s stormwater drainage strategy and overland flow paths. Upon inspection, the site’s topography was predominately grading from east to west, with the high point near the main entry (east) and the low end at the corner of Hospital Rd and the through road of the neighbouring 25 Lucas St site. The in-ground stormwater pit and pipe network followed a similar connection strategy. However, almost all inspected pits had varying levels of ponding / trapped water.

The natural low point of the site is at the corner of Hospital Rd and the through road of the neighbouring 25 Lucas St site. Existing electrical substations are also located at this point. Considering sediment and erosion control measures, the proposed above-ground sediment basin is to be positioned near the site’s low point to allow gravity drainage of the surface flows from the wider site catchment. The sediment basin is to ensure adequate clearance and no impacts to the below-ground utilities servicing the substation.

4. Impacts and mitigation

4.1 Impact details

Potential Matters of National Environmental Significance (MNES) relevant to your proposed action area.

EPBC Act section	Controlling provision	Impacted	Reviewed
S12	World Heritage	No	Yes
S15B	National Heritage	No	Yes
S16	Ramsar Wetland	No	Yes

EPBC Act section	Controlling provision	Impacted	Reviewed
S18	Threatened Species and Ecological Communities	No	Yes
S20	Migratory Species	No	Yes
S21	Nuclear	No	Yes
S23	Commonwealth Marine Area	No	Yes
S24B	Great Barrier Reef	No	Yes
S24D	Water resource in relation to large coal mining development or coal seam gas	No	Yes
S26	Commonwealth Land	No	Yes
S27B	Commonwealth heritage places overseas	No	Yes
S28	Commonwealth or Commonwealth Agency	Yes	Yes

4.1.1 World Heritage

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

—

4.1.1.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.1.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact.

*

The nearest World Heritage property is the Hyde Park Barracks located approximately 3.6 kilometres to the north-east of the project site. Other World Heritage sites within 5 km include Cockatoo Island to the north and the Sydney Opera House to the north-east.

Any impacts, (albeit minimal) to the local environment will be limited to potential dusts production and surface water contamination. Demolition of the vault areas will include wire cutting of concrete sections of the vault walls which have been incidentally irradiated during the life of the facility. This activity may produce dusts, however, will be confined to the immediate local area and will not destroy or damage any World Heritage values. Dust suppression methods, such as tenting of the building and use of local air scrubbers at various stages of the project, dust suppression system; regular dust monitoring, use appropriate approved transport containers of wastes and equipment being transported.

The proposed decommissioning of the Camperdown cyclotron facility is unlikely to have a direct and/or indirect impact on World Heritage properties due to the nature of the action and the distance to the closest listing.

4.1.2 National Heritage

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

4.1.2.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.2.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact.

*

A Protected Matters Search was conducted for the project area, there are no national heritage sites or values identified within the vicinity of the project area and therefore no impacts are likely on national heritage sites or values.

The nearest National Heritage Place is the Cyprus Hellene Club – Australian Hall located approximately 2.1 kilometres to the north-east of the project site. Other National Heritage Place within 5 km include: Hyde Park Barracks to the north-east; Cockatoo Island to the north; the Sydney Opera House to the north-east, Sydney Harbour Bridge to the north-east, First Government House Site to the north-east, Centennial Park to the east. The Cubbitch Barta National Estate is situated to the south of the Lucas Heights Science and Technology Centre (LHSTC) where some low-level radioactive waste, instruments, infrastructure will be transported to.

Any impacts, (albeit minimal) to the local environment will be limited to dusts production and surface water contamination. Demolition of the vault areas will include wire cutting of concrete sections of the vault walls which have been incidentally irradiated during the life of the facility. This activity may produce dusts, however, will be confined to the immediate local area and will not destroy or damage any National Heritage Place values. Dust suppression methods, such as tenting of the building and use of local air scrubbers at various stages of the project, dust suppression system; regular dust monitoring, use appropriate approved transport containers of wastes and equipment

The low-level radioactive waste, instruments, infrastructure to be transported to the LHSTC will be conducted using approved containers for the hazards contained.

The transport of materials to the Kemps Creek Waste Management Centre and LHSTC will not be conducted in proximity to any National Heritage Places.

4.1.3 Ramsar Wetland

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

4.1.3.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.3.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact.
*

The proposed decommissioning of the Camperdown cyclotron facility is unlikely to have a direct and/or indirect impact on any Ramsar wetlands due to the nature of the action and the distance to the closest listing. There are no Ramsar wetlands matters within the project site, however one occurs within the wider locality being the Towra Point Nature Reserve Park, which is located around 12 kilometres to the south of the project site. The water catchment area for the Camperdown facility is the Johnston’s Creek catchment, which drains into Whyte’s Bay in Sydney Harbour. All low instrumentation and infrastructure being transported to the Lucas Heights Science and Technology Centre for storage or re-purposing, and all wastes being transported to appropriate waste collection facilities will be immobilised. The likelihood of contamination to waterways and further to the Towra Point Nature Reserve Park from this activity is considered very unlikely.

4.1.4 Threatened Species and Ecological Communities

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

Threatened species

Direct impact	Indirect impact	Species	Common name
No	No	Acacia pubescens	Downy Wattle, Hairy Stemmed Wattle
No	No	Acacia terminalis subsp. Eastern Sydney (G.P.Phillips 126)	Sunshine Wattle (Sydney region)

Direct impact	Indirect impact	Species	Common name
No	No	<i>Allocasuarina glareicola</i>	
No	No	<i>Anthochaera phrygia</i>	Regent Honeyeater
No	No	<i>Botaurus poiciloptilus</i>	Australasian Bittern
No	No	<i>Caladenia tessellata</i>	Thick-lipped Spider-orchid, Daddy Long-legs
No	No	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper
No	No	<i>Calidris canutus</i>	Red Knot, Knot
No	No	<i>Calidris ferruginea</i>	Curlew Sandpiper
No	No	<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo
No	No	<i>Calyptorhynchus lathami lathami</i>	South-eastern Glossy Black-Cockatoo
No	No	<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat, Large Pied Bat
No	No	<i>Charadrius leschenaultii</i>	Greater Sand Plover, Large Sand Plover
No	No	<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (south-eastern)
No	No	<i>Cryptostylis hunteriana</i>	Leafless Tongue-orchid
No	No	<i>Dasyornis brachypterus</i>	Eastern Bristlebird
No	No	<i>Dasyurus maculatus maculatus</i> (SE mainland population)	Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)
No	No	<i>Diomedea epomophora</i>	Southern Royal Albatross
No	No	<i>Diomedea sanfordi</i>	Northern Royal Albatross
No	No	<i>Eucalyptus camfieldii</i>	Camfield's Stringybark
No	No	<i>Falco hypoleucos</i>	Grey Falcon
No	No	<i>Gallinago hardwickii</i>	Latham's Snipe, Japanese Snipe
No	No	<i>Genoplesium baueri</i>	Yellow Gnat-orchid, Bauer's Midge Orchid, Brittle Midge Orchid
No	No	<i>Grantiella picta</i>	Painted Honeyeater
No	No	<i>Heleioporus australiacus</i>	Giant Burrowing Frog
No	No	<i>Hirundapus caudacutus</i>	White-throated Needletail

Direct impact	Indirect impact	Species	Common name
No	No	Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern)
No	No	Lathamus discolor	Swift Parrot
No	No	Limosa lapponica baueri	Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit
No	No	Litoria aurea	Green and Golden Bell Frog
No	No	Macquaria australasica	Macquarie Perch
No	No	Melanodryas cucullata cucullata	South-eastern Hooded Robin, Hooded Robin (south-eastern)
No	No	Neophema chrysostoma	Blue-winged Parrot
No	No	Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew
No	No	Pachyptila turtur subantarctica	Fairy Prion (southern)
No	No	Persicaria elatior	Knotweed, Tall Knotweed
No	No	Petauroides volans	Greater Glider (southern and central)
No	No	Petaurus australis australis	Yellow-bellied Glider (south-eastern)
No	No	Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)	Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)
No	No	Pimelea curviflora var. curviflora	
No	No	Pimelea spicata	Spiked Rice-flower
No	No	Prostanthera densa	Villous Mintbush
No	No	Pseudomys novaehollandiae	New Holland Mouse, Pookila
No	No	Pteropus poliocephalus	Grey-headed Flying-fox
No	No	Pycnoptilus floccosus	Pilotbird
No	No	Rhodamnia rubescens	Scrub Turpentine, Brown Malletwood
No	No	Rhodomyrtus psidioides	Native Guava
No	No	Rostratula australis	Australian Painted Snipe
No	No	Stagonopleura guttata	Diamond Firetail
No	No	Sternula nereis nereis	Australian Fairy Tern

Direct impact	Indirect impact	Species	Common name
No	No	Syzygium paniculatum	Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry
No	No	Thalassarche cauta	Shy Albatross
No	No	Thalassarche eremita	Chatham Albatross
No	No	Thalassarche salvini	Salvin's Albatross
No	No	Thalassarche steadi	White-capped Albatross
No	No	Thesium australe	Austral Toadflax, Toadflax
No	No	Tringa nebularia	Common Greenshank, Greenshank

Ecological communities

Direct impact	Indirect impact	Ecological community
No	No	Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion
No	No	Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community
No	No	Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland
No	No	Coastal Upland Swamps in the Sydney Basin Bioregion
No	No	Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion
No	No	Eastern Suburbs Banksia Scrub of the Sydney Region
No	No	River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria
No	No	Western Sydney Dry Rainforest and Moist Woodland on Shale

4.1.4.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.4.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact.

*

ANSTO has self-assessed the potential significance of impacts to threatened species and ecological communities (**Att B - EPBC Self assessment - Camperdown decommissioning**). This self assessment was conducted using the guidance provided in **Ref 4 - Significant Impact Guidelines 1.1 - Matters of National Environmental Significance** and **Ref 5 - Significant impact guidelines 1.2 - Actions on, or impacting upon, Commonwealth land and Actions by Commonwealth Agencies**.

Project area

A Protected Matters Search was conducted for the project area, with eight (8) threatened ecological communities and fifty-seven (57) listed threatened species identified as potentially occurring in proximity of the project site.

Due to the highly urbanised nature of the project area and surroundings, no ecological communities are situated within the project area or surrounds. The likelihood of threatened species to be found is very unlikely. Native vegetation and habitat to support threatened faunal species is sparse and highly fragmented from remnant corridors. Within the project area and the immediate surroundings, there is very minimal vegetation.

Transport of waste and equipment for disposal and storage

It is not practicable to conduct a Protected Matters Search on the possible transport routes, as these have not been finalised and will not until the waste transport contractors are selected. It is likely however that the transport route of restricted waste to the Kemps Creek Waste Management Facility will traverse near to one endangered ecological community, PCT849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain. This ecological community has fragments situated along the M4 motorway and along access roads to the Kemps Creek Waste Management Facility.

It is very unlikely that the transport of materials will have any direct or indirect impacts on the environment adjacent to any transport routes, even in the event of an accident. Wastes and equipment will be transported in the appropriate containers and covered/enclosed vehicles to minimise any emission or loss of containment to the environment along the transport route. Information on the transport containment controls is provided in **Att A - DRAFT Decommissioning Plan – October 2024, pages 54-57**.

4.1.5 Migratory Species

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

Direct impact	Indirect impact	Species	Common name
No	No	Actitis hypoleucos	Common Sandpiper
No	No	Apus pacificus	Fork-tailed Swift
No	No	Calidris acuminata	Sharp-tailed Sandpiper
No	No	Calidris canutus	Red Knot, Knot
No	No	Calidris ferruginea	Curlew Sandpiper
No	No	Calidris melanotos	Pectoral Sandpiper

Direct impact	Indirect impact	Species	Common name
No	No	Charadrius leschenaultii	Greater Sand Plover, Large Sand Plover
No	No	Cuculus optatus	Oriental Cuckoo, Horsfield's Cuckoo
No	No	Diomedea epomophora	Southern Royal Albatross
No	No	Diomedea sanfordi	Northern Royal Albatross
No	No	Gallinago hardwickii	Latham's Snipe, Japanese Snipe
No	No	Hirundapus caudacutus	White-throated Needletail
No	No	Limosa lapponica	Bar-tailed Godwit
No	No	Monarcha melanopsis	Black-faced Monarch
No	No	Motacilla flava	Yellow Wagtail
No	No	Myiagra cyanoleuca	Satin Flycatcher
No	No	Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew
No	No	Rhipidura rufifrons	Rufous Fantail
No	No	Symposiachrus trivirgatus	Spectacled Monarch
No	No	Thalassarche cauta	Shy Albatross
No	No	Thalassarche eremita	Chatham Albatross
No	No	Thalassarche salvini	Salvin's Albatross
No	No	Thalassarche steadi	White-capped Albatross
No	No	Tringa nebularia	Common Greenshank, Greenshank

4.1.5.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.5.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact.

*

ANSTO has self-assessed the potential significance of impacts to migratory species (**Att B - EPBC Self assessment - Camperdown decommissioning**). This self assessment was conducted using the guidance provided in **Ref 4 - Significant Impact Guidelines 1.1 - Matters of National Environmental Significance** and **Ref 5 - Significant impact guidelines 1.2 - Actions on, or impacting upon, Commonwealth land and Actions by Commonwealth Agencies**.

Project area and the transport of waste and equipment for disposal and storage

A Protected Matters Search was conducted for the project area, with twenty-four (24) migratory species identified as potentially being found in proximity of the project site or with habitat supporting them.

Due to the highly urbanised nature of the project area and surroundings, the likelihood of migratory species or habitat to support them within the project area is considered to be very unlikely.

It is very unlikely that the transport of materials will have any direct or indirect impacts on the environment adjacent to any transport routes, even in the event of an accident. Wastes and equipment will be transported in the appropriate containers and covered/enclosed vehicles to minimise any emission or loss of containment to the environment along the transport route. Information on the transport containment controls is provided in **Att A - DRAFT Decommissioning Plan – October 2024, pages 54-57.**

4.1.6 Nuclear

4.1.6.1 Is the proposed action likely to have any direct and/or indirect impact on this protected matter? *

No

4.1.6.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact.

*

ANSTO has self-assessed the proposed action to decommissioning the NRCF as not a nuclear action. ANSTO has considered this determination on the basis of the isotopes which were produced in the facility while it was operational, and the isotopes which remain in the facility as a result of proton activation of the vault walls. This determination is based upon section 22(1)(f) of the EPBC Act and sections 2.01 and 2.02 of the EPBC Regulations.

Radioactivity during operations

During operations, the maximum amount of radioactivity permitted in the hot cells following each cyclotron run would be either 3.7×10^{11} Bq of fluorine-18 or 2.2×10^{11} Bq of carbon-11. The half-life for fluorine-18 and carbon-11 are 110 minutes and 28 minutes respectively. This means the residual activity after 1 day for each isotope after each cyclotron run would be approximately 4.5×10^7 Bq for fluorine-18, and 3.3×10^3 Bq for carbon-11.

The activity values as prescribed in Schedule 1 of the Australian Radiation Protection and Nuclear Safety Regulations 2018 (ARPANSA Regulations) for fluorine-18 and carbon-11 respectively are: 1×10^6 and 1×10^6 . Calculating the activity division steps for each isotope, these equate to 3.7×10^5 Bq for fluorine-18 or 2.2×10^5 Bq for carbon-11. These are both less 1×10^6 times the 'excessive' activity limit for unsealed sources as prescribed in 2.02 of the EPBC Regulations. Considering the short half-life of each isotope and that the maximum allowable radioactivity in the hot cells at any one time is below the 'excessive' threshold as prescribed in the EPBC Regulations, ANSTO determines the historical use of the facility does not constitute a nuclear action.

Radioactivity during decommissioning

Since operations ceased in 2021, no new radionuclides have been produced in the facility. Neutron capture (neutrons being a by-product of the production of fluorine-18 and carbon-11) within the reinforced concrete of the vault walls, has resulted in a small amount of radioactive elements being present in the concrete. These radioisotopes include: calcium-41, iron-55, cobalt-60, nickel-63, cesium-134, europium-152, and europium-154. The total mass of activated concrete from the vault walls is estimated as 500 tonnes. For each radioisotope, the activity steps have been calculated and assessed against section 2.02 of the EPBC Regulations and Schedule 1 of the ARPANS Regulations.

Calcium-41: Total activity = 1.76×10^9 Bq, Activity value (Schedule 1 ARPANS Regulations) = 1.0×10^5 Bq, Activity Division Step = 1.76×10^4 Bq.

Iron-55: Total activity = 2.09×10^{10} Bq, Activity value = 1.0×10^6 Bq, Activity Division Step = 2.09×10^4 .

Cobalt-60: Total activity = 3.93×10^9 Bq, Activity value = 1.0×10^5 Bq, Activity Division Step = 3.93×10^4 .

Nickel-63: Total activity = 4.67×10^9 Bq, Activity value = 1.0×10^8 Bq, Activity Division Step = 4.67×10^1 .

Ceasium-134: Total activity = 1.67×10^7 Bq, Activity value = 1.0×10^4 Bq, Activity Division Step = 1.67×10^3 .

Europium-152: Total activity = 1.19×10^{10} Bq, Activity value = 1.0×10^6 Bq, Activity Division Step = 1.19×10^4 .

Europium-154: Total activity = 9.86×10^8 Bq, Activity value = 1.0×10^6 Bq, Activity Division Step = 9.86×10^2 .

Total sum of activity division steps = 9.19×10^4 , which is less than 1×10^6 'excessive threshold for unsealed sources, therefore the proposed action is not considered a nuclear action from a decommissioning perspective as prescribed in 2.02 of the EPBC Regulations.

4.1.7 Commonwealth Marine Area

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

4.1.7.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.7.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact.

*

The proposed decommissioning of the NRCF is unlikely to have a direct and/or indirect impact on Commonwealth Marine Area due to the nature of the action and the distance to the closest listing. A Protected Matters Search was conducted for the project area, there are no Commonwealth marine areas identified within the vicinity of the project area. The risk of contaminants propagating into the Port Jackson catchment is assessed as very low, and therefore the risk to contaminants entering Commonwealth marine areas is also considered as very low.

4.1.8 Great Barrier Reef

4.1.8.1 Is the proposed action likely to have any direct and/or indirect impact on this protected matter? *

No

4.1.8.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact.

*

There is no risk to the Great Barrier Reef as a result of this project due to the vast distance.

4.1.9 Water resource in relation to large coal mining development or coal seam gas

4.1.9.1 Is the proposed action likely to have any direct and/or indirect impact on this protected matter? *

No

4.1.9.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact.

*

This project does not involve coal mining or coal seam gas extraction.

4.1.10 Commonwealth Land

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

Direct impact	Indirect impact	Commonwealth land area
No	No	Commonwealth Land - Australian Telecommunications Commission
No	No	Defence - FOREST LODGE (SYDNEY) TRG DEP
No	No	Defence - SYDNEY UNIVERSITY REGIMENT - DARLINGTON

4.1.10.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.10.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact.

*

The land is owned and leased to ANSTO by the NSW Government, Department of Health – Sydney Local Health Service. The nearest Commonwealth-owned land is the Sydney University Regiment located about 700 m to the east-south-east of the project area. Other Commonwealth-owned land is situated approximately 1-2 km to the north-east and north-west of the project area.

The proposed action is unlikely to have any impact on these Commonwealth-owned lands due to the low likelihood of inherent impacts from the production of airborne or waterborne radiological and chemical contaminants as a result of the decommissioning and transport activities.

4.1.11 Commonwealth heritage places overseas

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

—

4.1.11.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.11.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

Commonwealth Heritage Places Overseas

This project will not have any impact on Commonwealth heritage places overseas due to the vast distance.

Other Commonwealth Heritage Places

The decommissioning of the Camperdown cyclotron facility is unlikely to have a direct and/or indirect impact on any Commonwealth Heritage Places due to the nature of the action and the distance to the closest listing, being the Pyrmont Post Office, approximately 2.5 km to the north-east of the project area. No activities are expected to have direct or indirect impact to this heritage place.

The Cubbitch Barta National Estate Area is located adjacent to the broader Lucas Heights Science and Technology Centre, which will be the end-location of the transportation route of reusable instruments/infrastructure from the project area. The exact storage locations of these have not been ultimately determined, however it is highly likely these will be transported and stored in existing ARPANSA licenced facilities within ANSTO, over 500 metres to the north of the Cubbitch Barta National Estate Area. All items to be returned to Lucas Heights will be immobilised and do not present a risk of contamination to the surrounding environment, both during transportation to and storage at Lucas Heights. No direct or indirect impacts are expected to this heritage place.

4.1.12 Commonwealth or Commonwealth Agency

4.1.12.1 Is the proposed action to be taken by the Commonwealth or a Commonwealth Agency? *

Yes

4.1.12.2 Briefly describe the nature and extent of the likely impact on the whole of the environment. *

ANSTO has completed a self-assessment on the potential impacts from the NMF on Commonwealth land and by a Commonwealth agency (**Att B - EPBC Act Referral Self-Assessment on Impacts to the Environment for the Nuclear Medicine Facility project**). Consulting **Ref 5 - Significant impact guidelines 1.2- Actions on, or impacting upon, Commonwealth land and Actions by Commonwealth Agencies**, ANSTO has identified a number of potential and likely impacts to the environment, and subsequently assessed the significance of these impacts. In summary the impacts assessed for significance are:

Activity: Demolition of building.

Impact: Emissions of radioactive and chemical contaminants into the environment.

The demolition of the NRCF will be undertaken by a suitably qualified and experienced Principal Contractor who will be managed by ANSTO. Before commencing the construction work, the Principal Contractor will be required to complete and implement a project /construction environmental management plan (P/CEMP - **Att G - AF-5947 Project – Construction Environmental Management Plan**), meeting ANSTO's minimum requirements for protection of the environment (**Att E - AP-5400 Project Environmental Protection Requirements**). Controls which will be required in the P/CEMP, include:

- dust suppression methods, such as tenting of the building and use of local air scrubbers at various stages of the project, dust suppression system; regular dust monitoring, use appropriate approved transport containers of wastes and equipment being transported;
- sediment capture mechanisms, which will be informed through a sediment control plan;
- de-watering of excavated areas;
- noise, night light-spill and vibration suppression;
- further site characterisation post-excavation to assess for any residual surface contamination (and subsequent removal). The site will be decontaminated to a standard that meets the approval of the regulatory agency Australian Radiation Protection and Nuclear Safety Agency (APRANSA); and,
- back-filling with virgin excavated natural material and establishing a hard-stand surface for hand-over with NSW Health (**Att A - DRAFT Decommissioning Plan – October 2024, pages 43-44, 47-48, 75**).

The inherent risk posed by the production of dusts to the air or into stormwater have been determined to be low due to the limited nature of the radioactivity contained in the activated components of the building (noting the amount of activity does not exceed the 'excessive' threshold for a nuclear action). The controls to mitigate any releases to the environment further reduce these risks.

Activity: Transport of wastes for recycling or landfill.

Impact: There is a risk that restricted wastes transported by truck to Kemps Creek Waste Management Facility, and low-level solid radioactive waste to ANSTO Lucas Heights, and equipment to ANSTO Lucas Heights for repurposing could be released to the environment as a result of vehicular accident.

The vast majority of waste (≥93% of up to 8,000 tonnes) produced throughout the decommissioning of the NRCF will be below both ARPANSA and NSW EPA free release limits. These free release wastes, primarily concrete, which aim to be recycled through approved recycling facilities. The remainder of the wastes, will be either be transported to the Kemps Creek Waste Management Facility, as restricted waste (490 tonnes of activated concrete), hazardous wastes (<2 tonnes of lead-based wastes which will be recycled), and a small amount of low-level radioactive solid waste which will be transported to ANSTO's Lucas Heights facility for storage (**Att A - DRAFT Decommissioning Plan – October 2024, pages 47-48**). The transport routes being considered are shown in **Att A - DRAFT Decommissioning Plan – October 2024, pages 56-57**, however these routes will not be finalised until after the award of the Principal Contractor for the project. All wastes will be transported by licenced transport operators, in enclosed trucks and all wastes disposed with evidence of receipt at licenced and approved waste management facilities. The restricted waste to be disposed at Kemps Creek Waste Management Facility will be transported in IP1 bags and within enclosed trucks. The low-level radioactive solid waste will be transported to ANSTO Lucas Heights in 200 clamped steel drums and within enclosed trucks. Any contaminated liquid waste which is found or produced throughout the demolition activities will be managed in accordance with either NSW EPA guidelines, standard demolition processes or as per those defined by ANSTO Waste Management Services (**Att A - DRAFT Decommissioning Plan – October 2024, page 49**). Specific information on the packaging of the different wastes for transport is provided in **Att A - DRAFT Decommissioning Plan – October 2024, pages 54-57**.

Activity: Increase demand on surrounding road infrastructure during the site preparation and construction phases.

Impact: It is estimated approximately 300 heavy vehicle movements will be conducted throughout all stages of the demolition. The majority of the activity will occur over a 3-month period during weekdays. This will result in a truck movement of about 5 heavy vehicles per day.

A traffic management plan will be prepared for the preparation, demolition and waste disposal activities (**Att A - DRAFT Decommissioning Plan – October 2024, page 32**). ANSTO intends to limit transport activities to periods of lower pedestrian activity in the area (i.e. outside of standard university study periods). ANSTO does not believe this will have a significant impact on local roads and is less than or equivalent to other medium-scale urban construction/demolition works. Truck access will be conducted on the southern side of the site, to minimise the impact to pedestrian movements in the precinct, nearby accommodation buildings, and the risk of damage to essential services supporting neighbouring buildings (**Att A - DRAFT Decommissioning Plan – October 2024, page 45**).

Due to the relatively low activity and nature of contamination of the wastes to be produced by the decommissioning of the NRCF, the inherent risk to the environment through accidental release during transportation is considered to be low. The controls to be used (containment, licenced transporting companies, mandate of waste receipts) will reduce the risk to very low.

ANSTO therefore does not consider the proposed action constitutes a controlled action by a Commonwealth agency.

4.2 Impact summary

Conclusion on the likelihood of significant impacts

You have indicated that the proposed action will likely have a significant impact on the following Matters of National Environmental Significance:

None

Conclusion on the likelihood of unlikely significant impacts

You have indicated that the proposed action will unlikely have a significant impact on the following Matters of National Environmental Significance:

- World Heritage (S12)
- National Heritage (S15B)
- Ramsar Wetland (S16)
- Threatened Species and Ecological Communities (S18)
- Migratory Species (S20)
- Nuclear (S21)
- Commonwealth Marine Area (S23)
- Great Barrier Reef (S24B)
- Water resource in relation to large coal mining development or coal seam gas (S24D)
- Commonwealth Land (S26)
- Commonwealth heritage places overseas (S27B)

- Commonwealth or Commonwealth Agency (S28)

4.3 Alternatives

4.3.1 Do you have any possible alternatives for your proposed action to be considered as part of your referral? *

No

4.3.8 Describe why alternatives for your proposed action were not possible. *

ANSTO's lease with NSW Health for the land where the NRCF is located is due to lapse in the next few years. Alternatives were considered which could have allowed for the building and parts of its interior to be retained, however ANSTO determined these not in the viable and/or within lease arrangements with NSW Health (**Att A - DRAFT Decommissioning Plan – October 2024, pages 14-19**). The proposed action will allow for the make good on the land allowing it to be fully handed over to NSW Health at the end of the lease arrangement.

5. Lodgement

5.1 Attachments

1.2.1 Overview of the proposed action

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att A - DRAFT Decommissioning Plan - October 2024.pdf Provides the high-level information on the processes conducted to determine the preferred decommissioning options, and the proposed decommissioning activities and mitigation measures.	01/10/2024	No	High
#2.	Document	Att B - EPBC Self assessment - Camperdown decommissioning.pdf	18/11/2024	No	High

		ANSTO's EPBC self-assessment of the decommissioning incorporating the significance assessment against thresholds from EPBC Significance Guidelines 1.1 and 1.2.	
#3.	Link	Ref 1 - IAEA General Safety Requirements Part 3 https://www-pub.iaea.org/MTCD/Publications/PDF/P..	High
#4.	Link	Ref 2 - Waste Classification Guidelines Part 1: Classifying waste https://www.environment.nsw.gov.au/resources/was..	High
#5.	Link	Ref 3 - Waste classification guidelines Part 3: Waste containing radioactive material https://www.epa.nsw.gov.au/-/media/epa/corporate..	High

1.2.6 Commonwealth or state legislation, planning frameworks or policy documents that are relevant to the proposed action

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att B - EPBC Self assessment - Camperdown decommissioning.pdf ANSTO's EPBC self-assessment of the decommissioning incorporating the significance assessment against thresholds from EPBC Significance Guidelines 1.1 and 1.2.	18/11/2024	No	High
#2.	Document	Att C - Sydney Water Trade Waste Agreement #4423.pdf Trade waste discharge consent between ANSTO and Sydney Water Corporation - redacted version	22/08/2022	No	High
#3.	Document	Att C (SENSITIVE) - Sydney Water Trade Waste Agreement #4423.pdf Trade waste discharge consent between ANSTO and Sydney Water Corporation - sensitive version	22/08/2022	Yes	High
#4.	Link	Ref 2 - Waste Classification Guidelines Part 1: Classifying waste https://www.environment.nsw.gov.au/resources/was..			High
#5.	Link	Ref 3 - Waste classification guidelines Part 3: Waste containing radioactive material https://www.epa.nsw.gov.au/-/media/epa/corporate..			High
#6.	Link	Ref 4 - Significant Impact Guidelines 1.1 - Matters of National Environmental Significance https://www.dcceew.gov.au/sites/default/files/do..			High
#7.	Link				

Ref 5 - Significant impact guidelines 1.2 - Actions on, or impacting upon, Commonwealth land and Act https://www.dcceew.gov.au/sites/default/files/do..		High
#8.	Link Ref 6 - Local Environmental Monitoring https://www.ansto.gov.au/science/environment/env..	High

1.3.2.17 (Person proposing to take the action) Proposer's history of responsible environmental management

Type	Name	Date	Sensitivity	Confidence
#1.	Document Att D - Health, Safety, Community and Environmental Policy.pdf ANSTO's high level policy detailing its commitments to prevent or minimise its impacts on the environment.	17/06/2021	No	High
#2.	Link Ref 7 - ANSTO Environmental Sustainability Strategy https://www.ansto.gov.au/science/environment/env..			High

1.3.2.18 (Person proposing to take the action) If the person proposing to take the action is a corporation, provide details of the corporation's environmental policy and planning framework

Type	Name	Date	Sensitivity	Confidence
#1.	Document Att D - Health, Safety, Community and Environmental Policy.pdf ANSTO's high level policy detailing its commitments to prevent or minimise its impacts on the environment.	16/06/2021	No	High
#2.	Document Att E - AP-5400 Project Environmental Protection Requirements.pdf This document provides the overarching planning framework and requirements for the protection of the environment from project, construction, decommissioning and maintenance activities at ANSTO.	01/10/2021	No	High
#3.	Document Att F - AF-1376 Project Environmental Planning Checklist.pdf This checklist informs project planners to understand the environmental regulatory approvals requirement and internal planning requirements for any project conducted at ANSTO.	29/10/2021	No	High
#4.	Document Att G - AF-5947 Project - Construction Environmental Management Plan.pdf This form is completed for all major projects conducted at ANSTO which may have an impact on the environment. This form may be complemented by a Principal Contractor's own environmental management plan.	31/10/2021	No	High

#5.	Document	Att H - AF-2315 Safe Work Method and Environmental Statement (SWMES).pdf This form assists any staff member of ANSTO (or contractors) to identify, mitigate, and risk assess safety and environmental hazards for high risk or non-routine activities.	29/04/2024	No	High
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3.1.1 Current condition of the project area's environment

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att A - DRAFT Decommissioning Plan - October 2024.pdf Provides the high-level information on the processes conducted to determine the preferred decommissioning options, and the proposed decommissioning activities and mitigation measures.	30/09/2024	No	High
#2.	Document	Att I - Site location maps.pdf Satellite imagery of the project area in relation to the Sydney CBD.	04/10/2024	No	High
#3.	Document	Att J - Historical Site Assessment for Camperdown Facility.pdf Summarises the historical and current use and impact of the NRCF.	06/12/2024	No	High
#4.	Document	Att K - GETEX Due diligence contamination assessment.pdf Summarises the findings from a contaminated lands assessment of the NRCF and surrounds.	11/04/2024	No	High
#5.	Document	Att L - Certificate of Analysis - radioactivity in soil samples.pdf Supporting the contaminated lands assessment, this provides a summary of the radiological contamination assessment.	10/08/2024	No	High
#6.	Link	Ref 8 - Radiation Protection Series C-2 ARPANSA Code for the Safe Transport of Radioactive Material https://www.arpansa.gov.au/regulation-and-licens..			High

3.1.2 Existing or proposed uses for the project area

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att K - GETEX Due diligence contamination assessment.pdf Summarises the findings from a contaminated lands assessment of the NRCF and surrounds.	10/04/2024	No	High
#2.	Document	Att L - Certificate of Analysis - radioactivity in soil samples.pdf Supporting the contaminated lands assessment, this	09/08/2024	No	High

provides a summary of the radiological contamination assessment.
--

3.1.4 Gradient relevant to the project area

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att M - Civil Stormwater Engineering Services – Erosion and Sediment Control Report.pdf Summary of the local hydrological conditions and constraints of the NRCF site and surrounds.	20/10/2024	No	High

3.2.1 Flora and fauna within the affected area

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att A - DRAFT Decommissioning Plan - October 2024.pdf Provides the high-level information on the processes conducted to determine the preferred decommissioning options, and the proposed decommissioning activities and mitigation measures.	30/09/2024	No	High
#2.	Link	Ref 9 - Native Vegetation of the Sydney Metropolitan Area - Version 3.1 https://datasets.seed.nsw.gov.au/dataset/the-nat..			High

3.2.2 Vegetation within the project area

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att K - GETEX Due diligence contamination assessment.pdf Summarises the findings from a contaminated lands assessment of the NRCF and surrounds.	10/04/2024	No	High

3.3.2 Indigenous heritage values that apply to the project area

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att A - DRAFT Decommissioning Plan - October 2024.pdf Provides the high-level information on the processes conducted to determine the preferred decommissioning options, and the proposed decommissioning activities and mitigation measures.	30/09/2024	No	High
#2.	Document	Att X (SENSITIVE) - AHIMS search result.pdf Search result for Indigenous heritage sites in proximity to the NRCF.	20/10/2024	Yes	High

3.4.1 Hydrology characteristics that apply to the project area

	Type	Name	Date	Sensitivity	Confidence

#1.	Document	Att K - GETEX Due diligence contamination assessment.pdf Summarises the findings from a contaminated lands assessment of the NRCF and surrounds.	10/04/2020	No	High
#2.	Document	Att M - Civil Stormwater Engineering Services – Erosion and Sediment Control Report.pdf Summary of the local hydrological conditions and constraints of the NRCF site and surrounds.	20/10/2020	No	High
#3.	Link	Ref 10 – Johnstons Creek Catchment: Floodplain Risk Management Plan https://www.cityofsydney.nsw.gov.au/floodplain-m..			High

4.1.4.3 (Threatened Species and Ecological Communities) Why your action is unlikely to have a direct and/or indirect impact

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att A - DRAFT Decommissioning Plan - October 2024.pdf Provides the high-level information on the processes conducted to determine the preferred decommissioning options, and the proposed decommissioning activities and mitigation measures.	30/09/2020	No	High
#2.	Document	Att B - EPBC Self assessment - Camperdown decommissioning.pdf ANSTO's EPBC self-assessment of the decommissioning incorporating the significance assessment against thresholds from EPBC Significance Guidelines 1.1 and 1.2.	18/11/2020	No	High
#3.	Link	Ref 4 - Significant Impact Guidelines 1.1 - Matters of National Environmental Significance https://www.dcceew.gov.au/sites/default/files/do..			High
#4.	Link	Ref 5 - Significant impact guidelines 1.2 - Actions on, or impacting upon, Commonwealth land and Act https://www.dcceew.gov.au/sites/default/files/do..			High

4.1.5.3 (Migratory Species) Why your action is unlikely to have a direct and/or indirect impact

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att A - DRAFT Decommissioning Plan - October 2024.pdf Provides the high-level information on the processes conducted to determine the preferred decommissioning options, and the proposed decommissioning activities and mitigation measures.	30/09/2020	No	High
#2.	Document				

		Att B - EPBC Self assessment - Camperdown decommissioning.pdf ANSTO's EPBC self-assessment of the decommissioning incorporating the significance assessment against thresholds from EPBC Significance Guidelines 1.1 and 1.2.	18/11/2024	No	High
#3.	Link	Ref 4 - Significant Impact Guidelines 1.1 - Matters of National Environmental Significance https://www.dcceew.gov.au/sites/default/files/do..			High
#4.	Link	Ref 5 - Significant impact guidelines 1.2 - Actions on, or impacting upon, Commonwealth land and Act https://www.dcceew.gov.au/sites/default/files/do..			High

4.1.12.2 (Commonwealth or Commonwealth Agency) Nature and extent of the likely impact on the whole of the environment

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att A - DRAFT Decommissioning Plan - October 2024.pdf Provides the high-level information on the processes conducted to determine the preferred decommissioning options, and the proposed decommissioning activities and mitigation measures.	30/09/2024	No	High
#2.	Document	Att B - EPBC Self assessment - Camperdown decommissioning.pdf ANSTO's EPBC self-assessment of the decommissioning incorporating the significance assessment against thresholds from EPBC Significance Guidelines 1.1 and 1.2.	18/11/2024	No	High
#3.	Document	Att E - AP-5400 Project Environmental Protection Requirements.pdf This document provides the overarching planning framework and requirements for the protection of the environment from project, construction, decommissioning and maintenance activities at ANSTO.	30/09/2024	No	High
#4.	Document	Att G - AF-5947 Project - Construction Environmental Management Plan.pdf This form is completed for all major projects conducted at ANSTO which may have an impact on the environment. This form may be complemented by a Principal Contractor's own environmental management plan.	31/10/2024	No	High
#5.	Link	Ref 5 - Significant impact guidelines 1.2 - Actions on, or impacting upon, Commonwealth land and Act https://www.dcceew.gov.au/sites/default/files/do..			High

4.3.8 Why alternatives for your proposed action were not possible

Type	Name	Date	Sensitivity	Confidence
#1.	Document A - DRAFT Decommissioning Plan - October 2024.pdf Provides the high-level information on the processes conducted to determine the preferred decommissioning options, and the proposed decommissioning activities and mitigation measures.	30/09/2024	High	

5.2 Declarations

✔ Completed Referring party's declaration

The Referring party is the person preparing the information in this referral.

ABN/ACN	47956969590
Organisation name	AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION
Organisation address	178 New Illawarra Road, Lucas Heights NSW 2234
Representative's name	Michael Baker
Representative's job title	Manager, Regulatory Affairs and Compliance - Environment and Sustainability
Phone	0429155994
Email	mhb@ansto.gov.au
Address	178 New Illawarra Road, Lucas Heights NSW 2234

- ☒ Check this box to indicate you have read the referral form. *
- ☒ I would like to receive notifications and track the referral progress through the EPBC portal. *
- ☒ By checking this box, I, **Michael Baker of AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION**, declare that to the best of my knowledge the information I have given on, or attached to this EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence. *
- ☒ I would like to receive notifications and track the referral progress through the EPBC portal. *

✔ Completed Person proposing to take the action's declaration

The Person proposing to take the action is the individual, business, government agency or trustee that will be responsible for the proposed action.

ABN/ACN	47956969590
Organisation name	AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION
Organisation address	178 New Illawarra Road, Lucas Heights NSW 2234
Representative's name	Jakob Vujcic
Representative's job title	General Manager, Regulatory and Governance
Phone	02 9717 3844
Email	vujcicj@ansto.gov.au
Address	New Illawarra Road, Lucas Heights NSW 2234

☒ Check this box to indicate you have read the referral form. *

☒ I would like to receive notifications and track the referral progress through the EPBC portal. *

☒ I, **Jakob Vujcic of AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION**, declare that to the best of my knowledge the information I have given on, or attached to the EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence. I declare that I am not taking the action on behalf or for the benefit of any other person or entity. *

☒ I would like to receive notifications and track the referral progress through the EPBC portal. *

✔ Completed Proposed designated proponent's declaration

The Proposed designated proponent is the individual or organisation proposed to be responsible for meeting the requirements of the EPBC Act during the assessment process, if the Minister decides that this project is a controlled action.

Same as Person proposing to take the action information.

☒ Check this box to indicate you have read the referral form. *

☒ I would like to receive notifications and track the referral progress through the EPBC portal. *

☒ I, **Jakob Vujcic of AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION**, the Proposed designated proponent, consent to the designation of myself as the Proposed designated proponent for the purposes of the action described in this EPBC Act Referral. *

☐ I would like to receive notifications and track the referral progress through the EPBC portal. *

DECOMMISSIONING PLAN

FOR

B81 CAMPERDOWN FACILITY (NRCF)

October 2024

Document No : NRCF-0010-PM-0011

Decommissioning Project ID : D00063

ACS Document Reference ID :

Revision History

Revision Details		<i>Print name, date, and initial each box</i>			
Rev.	Description of Revision	Prepared	Reviewed	Approved	Agreed
0	Initial issue	Name: Date:	Name: Date:	Name: Date:	Name: Date:

Camperdown Decommissioning Plan

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1 INTRODUCTION AND BACKGROUND

ANSTO's National Research Cyclotron Facility (NRCF) in Camperdown is located on land located at 81 Missenden Rd, Camperdown NSW, approximately 5 km southwest of the centre of Sydney (the **Camperdown Facility**), leased to ANSTO by the Sydney Local Health District (**SLHD**).

The Camperdown Facility originally commenced operations in 1991 as the National Medical Cyclotron, operating a 30Mev cyclotron, beam lines and isotope hot cells to produce radioisotopes principally for medical purposes. In 2010, the original cyclotron was replaced with a modern 18Mev cyclotron, all beam lines were removed and the facility started to produce Carbon-11 (C-11), a PET fluorine-18 (F-18), and FDG 18F, made from irradiated targets, for research purposes. ANSTO operated the 18Mev cyclotron under the Australian Radiation Protection & Nuclear Safety Agency (**ARPANSA**) issued Facility Licence number F0251.

The Camperdown Facility is currently in a permanent state of shutdown and there have been no cyclotron or radiochemistry operations in the hot cells and fume cupboards since mid-2021. Also, key systems of the facility, such as the cyclotron, have been disabled by disconnecting and isolating the power supply.

ANSTO intends to surrender its lease with SLHD, which expires on 30 June 2029, after completing its make-good activities and issuing the final radiation clearance survey report. To do this, ANSTO must obtain a decommissioning licence from ARPANSA under the *Australian Radiation Protection and Nuclear Safety Act 1998* (1) (the **ARPANS Act**). ANSTO will surrender the decommissioning licence before surrendering the lease.

ANSTO's Infrastructure and Engineering Services group (**I&ES**) has assembled a team (the Decommissioning Project Team) to manage these make-good obligations, including the issue of the final radiation clearance survey. This team will perform the work as detailed in the decommissioning plan (once approved), be responsible for safety and compliance within the Camperdown Facility and manage the interface with ARPANSA (including applying for, and surrendering, the decommissioning licence).

1.1 Decommissioning, Dismantlement and Clearance

The following major works are required in order to surrender both the lease to SLHD and the ARPANSA decommissioning licence, i.e., to decommission the Camperdown Facility:

- a) Removal of the 18MeV cyclotron and transport to LHTC for storage prior to disposal.
- b) Removal of the liquid waste tanks in the basement.
- c) Removal and disposal of all service and ancillary equipment e.g., active ventilation, stack etc.
- d) Standard demolition works for the building structures/systems determined by characterisation to be radiologically exempt and free of any radiological contamination.
- e) Transport of radiological-free waste to an approved recycling facility.
- f) Installation of an enclosure over the vault structure.
- g) Packaging of radiologically activated waste, its transportation to an authorised facility and disposal as restricted waste.
- h) Final radiation surveys necessary to meet the requirements for surrendering both the ARPANSA decommissioning licence and the lease to SLHD.

1.2 Purpose

The purpose of this Decommissioning Plan is to outline the decommissioning methods to be employed in the final decommissioning of the Camperdown Facility, in a safe and environmentally acceptable manner and in accordance with good international practice, and focusing on the measures employed to protect staff, the public and the environment.

1.3 Objective

This Plan will form part of the application for the decommissioning licence, which will also include a Safety Analysis Report (**SAR**), and a suite of plans and arrangements to establish the decommissioning of the Camperdown Facility, documented in a management system, designed to support the object of the ARPANS Act and integrate safety, health, environmental, security, quality, societal and economic elements.

1.4 References

A list of references relevant to this document is contained in Section 15.

2 FACILITY DESCRIPTION

2.1 Location and Surrounding Land Use

Camperdown is an inner suburb of Sydney with a mix of residential, commercial, and public utility areas (Appendix C).

The Camperdown Facility is located in the immediate vicinity of the Royal Prince Alfred Hospital (**RPAH**) and is a stand-alone building, bounded on the north side by Brodie Street (a private hospital road), extending on its western side to Hospital Road. Its eastern boundary is 75m west of Missenden Road, in line with the pedestrian crossing in front of the hospital security gates on Missenden Road. The total site occupies an area of less than 2000m².

The surrounding land is largely occupied by facilities of the RPAH. There is also a residential college of Sydney University and a limited number of residential houses nearby. There are 2 large oxygen tanks and 2 rainwater tanks servicing the RPAH located to the rear of the building and adjacent to the exterior of the cyclotron vault wall. There are 2 substations on the northwest corner servicing RPAH and one substation on the southwest corner servicing the Camperdown Facility and others (see site survey plan 1738AA).

2.2 Description of the Camperdown Facility

The Camperdown Facility comprises a two-storey brick building with a concrete basement.

The ground floor contains laboratories, production areas that previously housed Hot Cells, workshops and 4 purpose-built vaults, the layout of which is shown in Appendix B.

Vault (Rm No. 0053) currently contains the 18MeV cyclotron with its integral target stations. The concrete walls of the vaults are approximately 2 metres thick and were used to shield against neutron and gamma radiation.

Vault (Rm No. 0059) is the cyclotron utility room which presently houses the cyclotron chilled water circulating equipment and the hot cell waste gas management system.

Vaults (Rm No.'s 0061, 0051) previously housed the target stations of the 30MeV cyclotron, which was decommissioned in 2009. These two vaults were not used in the refurbished facility.

Details of previous facility layout is shown in Appendix B.

Active and non-active ventilation, hot water services, air handling units, HEPA and charcoal filters etc. are housed on the first floor in Rm No.'s 1040 and 1044. This floor also houses general office areas.

2.3 18Mev Cyclotron

The cyclotron used in the Camperdown Facility is a fixed-energy particles accelerator, accelerating negative ions (H-) up to 18 MeV. The cyclotron includes eight independent exit ports allowing eight targets to be mounted on the cyclotron vacuum chamber. Radioisotope production took place in these exit ports with reactions between gas and liquid targets with the proton beam

Carbon-11 (C-11) and a PET fluorine-18 (F-18) isotopes were produced in the gas and liquid targets of the cyclotron and transferred to the hot cells by a helium push gas system made from plastic tubing laid in shielded conduits.

The short half-life of these isotopes produced by the cyclotron (F-18 @110 min and C-11 @ 20 min) will not be a problem in the decommissioning of the Facility and will not generate a long-term hazard.

After QC checking, the finished radiopharmaceutical was then transferred to the packaging and transport area.

2.4 Facility & Site Radiological Characterisation

A project to characterise the Camperdown Facility was initiated in May 2022. The characterisation project lasted for 6 months, providing data that enabled the Decommissioning Project Team to determine the appropriate methods for demolishing the activated areas.

The results of the characterisation are published in the report titled "Report on the Characterisation of Camperdown (NRCF-1200-RT-0003)" (4).

2.5 Site & Facility Operational History

Details of the history and operational use of the Camperdown Facility is contained in the Building 81 Camperdown Decommissioning - Historical Site Assessment (5), a Facility and Site timeline is shown in Table 1 below.

Table 1 Camperdown Facility and Site Timeline

Year	Usage or Event
Pre 1997	Light Industrial Area
1987-1991	Camperdown Facility Construction
1991	Radiochemical Production
1993	Radiochemical Product Expansion
~1995	Building Expansion
Late 1990s	Cooling Tower Replacement
2010 - 2012	Cyclotron Facility Refurbishment
~2014	Vertical Section of Transfer System Removed
2021	Final Shutdown
2021	Decommissioning Project
2029	End of Lease

The report (5) also contains details of site releases, incidents, and corrective actions during its operational lifetime.

3 DECOMMISSIONING STRATEGY

3.1 Introduction & Objectives

The decommissioning strategy that is to be employed at the Camperdown Facility is for immediate decommissioning and dismantlement (**D&D**).

The objective of the strategy is to meet the requirements of the ARPANSA Regulatory Guide – Decommissioning of Controlled Facilities (2) and ensure that final decommissioning of the Camperdown Facility is completed in a safe and environmentally acceptable manner and that final site radiation survey meets the requirements for release from regulatory control (surrender of the decommissioning licence) as well as meeting its lease obligations to make good (to surrender the lease to SLHD).

This immediate D&D approach seeks to reassure stakeholders that the Camperdown Facility will be decommissioned safely, avoiding any ongoing legacy issues, and maximising the use of experienced staff in the D&D process.

As a precursor to identifying a suitable D&D strategy, the Camperdown Decommissioning Project Team conducted a CORIS360^{®1} survey of the four vaults (Appendix E , a vault characterisation, and a Facility Historical Site Assessment (5) (**HSA**), identifying the history and operational usage of the Camperdown Facility. These surveys and plans informed the Decommissioning Project Team where best to perform the detailed radiological and non-radiological characterisation of the entire facility.

Additionally, radiological soil samples of external areas were conducted See Certificate of Analysis Camperdown Soil Samples (6) and Camperdown Due Diligence Contamination Assessment External Soil Samples Report (7).

3.2 Decommissioning Strategy

Decommissioning of the Camperdown Facility will follow the sequence detailed below:

1. Seek regulatory approval under the current operational licence F0251 to characterise the Facility.
2. Undertake both invasive and non-invasive characterisation of the Camperdown Facility.
3. Remove peripheral structures, equipment, and components not subject to regulatory control.
4. Develop the submission for the Decommissioning Licence.
5. Submit an assessment under the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC)* to the Department of Climate Change, Energy, the Environment and Water (**DCCEEW**).
6. Complete the D&D work after receiving all regulatory and/or local approvals.
 - a. Remove cyclotron
 - b. Dismantle and remove the liquid waste tanks
 - c. Remove lead blocks in trenches
 - d. Prepare structural support to the vaults
 - e. Demolish the main building
 - f. Erect of enclosure and dust and fumes extract system
 - g. Demolish the vaults

¹ [CORIS360[®]](#) is the world's most advanced radiation imaging solution. It delivers fast, wide area spectroscopic gamma-ray imaging across the full energy range, by using [compressed sensing techniques](#), CORIS360[®] quickly produces precise high-quality images, improving decision making for anyone working in radioactive environments.

7. Perform survey for final clearance and obtain final site clearance report - radiological/non-radiological.
8. Surrender the decommissioning licence (removal from regulatory control).
9. Surrender the lease and handover the site to SLHD.

3.3 Decommissioning Strategies Considered

The data obtained from the characterisation of the Camperdown Facility identified the main radiological hazard to be the concrete from the walls, floors, and ceilings of the vaults. The radiological hazard was due to activation of the concrete.

There is also the potential for loose contamination to be present. The methods employed to clear loose contamination are well known and well-practiced by ANSTO staff, and given the minor nature of this risk, they were not part of the considered D&D strategy.

As the greatest radiological hazard is activation of the concrete in the vaults, the Decommissioning Project Team considered 4 options to decommission them. These options considered in the main, the safety and environmental risks, costs, schedule impact and D&D difficulties.

Other factors that were considered but not ranked were:

1. The availability of experienced staff and knowledge gained from previous regulated D&D works.
2. The availability of a project team who can conduct an agile project approach i.e., can reflect, learn, and safely manage associated D&D risks
3. The availability of a project team who have (or can gain) sufficient understanding of the Camperdown Facility.
4. Reputational factors.
5. Potential impacts to the surrounding medical facilities.
6. Availability of specialist contractors/equipment to complete D&D activities.
7. Compliance with WHS processes.

The four main options that were considered are discussed as follows:

3.3.1 Option 1 - Removal of Activated Concrete Only - Maintaining Remaining Building

Option 1 considered leaving the main parts of the building but removing all activated concrete using specialist, remote-operated equipment - a Brokk® excavator (See Figure 1 **Image of Proposed Brokk® 200 Machine** with Breaker) from inside the vaults until clean, non-activated concrete was reached. The main steps to this option would have included the following:

1. Removal of the 18MeV cyclotron, the radiopharmaceutical production hot cells and associated equipment and cleaning minor, loose, low activity contamination.
2. Installation of temporary ventilation system for the decommissioning works to maintain a negative pressure to the working area. The ducting of the ventilation system to be extended to Cyclotron vault Room 0053 and vault Room 0061.
3. Use of Brokk® machine with breaker and /or drum cutter attachments to systematically breakaway the entire ceiling in sections as per structural advice that includes staged propping system, supporting beams and columns.
4. Use of Brokk® machine with breaker and /or drum cutter attachments to systematically breakaway wall/floor sections.
5. Removal of all steel fittings, brackets anchors and reinforcement.
6. Transfer of waste in rooms using conveyors to a loading area in Room 0048 where drums would be loaded, weighed, and cleaned.
7. Transportation of drums to Lucas Heights for storage.

A representation of this option is presented in Appendix F / F.1 .

This option was excluded from further consideration following detailed technical reviews. The depth of the concrete activation was considered too great for the Brokk® equipment. The separation of the activated concrete would have resulted in an increased number of storage drums, as discussed in Section 3.4 below.



Figure 1 Image of Proposed Brokk® 200 Machine with Breaker and additional attachments

3.3.2 Option 2 - Removal of Entire Vaults - Maintaining Remaining Building

Option 2 considered leaving the main building and removing the vaults entirely. This involved attaching a large, tented structure over the western end (vaults section) of the building and removing large, block-like sections of the vault concrete using specialist, wire sawing equipment.

This option proposed to use the relatively unaffected cyclotron vault (Rm No. 0053) to further process the blocks and separate the activated concrete from the non-activated concrete with the use of wire sawing. The main steps to this option would have included the following:

1. Removing the 18MeV cyclotron, the radiopharmaceutical production hot cells and associated equipment and cleaning minor, loose, low activity contamination.
2. Setting up a large construction enclosure to cover the vault and a site establishment area West of the Camperdown Facility.
3. Decommissioning the vaults by cutting the concrete ceiling and walls using wire sawing, then removing the blocks and storing on site (cyclotron vault - Rm No. 0053) for separation of the activated concrete from the non-activated concrete.
4. Transporting the activated concrete blocks in 1/3 height, ISO containers to Lucas Heights for storage.
5. Disposing the non-activated concrete as general waste at a certified licenced facility. Each block would have been tested for radioactivity and a clearance certificate issued.

A representation of this option is presented in Appendix F / F.1 .

3.3.3 Option 3 – Deferred Removal of Vaults

Under Option 3 the Camperdown Facility would have been placed under a possess and control licence after ANSTO had secured the vaults from unauthorised access and decommissioned the 18MeV cyclotron, the radiopharmaceutical production hot cells and associated equipment along with clearing any minor, loose, low activity contamination.

This option would have left the Camperdown Facility intact for use by SLHD for a period of 5-8 years and in due course, SLHD would have demolished the building.

This Option would have left vault rooms 0051, 0053, 0059 & 0061 (including the maze connecting the vaults to the building) for deferred D&D activities by ANSTO under a decommissioning licence.

3.3.4 Option 4 - Full Building Demolition

Under Option 4 ANSTO would demolish the main part of the Camperdown Facility (using standard demolition methods and using wire sawing techniques to decommission the vault rooms and leaving the site as a brown field ready for handover to SLHD.

This Option would include:

1. Decommissioning the 18MeV cyclotron, the radiopharmaceutical production hot cells and associated equipment along with clearing any minor, loose, low activity contamination.
2. Demolishing the building from East to West but leaving the building foundation slab as a base for site establishment, clearance, trucking, package, and temporary storage areas etc.
3. Demolishing vault rooms 0051, 0053, 0059 & 0061 including the maze connecting the vaults to the building, using wire sawing techniques to separate activated and non-activated concrete.
4. Managing waste onsite by separating the activated concrete from the non-activated concrete. Storage of the activated blocks in IP1 bags and transporting to Kemps Creek as restricted waste.
5. The non-activated concrete will be tested and a clearance certificate issued for each block. The waste will then be disposed of offsite at an approved tip.

A representation of this option is presented in Appendix F / F.1 .

3.4 Summary of Options Considered

A summary of the potential benefits and challenges of each of the four options considered in Section 3.3 is detailed in Table 2.

Table 2 Summary of Option Considerations

Option Study	Potential Benefits	Potential Challenges
Option 1 - Removal of Activated Concrete Only - Maintaining Remaining Building	- This option would only remove the activated concrete from the vaults, therefore keeping the remaining building structure for use by SLHD immediately - Less 'general waste' (because the building will remain) which is environmentally more sustainable - Reuse of Brokk on other decommissioning projects within ANSTO - Removal of activated concrete within the vault rooms would not be visible to the public - This option is assumed to have the least amount of work and the least amount of 'restricted solid waste' due to removal of activated concrete ONLY (no requirement to allow a 100mm concrete buffer zone for wire sawing)	- Decommissioning works could weaken vault structural integrity - The depth of activation of the concrete precludes the use of this technique - Breaking with a Brokk produces significant noise and vibration which will have a detrimental impact for SLHD occupants - Breaking can cause cracks to develop in concrete which may require cessation of activities for investigation and restoration - The availability of Brokk attachments dedicated to decommissioning activated concrete structures in Australia is limited - The line-of-sight required for Brokk operation exposes workers to unnecessary doses from the activated concrete and reinforcement bar - The Brokk would be working in tight areas and there is a risk of knocking over the temporary propping of the vault room ceiling - Recovery of the demolition process will be difficult if there is a collapse of the vault ceiling - The possible inaccuracy of the Brokk method to separate activated and non-activated concrete would require multiple entry, gamma spectrometry testing (to confirm level of activity in remaining concrete) and monitoring - This method would require waste packaging into 200L drums, causing an increase in logistical problems (transport and storage) of approximately 2,000 drums at Lucas Heights - The stop/start nature of the work would prolong decommissioning activities adding time to task completion and affecting cumulative dose to workers and overall cost of the project - Full PPE against inhalation of activated dust during the works would increase the risk of workers' fatigue - This option would make use of the existing vault ventilation system and therefore could potentially cause contamination of the system

Option Study	Potential Benefits	Potential Challenges
		- Added project costs to reconfigure the vault ventilations system - ARPANSA Licence approval may be prolonged due to the complications of dual occupancy during demolition (SLHD occupying the upper floor)
Option 2 - Removal of Entire Vaults - Maintaining Remaining Building	- This option would only remove the vaults, therefore keeping the remaining building structure for immediate use by SLHD - Less 'general waste' (because the building will remain) which is environmentally more sustainable - Recovery in the event of collapse is easier than for Option 1 due to the wire sawing method separating activated from non-activated concrete in a designated area	- Decommissioning works could potentially weaken vault structural integrity - Potential for environmental release (standard or active) of dust or waste from demolition works - Cutting and removing of concrete produces noise and vibration - Lifting and craning of concrete blocks in space-constrained site increases WHS & radiation exposure risks - ARPANSA Licence approval may be prolonged due to the complications of dual occupancy during demolition (SLHD occupying the upper floor) - Increase in dose exposure from the activated concrete and reinforcement bar due to: - Setting up wire sawing operations, and the slow sawing process - Installation of anchors for lifting hundreds of cut blocks - A large number of cut blocks would increase the number of lifting operations, imposing WHS concerns - Wire sawing methods would significantly increase the secondary activated liquid waste (cooling water and slurry) - The stop/start nature of the work would prolong decommissioning activities adding time to task completion and effecting cumulative dose to workers - The decommissioning operations would be visible to SLHD occupants and the use of radiological PPE may affect the perception of safety - Greater cost, longer schedule

Option Study	Potential Benefits	Potential Challenges
Option 3 – Deferred Removal of Vaults	- This option would defer the removal of the vaults, therefore allowing SLHD to immediately use the building - The activated concrete will decay, reducing radiological risks and quantity of ‘restricted waste’ - ANSTO would be able to deploy resources to other decommissioning projects	- Difficulties may arise in releasing the site from regulatory control due to the inability to perform a final site survey - Does not comply with requirements of SLHD lease - The facility would need to remain licenced by ARPANSA, requiring a Possess & Control Licence - Interface risks and other risks during Possess & Control Licence - Complicated Licencing requirements - Leasing - Possess & Control - Ongoing licencing and lease costs - Loss of knowledge and expertise - SLHD does not want existing cyclotron/hotcell production areas of the Camperdown Facility - Significant risk of future changes to regulatory, political, funding, waste disposal environment etc.
Option 4 - Full Building Demolition (standard demolition methods)	- Use of an excavator would reduce dose to workers due to the distance from the activated concrete - The worker is within a filtered cab - Full PPE (against inhalation of activated dust during the works) would not be required, reducing the risk of worker fatigue - A single head contractor would be responsible for the full demolition of the Facility - Risks are reduced compared with Option 2 due to the area available to contain the works - Greater area availability from transport movements and testing and monitoring of waste packaging - Limited secondary waste production (limited wire sawing requirement)	- Potential for environmental release (standard or active) of dust or waste from demolition works - Demolition works produces noise and vibration - Potential for delays due to prolonged approval process for demolition of the entire building (local council, ARPANSA etc.) - Dust would need to be filtered prior to exiting the enclosure - Demolition works would be visible to the public unless a large tent is erected to obscure the site - May require greater stakeholder management

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Option Study	Potential Benefits	Potential Challenges
	• ANSTO could better control the generation/ segregation of waste (non-activated for recycling and activated for waste disposal as 'restricted waste') • Final status survey easier to perform, which would simplify surrender of Decommissioning Licence • No dual occupancy risks • Full control of the site • Option meets client's and lessor's expectations	

3.5 Decommissioning Strategy Adopted

The project completed an option study for the eventual decommissioning of the Camperdown Facility. The project completed a scoring of the “least best option” to “best option” for a range of project risks, which are presented in Table 3 below.

Option 4 - ANSTO Demolish Building in Full was determined to be the most viable D&D method because it has the greatest potential benefits with the least challenges and is the best option to minimise project risks.

Table 3 Determining Best Available Decommissioning Strategy

Description	Considerations	Option 1 Remove of Activated Concrete only	Option 2 Remove of Entire vault	Option 3 Deferred Removal of Vaults	Option 4 Full Building Demolition
Licensing / Approvals Risk	ARPANSA, NSW EPA & other regulatory bodies	2	1	2	2
Radiological Risks	Radiation exposure to workers	1	2	3	3
Safety Risks	Non-Radiation safety for workers and surrounding infrastructure	1	2	3	3
Reputation Risks	Community and stakeholders management	4	1	2	2
SLHD Support / Agreement	SLHD are the owners of the land and building. The decommissioning option must be made in consultation with SLHD	1	1	1	4
Delivery Confidence	Availability/expertise of contractor and equipment to do the works	1	2	3	4
Cost	Full project costs required for PWC approval	1	2	3	4
Cost Risks	Unknown project costs and required contingencies	2	1	4	3
Total		13	12	21	25

Ranking - 1= least best option, 4 = best option

3.6 Peer review of Decommissioning Strategies

The decommissioning strategy that is to be employed at the Camperdown Facility was peer reviewed by UK specialists, Jacobs International (8).

Jacobs carried out a peer review of the proposed procedures and documentation in respect of the Camperdown Decommissioning Strategy to promote compliance with regulations and best practice. To support the review, the review focused on the following key areas:

- Radiological safety;
- Health and safety;
- Waste management;
- Decommissioning/demolition techniques; and
- Overall demolition sequence.

Overall, the peer reviewers found the proposed methodology appropriate and that it demonstrates use of good practice. The peer review views the characterisation carried out at the Camperdown Facility as comprehensive and that it supports the reasoning behind the depth of concrete wire sawing.

The peer reviewers also concluded that the overall sequence demonstrates good practice because it removes as much non-active material as far as is reasonably practicable prior to commencing on the active vault demolition, which will avoid cross-contamination and minimise disposal of restricted waste.

All recommendations or requirements for additional information or clarity as a result of the peer review have been incorporated in this decommissioning plan.

3.7 Regulatory Strategy

To enable D&D activities to be undertaken at the Camperdown Facility, which will allow ANSTO to surrender the lease to SLHD, ANSTO needs to successfully apply for a decommissioning licence from ARPANSA, which will also require approval from the following agencies/ regulatory bodies:

- ARPANSA - to assess the potential for significant risk to safety and/or the environment;
- DAWE - to review the potential impacts to the environment pursuant to the to the EPBC.
- Public Works Committee (**PWC**) – to assess the cost effectiveness of the proposal.

The project will also seek approval from ANSTO's internal Safety Reliability and Assurance team (**SRA**) for an independent review and endorsement of the activities that have potential for significant risk to safety and/or the environment.

The overall ARPANSA submission process has been summarised in the flowchart below and timing of the overall regulatory actions is shown in Table 4 below.



Table 4 Estimated Timeline of Safety and Regulatory Actions

Item	Safety and Regulatory Submissions	Lodgement of application	Approval received
1.	EPBC Submission – referral to the Department	November '24	February '25
2.	PWC Submission	March '25	December '25
3.	Decommissioning Licence Application		
	• SRA approval	August '25	December '25
	• ARPANSA approval	December '25	December '26
4.	Final Decommissioning Report and Site Release Submission		
	• ARPANSA approval	August '28	February '29

4 DECOMMISSIONING MANAGEMENT

This section of the Decommissioning Plan summarises the management of decommissioning activities and identifies how D&D activities will be conducted safely.

4.1 Management System

The Decommissioning of the Camperdown Facility will follow the ANSTO Business Management System (**BMS**) which gives the Project a set of tools for planning and implementing optimised decommissioning practices.

The Project will undergo ongoing assessment during all phases of decommissioning i.e., characterisation, decommissioning planning, and eventual execution. This includes consultation with all stakeholders, with an emphasis on the potentially sensitive nature of the surrounding area.

4.2 Safety Management

Safety management will be conducted in compliance with the ANSTO Work Health & Safety Management System (**WHSMS**) which is made up of standards and guides that support ANSTO's Work Health & Safety and Environment (**WHSE**) Policy. The Safety Management Plan section of the Camperdown Plans and Arrangements (NRCF-1750-PM-0001) (9) covers off the organisational systems and processes.

The project is committed to enabling a positive safety culture by:

- Conducting works in accordance with the Codes of Practice and standards (Appendix A).
- Conducting workshops to identify the best decommissioning approach (See Section 3.3).
- Enabling collaboration with safety and radiation experts, including peer review by international experts.
- Supporting a questioning attitude and involving all Decommissioning Project Team members.
- Providing relevant training and awareness for all personnel working on decommissioning activities.
- Using safety briefings, toolbox talks, safety inspections and the STAR (Stop, Think, Act, Review) principle to encourage a positive safety culture for all.
- Providing effective communication, consultation, and cooperation.
- Ensuring all risks to the health and safety of ANSTO staff, contractors and contractor personnel and the community are minimised.

4.3 Organisational and Administrative Controls

The Camperdown Decommissioning Team Organisational Chart is set out below. The roles and responsibilities are defined in the Project Management Plan (NRCF-0010-PM-0004) (10).



**Camperdown Decom
Program Delivery Structure
8th February 2023**

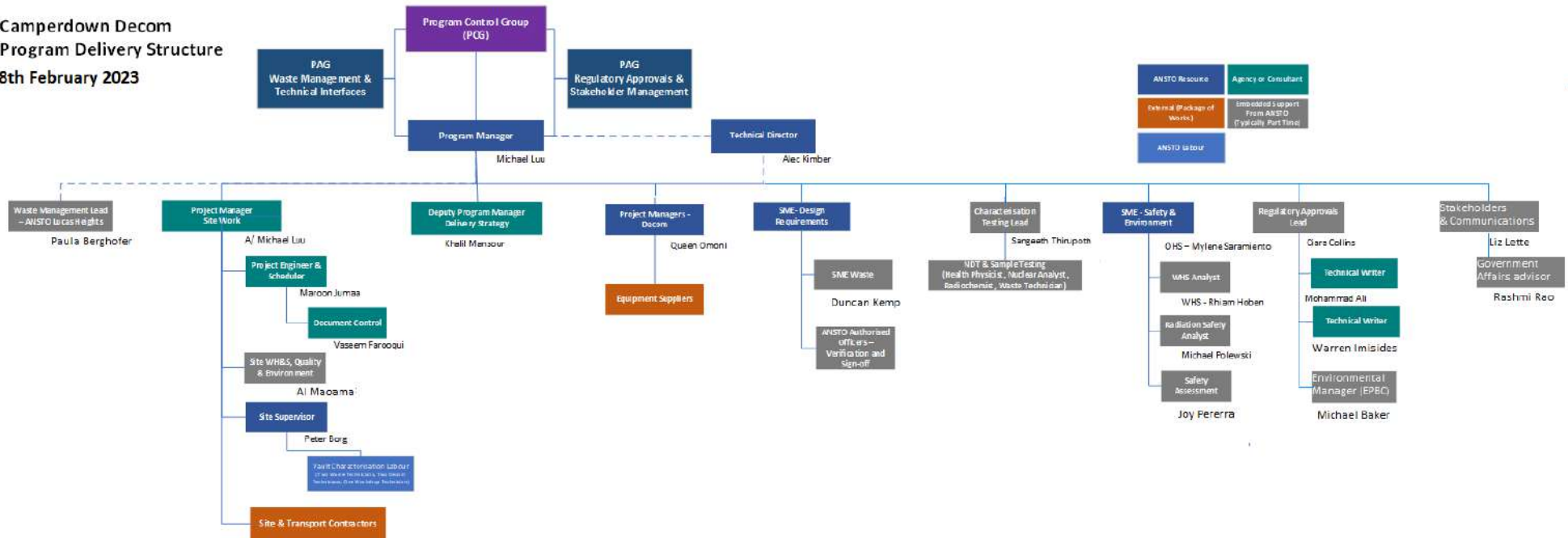


Figure 2 Project Organisational Governance Structure

4.4 Staffing, Qualification and Training

The Project will be adequately staffed for its duration.

Several team members have previous decommissioning experience dating back to the MOATA and former Cyclotron Removal decommissioning projects and, as well, several members available to the project have received the Argonne National Laboratory/Oak Ridge Associated Universities (ANL/ORAU) Certification for decommissioning.

Additionally, the Decommissioning Project Team will use the experience of several internal specialist groups at ANSTO, including:

- Waste Management Services (**WMS**)
- Radiation Protection Services (**RPS**)
- Health Physicists (**HP**) and Health Physics Surveyors (**HPS**)
- Workplace Health & Safety (**WHS**)
- Safety Systems & Reliability (**SSR**)

WMS provide specialist capability for decontamination methods; health physicists (**HP**) and health physics surveyors (**HPS**) are recruited with the necessary knowledge, skills and experience or are trained and authorised within ANSTO's Radiation Protection Services group, which provides radiation training and regularly conducts refresher training courses to ensure staff competency when working in radiological areas.

Staff from WHS provide advice on conventional work health and safety, including induction for workers and safety training for contractor supervisory workers.

Any workers, including contractors, required to do specialised tasks will be provided training prior to their assignment to the job. Contractors engaged by the project will be supervised by a nominated and approved ANSTO Contractor Supervisor as outlined in the [AP-2363](#) Work Health and Safety Training Procedure.

The Decommissioning Project Team can also call upon ANSTO safety specialists who conduct the detailed safety and risk assessments for project activities.

All Decommissioning Project Team members will undergo Camperdown induction and work-specific area training as well individual training

4.5 Project Management

The Camperdown Decommissioning Project is managed and governed in accordance with the formal AME Project Management Policy ([ACS046343](#)) authorised by ANSTO's Capital Project Management Office.

4.6 Quality Management

The Camperdown Decommissioning Project will comply with the ANSTO BMS, which is certified to ISO 9001 (Quality Management) and ISO 14001 (Environmental Management System).

4.7 Documentation and Record Keeping

4.7.1 Project Documentation

Project documents pertaining to the decommissioning of the Camperdown Facility will be managed in accordance with the ANSTO Management System 'Controlled Document Process' (AR-1041). The Decommissioning Project Team has developed a document management Plan (NRCF-0010-PM-0001) (3) to encode all formal project documents (contractual, technical, administrative and quality) so that each document is assigned a single unique encoding ID number, that has a logical link to the Camperdown Decommissioning Project. A document map is provided in Appendix G .

Other documents or records include:

- Approvals, licences, and authorisations granted by a regulatory authority.
- Details of training courses provided to and attended by workers.
- Waste characterisation information in database form.
- Reports of any incidents or accidents involving spills, dropped items or inadvertent exposure to ionising radiation.

As is described in the WMS Plans and Arrangements for Managing Safety (G-5416), important information relating to the radioactive waste inventory of waste packages is recorded and documented in ANSTO's operational management database (**SAP**). Records are maintained for all types of waste including exempt wastes.

4.7.2 Training Records

All training records will be retained and managed by the Camperdown Decommissioning Project.

4.7.3 Health Records

All necessary health monitoring for ANSTO employees and contractors engaged in D&D activities will be coordinated in consultation between WHS and the Occupational Health Centre. The Occupational Health Centre will keep health monitoring records.

Radiological records will be registered and maintained through ANSTO's Dosimetry service.

4.7.4 Incident Reporting Records

ANSTO maintains a system to capture and record operational, quality, safety, or security concerns or incidents, which include near misses, incidents, accidents, or abnormal occurrences.

4.8 Contractor Involvement

Contractors or agency staff used during the Camperdown Decommissioning Project will be trained and managed in accordance with the ANSTO Work Health & Safety Management System (WHSMS).

5 DECOMMISSIONING COST AND SCHEDULE ESTIMATE

5.1 Decommissioning Cost

The costs to complete the decommissioning works to surrender the lease and hand the site back to SLHD is estimated to be \$17M including risks and contingencies.

5.2 Decommissioning Schedule

Decommissioning schedule milestones are identified in

6 CONDUCT OF DECOMMISSIONING

The conduct of decommissioning includes the preparatory work aimed at optimising D&D activities. Characterisation forms a large part of this preparatory work, as discussed in Sections 2.4 and 2.5 of this plan. The Camperdown Decommissioning Project plans to implement the decommissioning strategy outlined in Section 3, which includes removal of all operational waste, residual fluids, and preliminary cleaning and decontamination of process equipment.

The Camperdown Decommissioning Project aims to align its D&D activities with practices commonly used in various demolition industries.

The main Structures, Systems and Components (**SSC's**) to be decommissioned as part of this decommissioning licence application is:

- The 18MeV Cyclotron; and
- The vault structure and building

The development of a decommissioning work plan for each SSC has involved detailed input from Subject Matter Experts, including WHS, RPA and radiological risk advisors, as well as other key members of the Decommissioning Project Team. Each stage of the D&D activity has taken into account safety risks and controls, waste and the disassembly and/or demolition sequence of the potentially activated material.

The D&D activities for each stage is described below:

6.1 Stage 1: Preparation Prior to Physical Decommissioning Work

The preparation work that forms the basis of the decommissioning strategy presented in this Decommissioning Plan includes the Decommissioning Licence application, which encompasses:

- Safety Analysis Report (**SAR**);
- Suite of Plans and Arrangements to establish the decommissioning of the Camperdown Facility;
- the Characterisation Report; and
- optioneering studies, etc.

Prior to any physical work, a dilapidation report will be prepared to accurately assess the status and condition of all items located within and adjacent to the Camperdown Facility. This would be applicable to all activities, materials, equipment, plants, and other items on the site, including its boundaries.

ANSTO will remove some equipment/furniture/fittings etc from the Building prior to the handover of the Building to the contractor. Any equipment/furniture/fittings remaining in the Building after the handover is to be disposed/recycled by the contractor.

6.2 Stage 2: Dismantling and removal of all equipment

The contractor shall plan the removal of the remaining equipment inside the building to utilise the existing building services, such as ventilation, air conditioning, water and fire system. For instance, the removal of cyclotron and lead in the trenches will be conducted with all existing building services fully operational.

6.2.1 Removal of the Cyclotron

The 18MeV Cyclotron was surveyed in April 2022 and the survey revealed that the highest contact dose rate is 65µSv/hr from an internal component with external dose rates at contact less than 10µSv/hr. These details are referenced in the Characterisation Report (4).

All services connected to the cyclotron and surrounding rooms will be disconnected prior to any removal by licenced ANSTO staff and/or licenced contractors following the approval of required work

permits and SWMES. These include Safety Interlock System (SIS), Building Management System (BMS), (Programme Logic Controller) PLC and the VESDA systems.

Refer to the drawing listed below for some of the special systems.

- Drawing A3E 128453 for Building 81 Safety Interlock Systems (SIS)
- Drawing A1E 114081 for distribution board numbers and locations.
- Drawing SK 143686A1 for compressed gases services.
- Drawing AIE101040 for water supply servicing (including Hydraulic Services – Ground Floor Gas, Hot and Cold Water).

Dismantling techniques will be selected to ensure that activated plant and equipment components are removed in a controlled manner, avoiding any mixing with non-activated wastes where possible. The overriding objectives during dismantling include minimizing worker radiation exposure and reducing waste generation through suitable cutting and decontamination techniques.

Lead blocks and fillings were used as shielding to limit any radiation dosage exposure to workers in the Camperdown Facility. These will be removed prior to the disconnection and removal of the cyclotron, as they are located within trenches and underneath the cyclotron and its ancillary equipment.

The removal and transport of the cyclotron and its ancillary equipment will be carried out by trained and experienced logistics technicians.

A Cyclotron Removal and Transport Plan (15) has been prepared to outline the procedures, activities, and responsibilities required to ensure the safe removal and transport of the 18MeV cyclotron from the Camperdown Facility to its final storage at the Lucas Heights Campus. The Transport Plan includes:

- The staging of the crane and truck;
- Lifting and removal of the vault roof plugs using a 400-tonne mobile crane;
- Lifting of the cyclotron onto a suitable truck utilising the same a 400-tonne mobile crane;
- Campus Traffic Management and clearance points; and
- Transportation of the cyclotron from the Camperdown Facility to its final storage at the Lucas Heights.

The cyclotron shall be placed in a frame secured onto the truck for transport, with specifications of the frame detailed in the Cyclotron Removal and Transport Plan.

The cyclotron manufacturer, IBA, has recommended that the lifting assembly be installed on the cyclotron before commencing the lift. The bolt installation is detailed in Drawing 05/09/02/0401 Rev B-01 (Yoke Lifting Assembly).

Removal of the cyclotron will also require removal of the cyclotron vault roof plugs. Due to the low activation levels in the bottom plug, the Rm0053 roof plugs can be safely removed and discarded as industrial waste. Therefore, no roof plugs will need to be stored at Lucas Heights. The 4 Rm0053 ceiling plugs are required to be scanned for radioactivity by HPS upon removal in line with ANSTO waste clearance procedure for concrete waste.

6.2.2 Removal of lead in lead in trenches

Work will be undertaken on the removal of the lead blocks and shaving with the trenches. The lead blocks and fillings were used to limit radiation dosage exposure to workers working above the ground from the transfer lines running through the trenches (see Figure 3). (The radioisotopes were conveyed to and from the cyclotron to the hot cells via transfer lines).

A specialist lead removalist will be contracted to safely remove and dispose of all lead in the trenches. The removal and disposal of all lead pieces and leads shavings in an efficient and safe manner will occur in accordance with the [Risk Management of Lead AG-5542 Act](#).

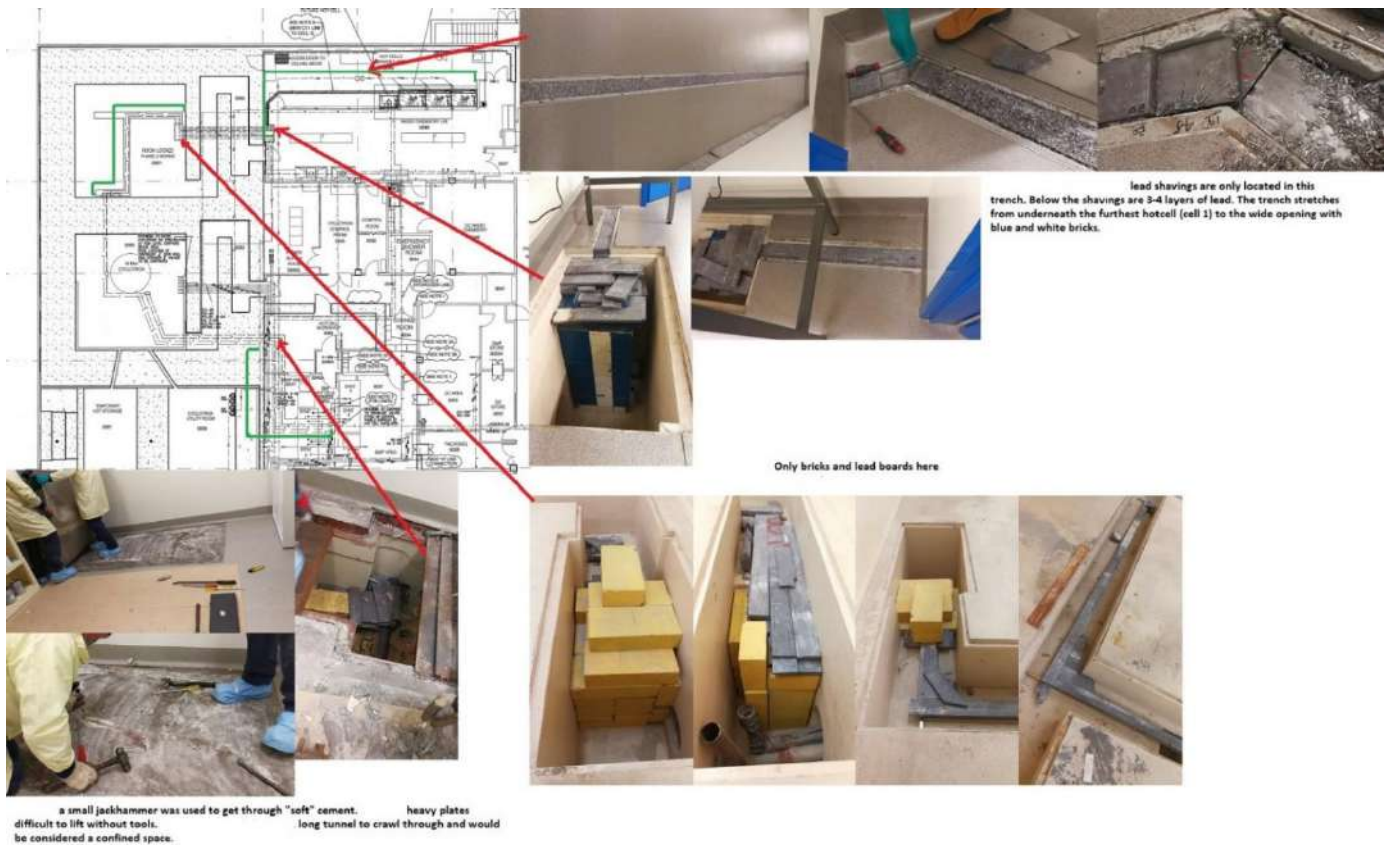


Figure 3 Lead to be removed from trenches

6.2.3 Transfer Line

The Transfer Lines within and underneath the trenches (See Figure 4) shall be removed after the lead removal. Characterisation of the trenches shows negligible contamination.





Figure 4 Transfer lines underneath GMP hot cells

6.2.4 Liquid waste Tanks

The Camperdown Facility has all its trade-waste draining into liquid waste tanks housed in the basement whereupon they can be monitored for radiological contaminants allowing for some defence in depth during operations. These liquid waste tanks have been characterised and found to be free of contamination. As such the liquid waste tanks will be dismantled using standard techniques and disposed of as scrap metal to local recycle centres.

The basement itself is serviced by the building HVAC system. Air movement is from the far end of the basement towards the exhaust outtakes placed near the ceiling, above the wastewater tanks.

Note: This control shall remain operational until the wastewater tanks are removed from the Camperdown Facility. After the removal of the wastewater tanks the control can be dismantled as per the decommissioning schedule.

6.2.5 Services isolation and disconnection

Prior to starting the demolition works certain systems and services will need to be isolated and disconnected at appropriate times. These services are:

- Gas Services
 - Compressed air supply
 - Nitrogen Supply
 - Helium supply
- Electrical supply, including lighting and power outlets
- Ventilation System
- Fire and emergency alarms
- Radiation monitoring
- Security cameras and security alarm
- Remove all fixtures located in rooms, including:
 - Gas lines
 - Electrical lighting, switches, and power outlets
 - Monitors, alarms, and speakers
 - Monorail
 - Large beamline fixtures

- Pipes and tubes from penetrations

The following guides will be followed:

- AG-2304 ANSTO Electrical Safety Guide;
- AP-2101 ANSTO Electrical Safety Rules; and
- AG 2409 Isolations and Lockout/Tag Out.

In addition, prior to any electrical work, a risk assessment must be conducted, and a safe system of work implemented, as per AE-2101 WHS Risk Management Standard.

6.3 Stage 3: Demolition of Building excluding Vaults

Following the removal of the cyclotron and other non-activated and contamination free items within the existing Camperdown Facility, the outer building of the Camperdown Facility will be demolished using standard demolition techniques. Since the demolished material from the outer building will be contamination and activation free, the demolished material will be disposed of at a recycle centre for reuse. Demolition of the outer building will then allow the enclosure described in Section 6.7.3 to be installed. Once the building is demolished, the basement area will be fenced to prevent movement of plant and machinery above the basement.

Prior to commencement of the building demolition works, the following work must be completed:

6.3.1 Site Hoarding and scaffold

The construction site will be fenced with plywood hoarding minimum 2.4 m height. A site establishment plan of the proposed location of the hoarding, scaffold, vehicle and pedestrian access, location of the temporary amenities and offices must be submitted.

Installation of a scaffold around the building and one level higher than the building, with shade cloth will be considered to minimise noise, dust, risks of flying objects. The certified scaffold will be designed, approved and installed prior being used.

6.3.2 Traffic Management

The successful tenderer will prepare a Traffic Management Plan (**TMP**) in consultation with ANSTO and stakeholders (SLHD, local council, community etc.) to ensure the safety of pedestrian traffic, community around the site, along the routes to recycling facilities and around disposal tip. To implement the proposed TMP, the successful tenderer will need to successfully apply for a Road Occupancy Licence (**ROL**) from Transport for NSW. The traffic controllers must carry a hard copy of the ROL at all times.

All haulage material removed from the site of the Camperdown Facility will be transported by a licensed EPA transporter for category 1 trackable waste.

6.3.3 Structural Engineering Consultant

The contractor must engage a third party to design and certify:

- The methodology of the demolition works including type of equipment to be used.
- Temporary support system required during the demolition of the building and the vaults including temporary protection to SLHD tanks (water, hydrogen and nitrogen tanks) and support to basement ceiling.
- Design of the chemical anchors to be used for lifting concrete blocks.
- A detailed lifting plan, that includes lifting equipment (crane, forklift etc.) to be used, which must also be approved by ANSTO.
- Scaffold system.

The design will be submitted to ANSTO for review and comments.

6.3.4 Temporary Structural propping

A temporary propping system designed and certified by a structural engineer will be installed in vault rooms 0051 and 0061 to support the ceiling and walls during the works, ensure that the integrity of the vault structure is not compromised and eliminate the risk of radiation exposure to the public and workers. The temporary propping installation process in vaults 0051 and 0061 will not commence until all demolition activity onsite has ceased. Access to vaults 0051 and 0061 will be blocked to all personnel during the demolition works and all works will be carried out from outside the vaults, except that. ANSTO will permit access to the vaults for a limited time from time to time to allow inspection of the propping system, as required.

If required, a temporary propping system designed and certified by structural engineer will be installed to support the ceiling of the basement during the demolition of the building.

Temporary structural steel protection will be installed to protect SLHD tanks located on the western façade. The structure must be designed to protect the tanks from any damage from falling objects.

6.3.5 Install Temporary Services

Temporary services (electrical, lighting, safety signage systems, ventilation etc.) will be installed for the demolition works. These systems will be implemented with appropriate safety control measures to mitigate the risk of workers inadvertently damaging the equipment and to ensure the safety of all personnel on site.

6.3.6 Noise and Vibration Control Measures

Noise and vibration associated with demolition and remediation activities must be monitored from the commencement of the works. Hourly and daily results will be reported for compliance checks.

6.3.7 Air Quality Control and Measures

Where there is the potential for the generation of airborne dusts, approved dust control measures (such as misting systems installed on demolition plant) will be used. Air quality associated with demolition and remediation activities must be monitored from the commencement of works and recorded. Weekly and monthly monitoring will be reported for compliance checks. Air monitoring for asbestos and synthetic mineral fibres (SMF) must be undertaken during asbestos and/ or SMF removal works.

6.4 Stage 4: Demolition of Vaults

The concrete walls of the vaults are approximately 2 metres thick and were used to shield against neutron and gamma radiation. The roof of 2 of the vaults Rm No. 0053 (cyclotron vault) and Rm No. 0051 contain a series of 3 plugs, each of approximately 500mm thickness. These vault structures were mass-poured concrete and contain 20mm steel reinforcement bars at 250mm centres on their outer edges i.e., approximately 1.8m from the internal surface of the concrete.

In about 1995 the building was expanded to provide additional vaults (Rm No.'s 0061, 0059) for the 30MeV. These additional beam vaults were constructed to provide shielding for irradiations for both PET and Single Photon Emission Computed Tomography (**SPECT**) production. The new vaults had beam access tubes cored through the wall from the cyclotron vault to the PET target rack (Rm 0059) and SPECT target stations (Rm0061). The addition of these vaults resulted in the once external 20mm steel reinforcement bars to move closer to the internal sides of these vaults.

Rm No.'s 0061, 0059 presently only house ancillary systems such as the cyclotron chilled water circulating equipment and the hot cell waste gas management system and vaults were not used for target irradiations since refurbishment of the Camperdown Facility in 2009.

In order to demolish the concrete vaults (Figure 5), an enclosure (Section 6.7.1) will be erected, and areas will be marked to improve management of waste packages. The non-activated concrete and other material will be disposed of at a recycling facility, however, the activated concrete, rebar and other material will be monitored, tested and then disposed of at a licenced facility as restricted waste (See Section 7). The diagram below shows the flow of work within the tented enclosure.

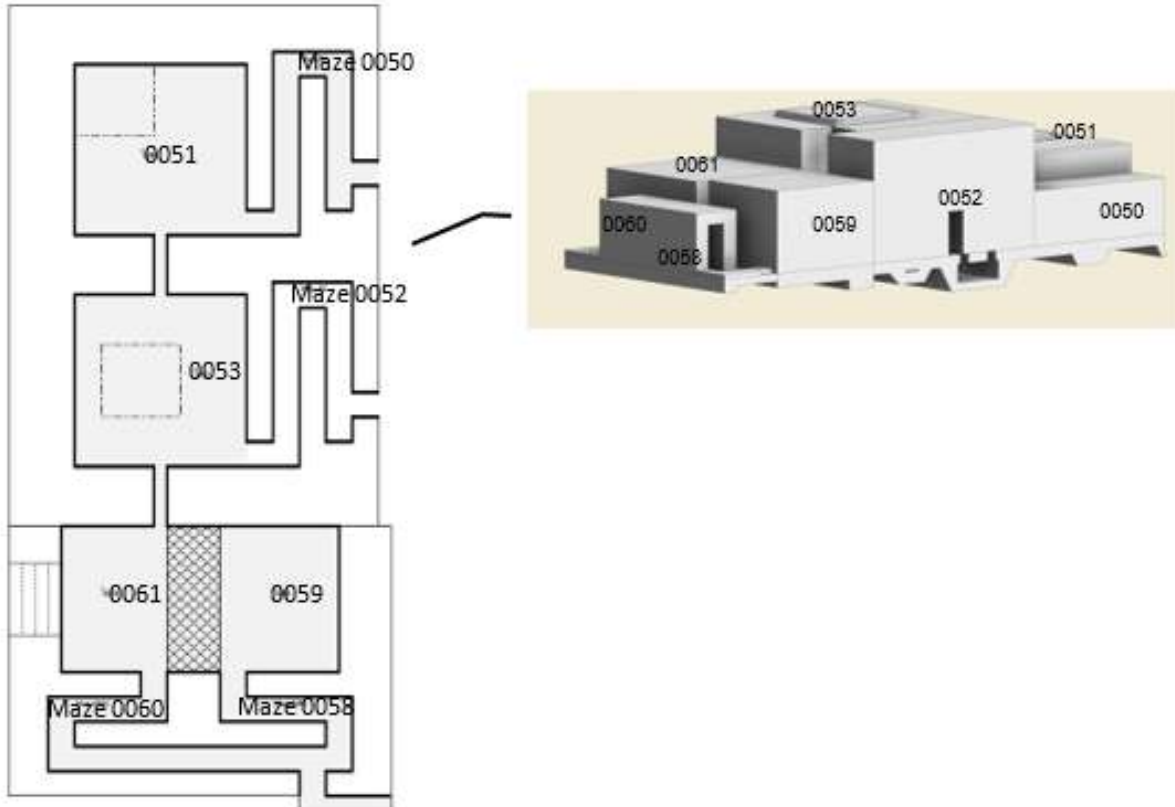


Figure 5 The Vault Maze

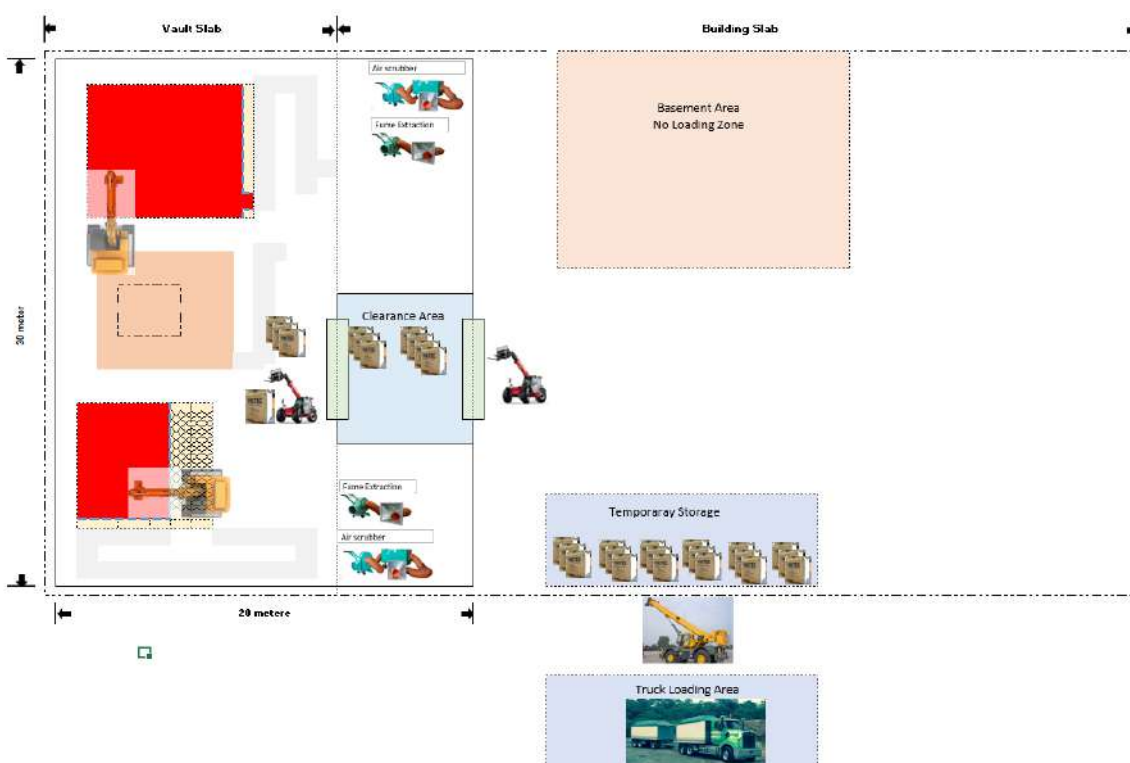


Figure 6 – flow of Vault demolishing process within tented enclosure

Broadly the step to the complete removal of vault walls, ceilings and floors are identified in the following steps:

6.4.1 Step 1 - Demolition of Maze No.50, 52, 58 and 60

The first stage of the preparatory work is to erect safety controls to minimise the risk of any potential radiological and /or conventional hazard, see Section 6.7.

The start of physical demolition work will require holes to be created on the Vault Roof using core-drilling machines. These holes will allow the workers to use a wire to cut the concrete vault and separating activated concrete from non-activated, thereby separating the activated from non-activated waste and minimising restricted waste generation. A wire saw uses a metal wire to cut bulk materials, in this instance concrete and the rebar. Wire saw cutting is widely used method in the demolition industry as it provides a greater advantage to traditional sawing.

In Step 1 the holes will allow the wire of ceiling and walls of maze 51, 52 and the maze walls attached to vaults 59 and 61, this will in turn form a separation between the vaults and the mazes, allowing for excavator demolition.

The excavator and the breakers will then be used from east to west and from top to bottom to demolish the maze area no. 0050, 0052, 0058 & 0060.

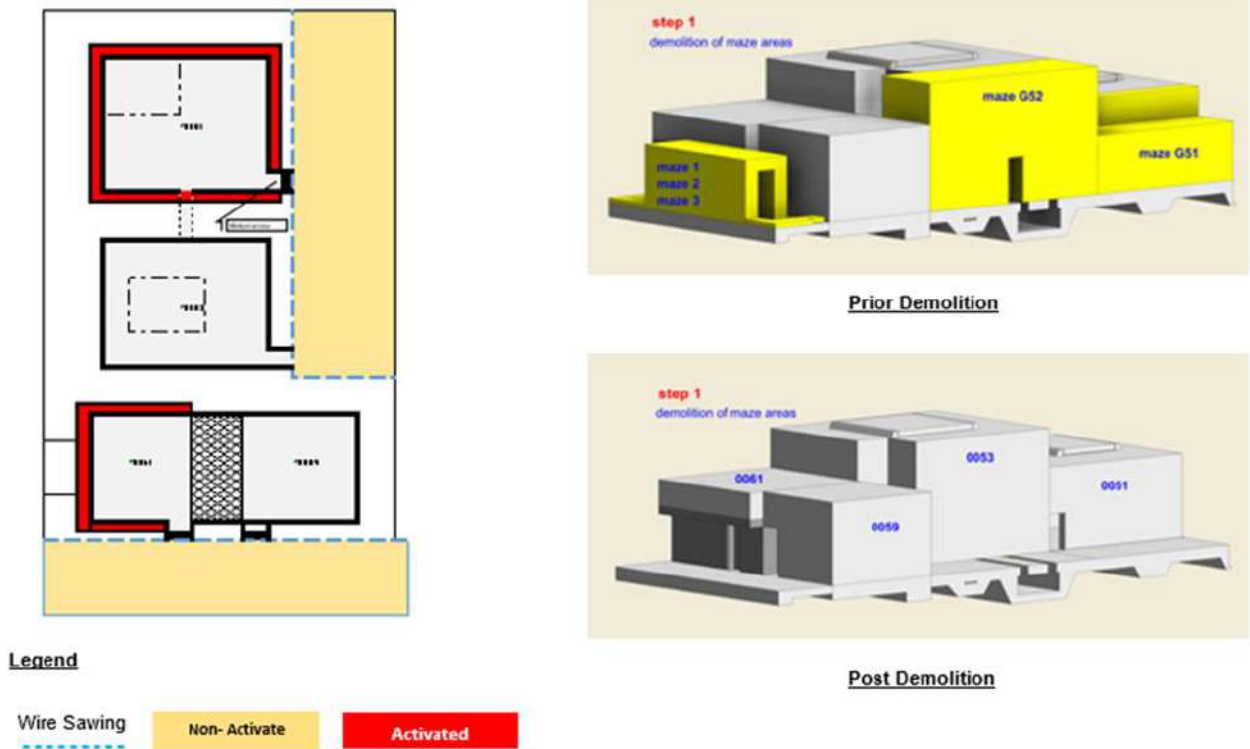


Figure 7 - Step 1, Demolition of Maze Areas

During this step of the demolition, it is expected that 1429 ton of non-activated concrete will be disposed of through recycling facilities.

Quantities	
Activated Concrete (Ton)	0
Non-activated Concrete (Ton)	1429
Total Concrete weight (Ton)	1429

6.4.2 Step 2 - Demolition of Cyclotron Vault Room No. 0053

Prior to demolishing Cyclotron Vault Room No.0053, a steel plate will be installed over the concrete floor of Vault 0053 to cover the trenches, and protection will be installed (if required) to the water tanks, hydrogen and nitrogen and oxygen tanks west of the vault rooms.

Drill holes will be created from the cyclotron room roof and from the western wall using core-drilling machine. Wire sawing will then be used to separate vault room 0053 from vault rooms 0051, 0061 and 0059 will commence from the east to west. The demolition works using excavators and breakers, will gradually progress by demolition the wall between the vault and the maze, then progressing to demolish the vault ceiling until reaching the vault western wall. Drill holes will be created in the western wall and wire sawing to separate room 053 wall from both sides, then using excavators and breakers to demolish the wall from top to the level of the concrete slab.

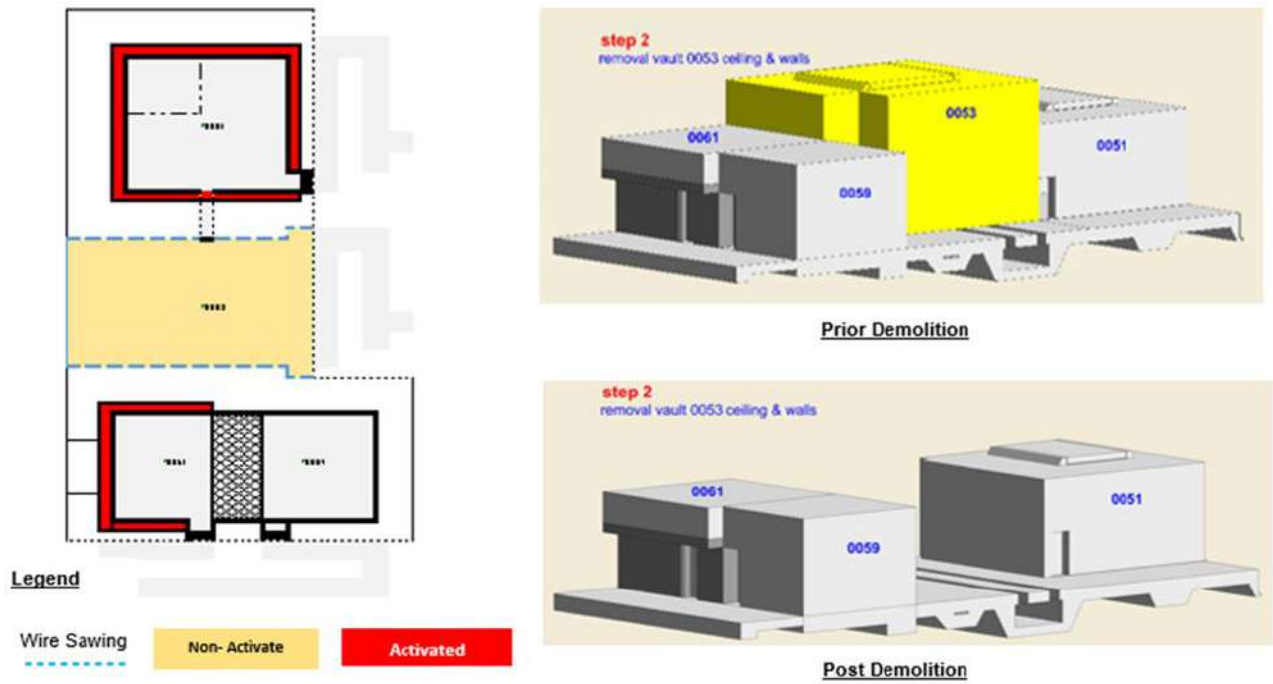


Figure 8 - Step 2 - Demolition of Cyclotron Vault Room No. 0053

During this step of the demolition, it is expected that 495 Ton of non-activated concrete will be disposed of through recycling facilities.

Quantities	
Activated Concrete (Ton)	0
Non-activated Concrete (Ton)	495
Total Concrete weight (Ton)	495

6.4.3 Step 3 - Demolition of Vault Room No.0059

Prior to any D&D activities, step 3 preparation will involve installing ceiling support in vault 0061. Drill holes will be created in ceiling and walls to provide a precise guide for the wire sawing cut that will separate the ceiling and walls of vault 0059 from 0061. Wire sawing will be carried out from floor level where the machines will be located outside the vault and the cut will include the ceiling and the walls. The demolition of vault 0059, using excavators and breakers, will progress from east to west and from top to bottom. The brick wall between vaults 0059 and 0061 will be retained.

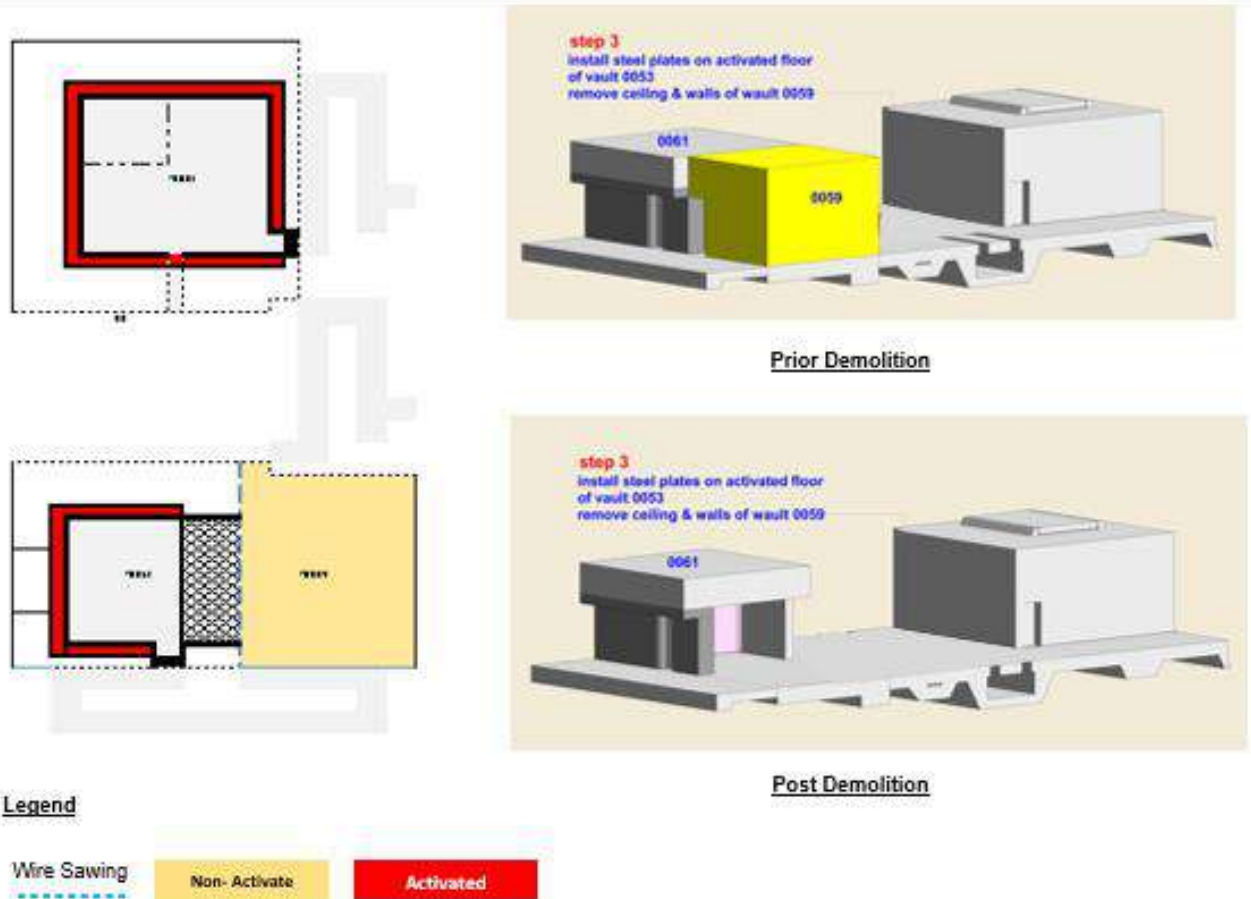


Figure 9 - Step 3 - Demolition of Vault Room No.0059

During this step of the demolition, it is expected that 495 Ton of non-activated concrete will be disposed of through recycling facilities.

Quantities	
Activated Concrete (Ton)	0
Non-activated Concrete (Ton)	495
Total Concrete weight (Ton)	495

6.4.4 Step 4 - Removal of Non-Activated Concrete in Vaults 51 & 61 Ceilings

Prior to any D&D activities, preparation for step 4 will involve installing ceiling support in vault 0051.

Vertical and horizontal holes will be drilled in the non-activated concrete in the ceiling of vaults 0051 & 0061 to provide a precise guide for the wire sawing cut that will separate the non-activated from the activated concrete. The workers will then commence with horizontal wire sawing to the top 500mm concrete layer. Using a road saw machine and cut the ceiling to blocks (room 51/ 2.05mx2.05m and room 61/2.2mx3.7m).

To remove the blocks, chemical anchors will be installed to lift each block using a mobile crane and stored in a holding area for further processing that includes breaking and reducing the size to max 500mm that is accepted by the recycling facility. Repeat the above stages to remove the additional 2 layers of non-activated concrete.

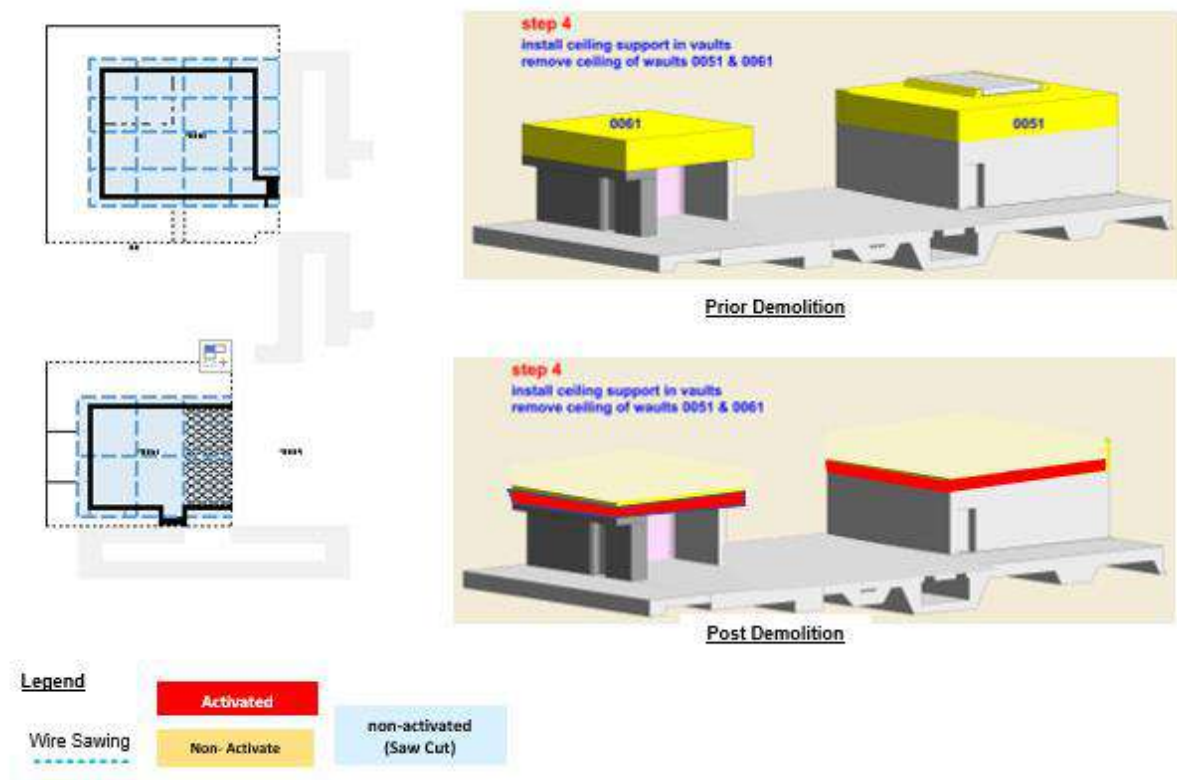


Figure 10 - Step 4 - Removal of Non-Activated Concrete in Vaults 51 & 61 Ceilings

During this step of the demolition, it is expected that 381 Ton of non-activated concrete will be disposed of through recycling facilities.

Quantities	
Activated Concrete (Ton)	0
Non-activated Concrete (Ton)	381
Total Concrete weight (Ton)	381

6.4.5 Step 5 - Demolition of Non-Activated Walls in Vaults 51 & 61

Vertical and horizontal holes will be drilled on the non-activated concrete walls surrounding vault room 0053 and 0061. Wire sawing to separate the activated from the non-activated concrete sections on the northern, western and southern walls of vault 0051 and on the northern and western walls of vault 0061. The walls will then be demolished using excavators and suitable breaker size to avoid damaging the activated concrete layer.

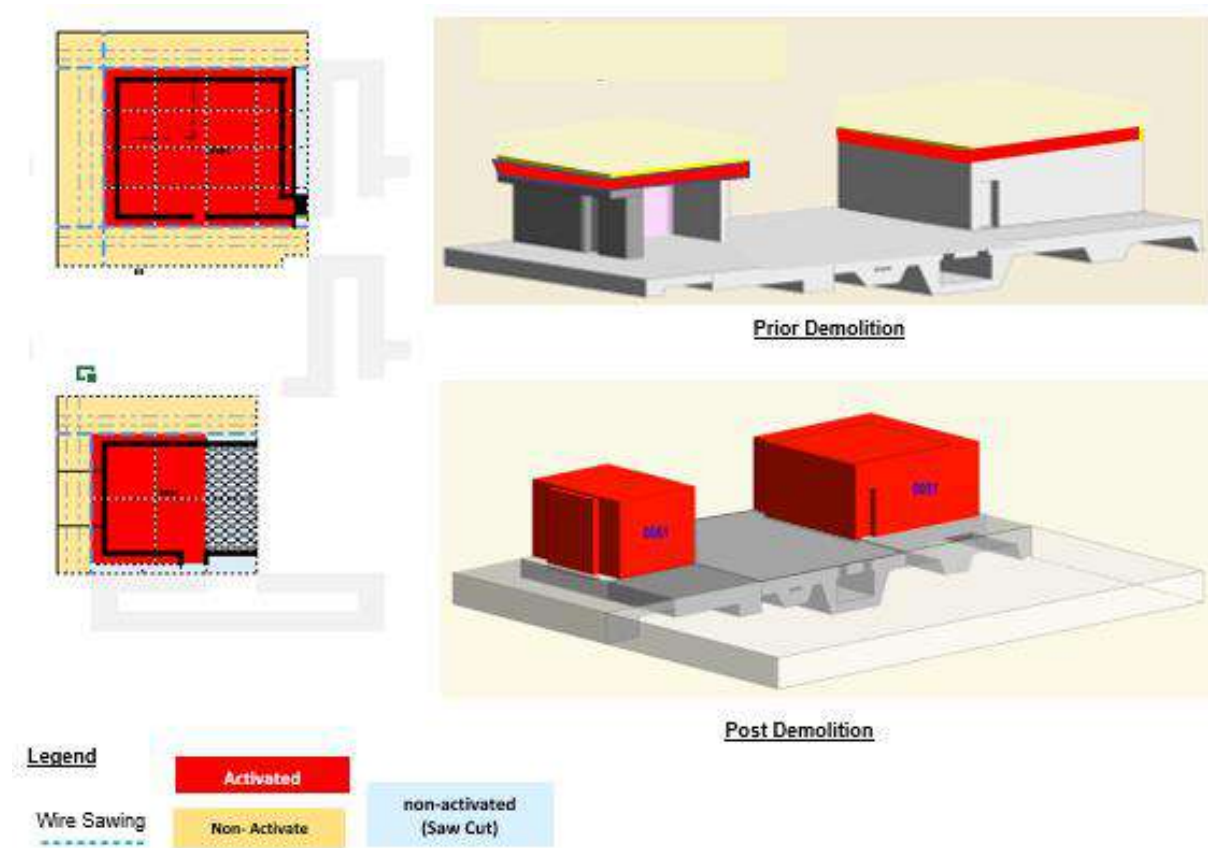


Figure 11 - Step 5 - Demolition of Non-Activated Walls in Vaults 51 & 61

During this step of the demolition, it is expected that 1094 Ton of non-activated concrete will be disposed of through recycling facilities.

Quantities	
Activated Concrete (Ton)	0
Non-activated Concrete (Ton)	1094
Total Concrete weight (Ton)	1094

6.4.6 Step 6 - Removal of Remaining Non-Activated Concrete Sections in Vault Rooms 059 & 061

Install enclosure above the vault rooms including dust control measures and ventilation systems as described in Section 6.7.1.

Vertical and horizontal holes will be drilled on the non-activated concrete walls east and south wall of vault 0061 and east wall of Vault 0051. Wire sawing to separate the activated from the non-activated concrete sections. The workers will then demolish the remaining non-activated concrete sections in walls and ceiling of vault rooms 51 and 59/61, and then the block wall between the rooms 59 & 61.

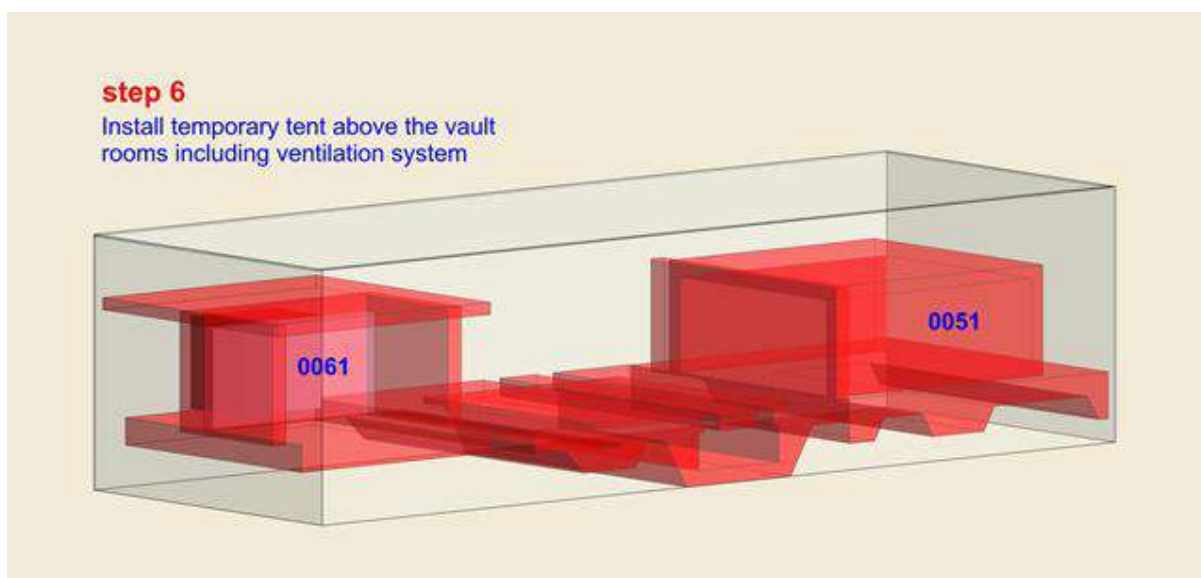


Figure 12 Image showing all remaining activated walls and ceilings

During this step of the demolition, it is expected that 95 Ton of non-activated concrete will be disposed off through recycle facilities.

Quantities	
Activated Concrete (Ton)	0
Non-activated Concrete (Ton)	95
Total Concrete weight (Ton)	95

6.4.7 Step 7 - Removal of Activated Ceilings and Walls in Vault 051 & 061

Following the removal of all non-activated walls and ceiling, work will commence to demolish the activated concrete in walls and ceiling of vault rooms 51 & 61, using excavators and breakers. The activated waste will be packaged into IP1 Bags (max 3.5ton) tested as discussed in Section 7.3 then the bags will be transported to an authorized tip and disposed as “Restricted Waste” (See Section 7.7).

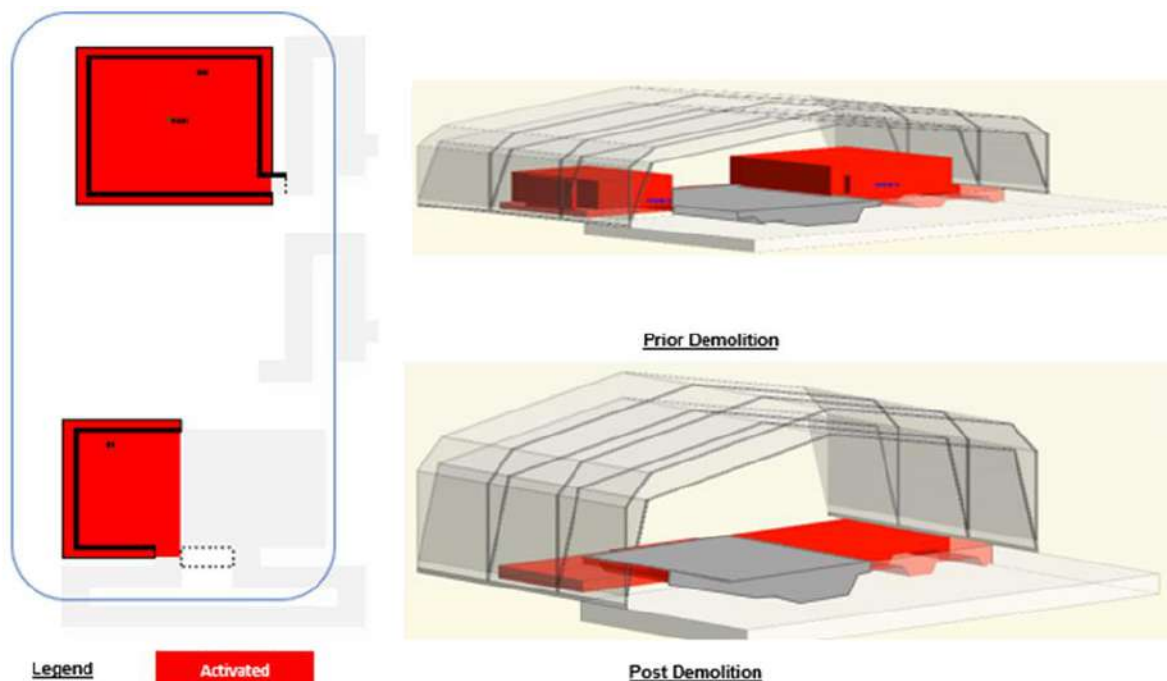


Figure 13 - Step 7, Removal of Activated Ceilings and Walls in Vault 051 & 061

During this step of the demolition, it is expected that 316 Ton of activated concrete will be disposed of as restricted waste through licenced Facilities.

Quantities	
Activated Concrete (Ton)	316
Non-activated Concrete (Ton)	0
Total Concrete weight (Ton)	316

6.4.8 Step 8 - Removal of Activated Floors in Vault Rooms no. 051 & 061

Immediately following the removal of the activated waste from the demolition of ceiling and walls of vault 061, the full depth of the concrete slab will be demolished and removed using excavators and breakers and disposed of in IP1 Bags as restricted waste. The process will be repeated to demolish and the activated slabs in vault room No.0051 (min600mm). Max waste size of 500mm x 500mm x 500mm. Upon removal of the activated slab, existing soil will be tested for radiological contamination, and contaminated soil will be removed.

During demolition, equipment will be located within the non-activated concrete slab in order to minimise the spread of contamination.

Quantities	
Activated Concrete (Ton)	130
Non-activated Concrete (Ton)	0
Total Concrete weight (Ton)	130

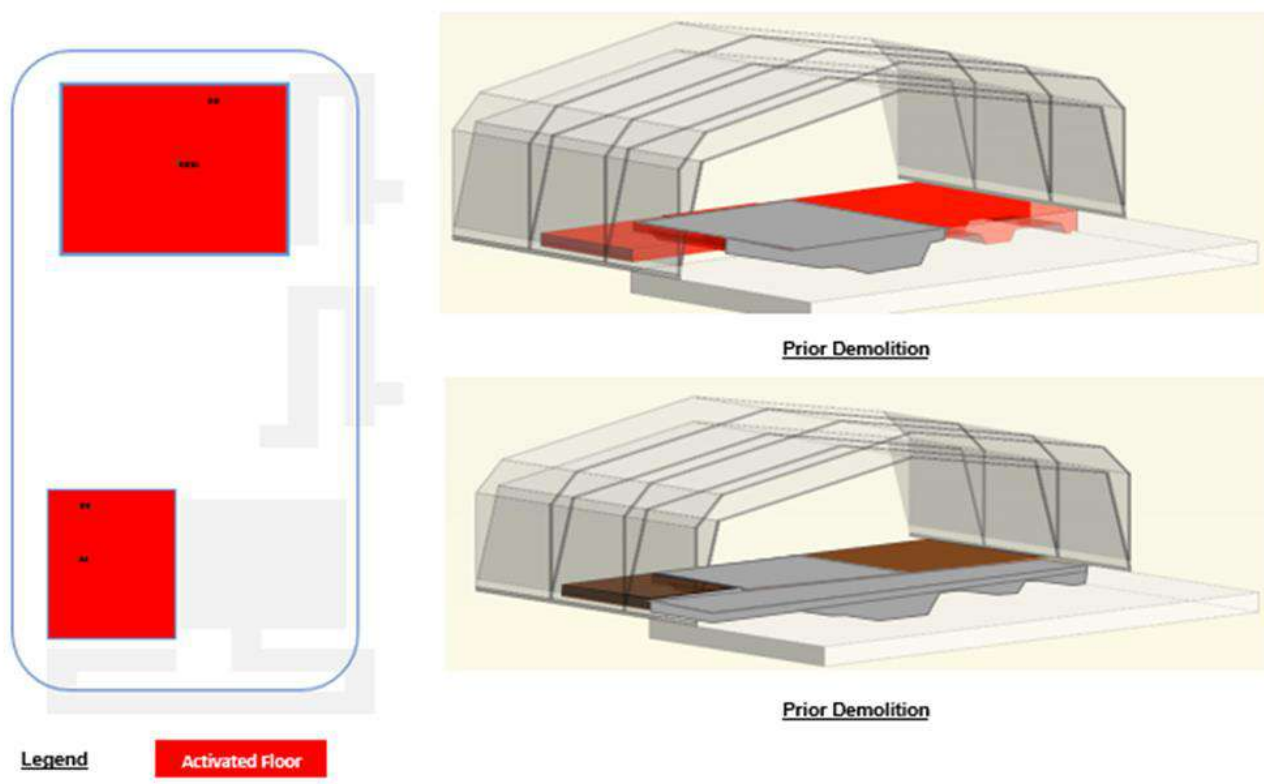
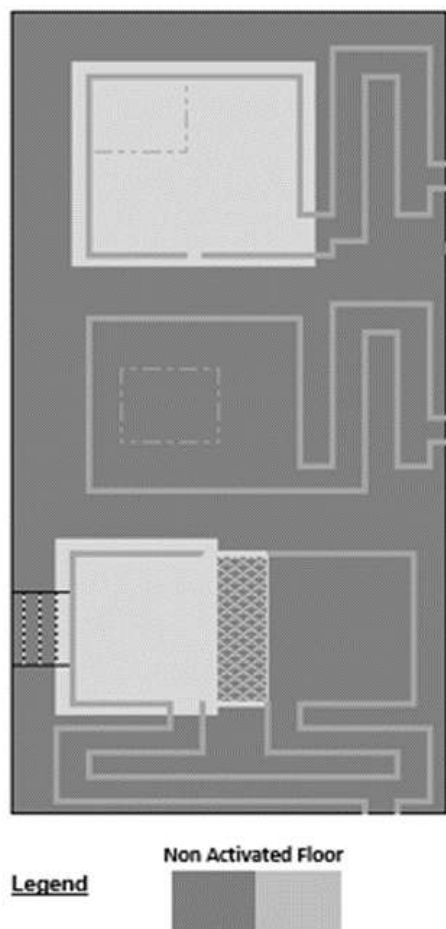


Figure 14 - Step 8 - Removal of Activated Floors in Vault Rooms no. 051 & 061

6.4.9 Step 9 - Demolition of Remaining Non-Activated Vault Rooms Slab

Following removal of all activated concrete, all surfaces exposed to activated concrete dust must be decontaminated, including all plant equipment, ventilation equipment and the internal of the enclosure. ANSTO will survey and provide clearance for all items that have been cleared of radiological contamination. The enclosure will be removed and standard demolition plant equipment will then be used to demolish the remaining non-activated concrete in slab.



During this step of the demolition, it is expected that 450 tonnes of non-activated concrete will be disposed for recycling

Quantities	
Activated Concrete (Ton)	450
Non-activated Concrete (Ton)	0
Total Concrete weight (Ton)	450

6.5 Stage 5: Demolition of remaining Building Slab and Basement Walls

A standard demolition plant equipment will be used to demolish what remains of the Camperdown Facility building, including the building slab and basement walls. During the demolition, the demolition plant equipment movement will be on the concrete slab to minimise disruption to the existing ground.

6.6 Stage 6: Final radiological surveys and make good of Site

Upon removal of the ground slab from the site, the ground [soil] will be investigated and tested for contaminants and activation. Works will then be carried out to remove the contaminated [soil] layer and dispose of it at an authorized site. The site will be levelled and handed over to SLHD after approval from ARPANSA for the site release.

The site will be maintained for the period between completion of the works and obtaining site release approval from ARPANSA. Maintenance will include site hoarding and environmental control measures.

6.7 Controls to Manage Demolition

6.7.1 Temporary Enclosure

An enclosure will be erected to cover the vault rooms, as well as to allow an area for temporary storage, clearance and loading of the transport vehicles, as shown by the example in Figure 15. The structure will be designed as per AS-1170 and will include considerations for dust containment, prevention of rainwater ingress, and a fire protection system, ensuring protection from external weather events, such as high winds, flooding, rain, etc.).



Figure 15 Example of potential enclosure layout and structure

6.7.2 Ventilation System

In order to manage the work to be performed in the vault room in particular, a temporary dust and fumes extract system will be installed.

6.7.2.1 Air Scrubber

When workers are inside the enclosure, an air scrubber will provide a temporary dust control system to capture and remove hazardous dust, such as respirable crystalline silica (**RCS**) and lead.

The air scrubber is an off-the-shelf system and will include a long running duct, set up with 3-stage filtration, HEPA Filtration (filtering up to 99.97% of dust captured), a powerful centrifugal fan and floor hood. The hood will be positioned as closely as possible to where D&D activities are being undertaken and the potential for dust arising. The fan will extract the fumes through the hood and into the HEPA filter capturing the dust.

The proposed air scrubber system air will circulate a minimum of 5800m³/h and have a washable pre-filter, F9 secondary filter and H13 HEPA filter.

6.7.2.2 Fumes Control System

Camperdown D&D proposal number 4 will use a diesel-operated excavator within the vault rooms. To filter out potentially harmful airborne contaminants, such as smoke and fumes, and to maintain a safe working environment where volatile materials and solvents are used, a temporary fume extraction system will be installed during D&D activities. The system will be supplied with a powerful centrifugal fan, ducting, and floor hood, which will extract fumes through the hood and direct them through a carbon filter.

Additionally, as the excavator will operate in close proximity to energised cables and dust suppression systems, a trained spotter will be required to help control its movement. All electrical equipment on site will be used with residual current devices to enhance safety on site.

6.7.3 Dust Suppression System

A dust suppression system will be designed by an expert to prevent issues with dust using atomised misting equipment and to create a water curtain that will prevent the dust from being released into the air. A fine misting jet will be used to optimise dust management.



Figure 16 Example of a Dust Control System used during Building demolition



Figure 17 Example of a Dust Control System 'Fog Lance' used for Vault Demolition

6.7.4 Fire Protection Systems

The emergency arrangements to the potential hazards and risks during decommissioning of the Camperdown Facility are identified in the project the risk assessment and D&D activity SWMES. This drives the level of response required for various incidents in accordance with the ANSTO WHSMS.

If an incident or accident occurs (including radiation incidents) the level of emergency response is managed by the on-call incident controller or the emergency operations manager. These arrangements are described in the [AG-5945](#) ANSTO Emergency Management Plan.

Camperdown Facility or site maps will be displayed showing muster points, safety equipment locations, including fire extinguishers, spill kits and first aid kits.

6.7.5 Security Measures

The Camperdown Facility onsite protections and safeguards have remained largely the same during the post-operational period compared to the operational period. Entry to and exit from the facility are controlled by electronic access (swipe card access) and is limited to authorised personnel. The entry and exit doors are closed and always alarmed. Additionally, the building is equipped with CCTV monitoring.

Following the removal of the cyclotron and other systems, the outer building of the Camperdown Facility will be demolished, and standard construction site security measures will be implemented in accordance with SafeWork NSW.

Physical and personal security assessment is discussed further in Section 12.

6.7.6 Traffic Management

It is estimated that approximately 300 heavy vehicle movement will be undertaken during D&D activities. Therefore, truck access and egress from the site shall be via the southern section of the building to minimise the risk of damage to essential services supporting neighbouring buildings and allow for a smooth flow of traffic. The details of which will be controlled by the demolition contractor as pictured in Figure 18.



Figure 18 Image of Proposed Truck Access and Egress During D&D Activities

6.7.7 Surveillance and maintenance

The following surveillance and maintenance activities will be performed:

- Maintenance of appropriate systems for physical protection commensurate with the risk entailed.
- Monitoring, surveillance, and inspection, commensurate with the level of hazard as mentioned in the Safety Analysis Report supporting the Camperdown Decommissioning Project.
- Maintenance of equipment, such as extract system (dust and fumes), heavy machinery, trucks used to transport waste, etc.
- Maintenance of barriers and/or containment structure utilised to manage dust.

6.7.8 Site Hoarding and scaffold

The construction site will be fenced with plywood hoarding at a minimum height of 2400mm. A scaffold will be erected with a shade of cloth to minimise noise, dust, and potential risk of flying objects during demolition of the building. The final design of the scaffold will incorporate appropriate safety measures, including fall protection and protection of scaffold footings.

The site establishment plan referred to above must also detail the proposed location of the hoarding, scaffolding, vehicle and pedestrian access and the location of the temporary amenities and offices.

7 WASTE MANAGEMENT PROGRAM

The general process adopted for the decommissioning licence is described in the Radioactive Waste Management section of the document titled “Camperdown Decommissioning, Plans and Arrangements (9)”.

[AG-1266](#) Packaging Waste from Classified Areas Guide specifies the local requirements of waste packaging prior to collection by WMS. Waste is segregated and placed in the appropriate bin or container according to its waste type. The identification and characteristics of waste are recorded on the AF-2358 Waste Service Request Form together with the dose rate and contamination level measured by a qualified HPS. This information is then recorded in an electronic database (SAP) for tracking of all radioactive waste packages.

Containers and packages will be labelled with sufficient information in relation to the contents and the intent of the package, i.e., whether the contents need to be further conditioned or decontaminated or if the package is ready for interim storage. It is anticipated that some additional contamination may be found during decommissioning that was not picked up during characterisation. All waste generated through dismantlement and decommissioning will be disposed of in accordance with ANSTO’s procedures.

7.1 Waste Minimisation – Design Systems & Processes

In accordance with ANSTO Radioactive Waste Management Policy ([AE-0103](#)) and [AG-2517](#) Safe Management of Radioactive Waste (Guide), Camperdown Decommissioning Project will minimise waste generation through segregation of waste, delay and decay and ongoing education and training of personnel on waste minimisation and radiation safety.

The Camperdown Decommissioning Project will employ several measures to ensure that decommissioning actions do not result in large volumes of primary or secondary wastes including:

- Size reduction of bulky components to enable optimal packaging.
- Segregation of wastes into radioactive and non-radioactive waste categories.
- Reuse of operational equipment and material handling equipment by decontaminating them for re-use where practicable.
- Training of personnel to be aware of decontamination and size reduction and contamination control best practices.
- Using suitable treatment, decontamination, and conditioning methodologies.
- The release of materials and equipment that meets regulatory requirements to landfill.
- Release of materials that meet regulatory requirements for recycling.

ANSTO's certified Environmental Management System (EMS) provides the commitment to minimise ANSTO's environmental footprint. The EMS is compliant with ISO 14001 and provides a structured approach to the identification of environmental aspects and the controls that limit the environmental impacts of ANSTO's activities. The EMS includes defined objectives and targets that focus on effective management of airborne, liquid, and solid wastes.

Figure 19 provides a schematic of the vaults and identifies which areas of concrete structure have been determined by recent characterisation to be either activated, non-activated or exempt waste.



Map of the West Campus area showing building footprints, parking lots, and streets. A red shaded area highlights the West Campus area, which includes buildings Rm 0051 N.W., Rm 0051 W.W., Rm 0051 E.W., Rm 0051 S.W., and Rm 0051 S.E. A red dot indicates the most agitated location. A north arrow is present in the top left corner.

The estimated waste amounts of non-activated and activated expected during D&D activities of the Camperdown Facility are detailed in Table 5 and Table 6 respectively, and is supported by the Camperdown Facility Characterisation Report (4). The outer building and other areas of the Camperdown Facility is free of contamination and non-active, therefore, standard demolition activities will be undertaken.

Table 5 Estimate Amount of Non- Activated Waste

AREA	TONNAGE	DISPOSAL	PACKAGE TYPE
Building Demolition– (General Waste – Glass, bricks, wood, steel, furniture, etc.)			
<i>Building Demolition – Excl. Vaults</i>	<i>5T</i>	<i>Recycled in licenced facility</i>	<i>Transported in enclosed trucks</i>
Building Demolition– (Concrete Waste)			
<i>Building Demolition– Excl. Vaults</i>	<i>2,000T – 3,000T</i>	<i>Recycled in licenced facility</i>	<i>Transported in enclosed trucks</i>
Building Demolition– (Hazardous Waste Type 1) – Lead in paint, lead blocks, lead shavings, etc.			
<i>Building Demolition– Excl. Vaults</i>	<i><2T</i>	<i>Recycled in licenced facility</i>	<i>Transported in enclosed trucks</i>
Building Demolition– (Hazardous Waste Type 2) – Hotcells			
<i>Building Demolition– Excl. Vaults</i>	<i>40T</i>	<i>Recycled for future use at Lucas Heights</i>	<i>Transported in Boxes & Pallets in enclosed trucks.</i>
Vaults Demolition (Non-activated Concrete Waste)			
<i>Maze+ Rm0053+Rm0059 +Rm0051+ Rm0061</i>	<i>4,383T</i>	<i>Recycled in licenced facility</i>	<i>Transported in enclosed trucks.</i>

Table 6 Estimate Amount of Activated Waste

AREA	TONNAGE	DISPOSAL	PACKAGE TYPE
Vaults Demolition (Activated Vaults Equipment & Components – e.g. Cyclotron, Metallic Brackets etc)			
<i>Maze + Rm0053 + Rm0059 + Rm0051 + Rm0061</i>	<i><1T</i>	<i>Lucas Heights</i>	<i>Transported in 200L drums</i>
Vaults Demolition (Activated Concrete Waste - Including Reinforced Steel & Filtered Slurry)			
<i>Rm0051 + Rm0061</i>	<i>490T</i>	<i>Restricted (Kemps Creek)</i>	<i>IP1 bags and transported in enclosed trucks.</i>

7.2.1 Solid Wastes

Most of the waste produced from D&D activities will be solid wastes. These include SSC's, demolition debris (concrete and reinforced steel) both from the main building and from the vaults.

7.2.1.1 Building Demolition (Non-Activated General Waste)

The waste created during demolition of the main building will be non-activated waste. This will be collected by the contractor and recycled off-site.

7.2.1.2 Building Demolition (Non-Activated Concrete Waste)

The concrete waste created during demolition of the main building will be collected by the contractor and recycled off-site.

7.2.1.3 Building Demolition (Non-Activated Hazardous Wastes Type 1)

Non-activated hazardous wastes include toxic heavy metals such as lead, and lead in paint. The removal and disposal of these wastes will be managed in accordance with NSW EPA requirements. This waste will be collected and disposed of at an off-site facility licenced to accept such wastes.

7.2.1.4 Building Demolition (Non-Activated Hazardous Materials Type 2)

Hot cell components such as lead blocks can be classed as non-activated hazardous materials. The removal storage and recycling of the hot cells will be managed by the Project Team, and in accordance with NSW EPA requirements. The hot cells are scheduled to be recycled for future use at Lucas Heights.

The expected waste arising from hot cell removal is identified in Table 7 below.

Table 7 Expected Waste from removal of hot cells

WASTE COMPONENT / MATERIAL	ANSTO CATEGORISATION (b)	WASTE DESTINATION
LEAD	HARD WASTE	Hazardous waste- Dispose off-site at a licensed facility
STEEL	Exempt Waste	Exempt – Offsite at a licenced facility
CONCRETE	Exempt Waste	Exempt – Offsite at a licenced facility
Other General Waste	Exempt Waste	Exempt – Offsite at a licenced facility
All active waste	Active Waste	Placed in drums and transported to LH for storage

7.2.1.5 Vaults Demolition (Non-Activated Concrete Waste)

A large percentage of the concrete waste expected to be created during the demolition of the vaults will be non-activated concrete, which will be segregated and collected for recycling at an off-site facility.

7.2.1.6 Vaults Demolition (Activated Vaults Equipment and Components)

Steel and other material items should be surveyed locally and if found to have a dose rate, should be placed into drums and returned to Lucas Heights for characterisation (drum scanned) and storage at a WMS facility.

Other activated equipment such as the cyclotron will be returned to Lucas Heights for storage at a WMS facility.

7.2.1.7 Vaults Demolition (Activated Concrete Waste)

A small percentage of the concrete waste (including the steel reinforcement) expected to be created during the demolition of the vaults will be activated, which will be collected and disposed of as Restricted Solid Waste under NSW EPA guidelines.

7.2.1.8 Secondary Waste Arisings

Secondary waste arisings, such as used PPE clothing, HEPA filtration cartridges etc. will be bagged, surveyed locally and, if found to have an activity limit above exemption levels, will be managed in accordance with WMS procedures.

7.2.2 Liquid Wastes (Including Slurry)

Liquid wastes produced during D&D activities are characterised as either radioactive or non-radioactive.

All liquid wastes produced during D&D activities will be managed according to either NSW EPA guidelines, standard demolition processes or as per those defined by ANSTO Waste Management Services.

7.2.2.1 Non-Radioactive Liquid Waste

Liquid waste cleared of radiation will be discharged to the sewer in accordance with a trade waste agreement to be entered between Sydney Water and the contractor.

7.2.2.2 Radioactive Liquid Waste

During the demolition of the activated sections of the vaults, radioactive liquids (and slurry) will be collected and held in a secure area and analysed by WMS. This waste will be subject to the limits specified in ANSTO's WH&S Guide [AG-2517](#) Safe Management of Radioactive Waste.

Liquids and slurry/fines containing higher levels of activity, or those not permitted to be discharged at the Camperdown Facility, will be stored separately until collected by WMS for treatment, conditioning, and/or storage.

7.2.3 Surface and Subsurface Soil and Sediment

According to the Camperdown Facility Characterisation Report only the activated concrete vaults have the potential to adversely affect ground and surface water during the D&D phase. This is because the D&D activities in relation to the vault structures might produce airborne contaminants and these airborne contaminants (including dust) will be confined within an exclusion enclosure and ventilated via an extract system (see Sections 6.7.1 and 6.7.2). Furthermore, a standard water misting technique will be used to suppress all local dust generated from these activities, which is expected to produce secondary radioactive liquid wastes.

To minimise any impact to ground and surface water from the secondary radioactive liquid wastes, the area bordering the dismantling and demolition activities of the vault structures will be bunded. This bunding will then allow the liquid waste to be vacuumed, with fines/slurries to be directed into a 200ltr drum and the resultant water to be recycled after monitoring for radiological contaminants.

Any soils that have been activated under the vault flooring will be excavated and removed to clearance levels.

Collected secondary radioactive liquid and solid waste will be managed in conjunction with ANSTO Waste Management Services procedures.

9 soil samples from the site of the Camperdown Facility were analysed by Minerals – Consulting and Process Development Specialists at ANSTO, using gamma spectrometry for both naturally occurring radionuclides and artificial (man-made) radionuclides. The soil samples contained low concentrations of naturally occurring radionuclides, which were found to be commensurate with worldwide background soil concentrations, as shown in Table 8 below.

No artificial radionuclides were found in any of the samples tested.

A report (Ref Certificate of Analysis-Camperdown Soil Samples_sbn_10_08_22) was produced.

Table 8 Soil Sample Results compared to General Background Reference Concentrations

Reference	Concentration in Soil (Bq/g)			
	²³⁸ U	²²⁶ Ra	²³⁵ U	⁴⁰ K
UNSCEAR²	0.035	0.035	0.030	0.40
IAEA³	0.025	0.025	0.025	0.370
Highest Sampled Result	0.034 ± 0.004	0.027 ± 0.003	< 0.0078	0.41 ± 0.04
Lowest Sampled Result	0.017 ± 0.002	0.017 ± 0.002	< 0.0034	0.15 ± 0.02
Averaged Result from 9-Samples	0.027	0.023	0.006	0.218

As can be concluded from the results, naturally occurring radionuclides meet international reference soil samples.

Final clearance of the site will be conducted after full demolition of the Camperdown Facility and its concrete slab as described in Section 13 of this plan.

7.3 Waste Clearance Equipment & Procedure

Any required waste clearance from D&D activities will be in accordance with ANSTO Radioactive Waste Management Policy ([AE-0103](#)) and [AG-2517](#) Safe Management of Radioactive Waste Guide.

Radiological monitoring equipment is selected based on the radiological conditions in the area. The radiation monitoring equipment used at the Camperdown Facility consists of a combination of fixed

² UNSCEAR, Ionising Radiation: Sources and Biological Effects, United Nations Scientific Committee on the Effects of Atomic Radiation, 2000.

³ IAEA, Generic Procedures for Assessment and Response during a Radiological Emergency, IAEA TECDOC Series No. 1162, 2000.

and portable instrumentation designed to monitor the radiological conditions, personnel and waste clearances.

Portable monitors will be used to complement the existing radiological monitoring equipment to survey specific operations or procedures and surface and airborne contamination levels. To reduce the possibility of contamination spread, measurement of potential external contamination of personnel and/or waste packages will be routinely performed as close as possible to the contamination source by means of portable equipment wherever a contamination risk is present. Potentially contaminated surfaces will be surveyed using portable monitoring instruments or applying smear sampling techniques and remote assessment.

Secondary liquid and fines samples will be transferred to Lucas Heights to undergo gamma spectrometry analysis to determine the level of activity, before disposal. Secondary liquid waste generated during D&D activities will be processed and managed by WMS.

7.4 Waste Clearance Process

The Waste Management Plan of the document known as the Camperdown Facility Plans and Arrangements (9) outlines the resources, methods, and capabilities that will be employed to ensure that all radioactive waste uncovered during D&D is managed in accordance with state and federal legislation.

The procedure for clearance of waste produced by the D&D activities is dependent on the waste type. Table 9 and Table 10 below shows the clearance process and frequency of occurrence for the various waste streams. Waste that does not meet 'Free Release' criteria will undergo further characterisation to identify its radiological characteristics for long term storage.

Table 9 Waste Clearance Process for Non-activated Waste

Waste Type	Method	Frequency
1. Building Demolition (Non-activated General Waste)	a) Segregation of waste b) Stockpiled in holding area for truck collection to licenced facility c) Radiological checks d) Tip dockets for all trips issued upon removal	For every truck trip from site.
2. Building Demolition (Non-Activated Concrete Waste)	a) Segregation of waste b) Stockpiled in holding area for truck collection to licenced facility c) Radiological checks d) Tip dockets (or EPA Waste Tracking System) for all trips issued upon removal	For every truck trip from site.

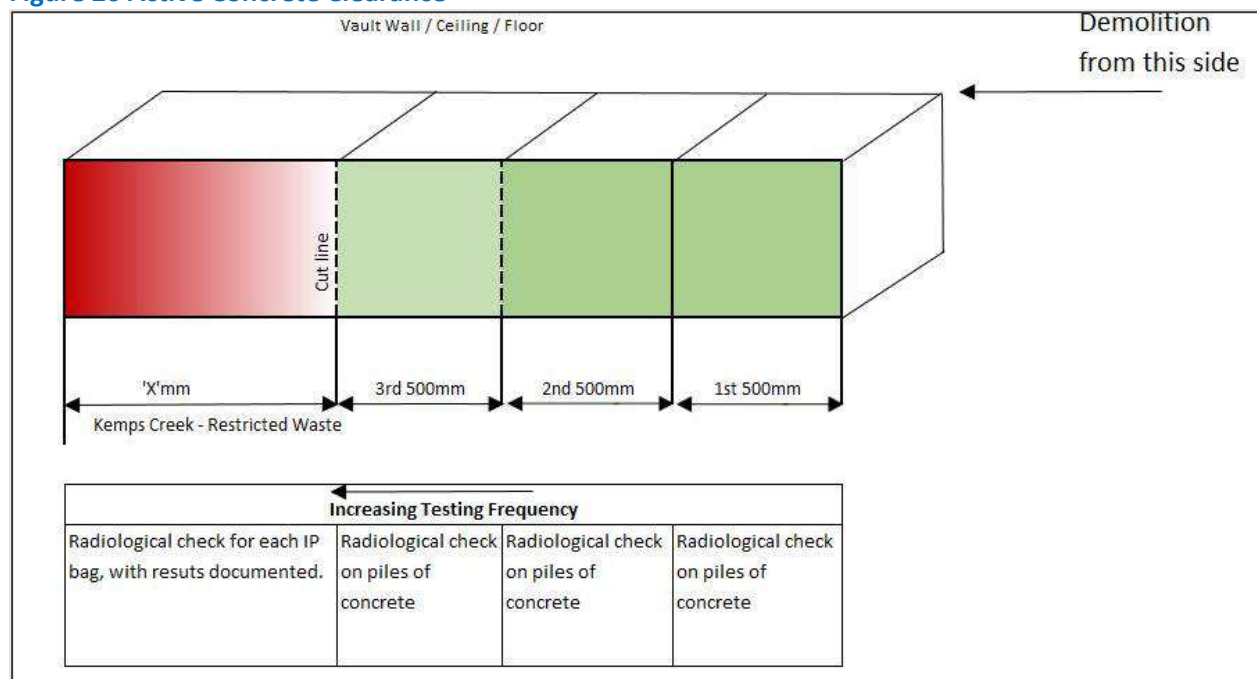
3. Building Demolition (Non-activated Hazardous Waste-Type 1)	a) Segregation of waste b) Stockpiled in holding area for truck collection to licenced facility c) Radiological checks d) Tip dockets, and EPA Waste Tracking System) for all trips issued upon removal	For every truck trip from site.
4. Building Demolition (Non-Activated Hazardous Waste-Type 2)	a) Radiological characterisation of hot cells b) Documentation and Tracking for all trips issued upon removal	For every truck trip from site.
5. Vaults Demolition (Non-Activated Concrete Waste)	a) Segregation of waste b) Radiological checks c) Stockpiled in holding area for truck collection to licenced facility d) Tip dockets (or EPA Waste Tracking System) for all trips issued upon removal	Refer to Figure 20 below.

Table 10 Waste Clearance Process for Activated and/or contaminated Waste

Waste Type	Method	Frequency
6. Vaults Demolition (Activated Vaults Equipment & Components)	a) Segregation of waste b) Radiological checks c) Stockpiled in holding area for truck collection to licenced facility d) Tip dockets (or EPA Waste Tracking System) for all trips issued upon removal	For each drum.
7. Vaults Demolition (Activated Concrete Waste)	a) Radiological checks of IP1 bags containing concrete rubble. b) Stockpile of restricted solid waste in holding area for truck collection to licenced facility c) Tip dockets (or EPA Waste Tracking System) for all trips issued upon removal	a) Refer to Figure 20 below b) Each IP1 bag
8. Non-Radioactive Liquid Waste	a) Collection of liquid waste b) Filtration	a) throughout demolition b) throughout demolition

	c) Radiological checks d) Sample & clearance check and discharge into sewer	c) once daily d) if needed
9. Secondary Radioactive Liquid Waste	a) Collection of liquid waste b) Filtration c) Radiological checks (Gamma spectroscopy) d) Transport to WMS	a) throughout demolition b) throughout demolition c) as required
10. Cyclotron	a) Radiological checks (Gamma spectroscopy) b) Transport to WMS	a) once – prior to transportation

Figure 20 Active Concrete Clearance



7.5 Waste Clearance Area

For the D&D of active vaults, a designated clearance area will be setup with appropriate shielding and contamination control provisions for the testing of the waste. The designated clearance areas will be in a low background area. The figure below is an example of the clearance area and will be finalised with the project RPA and demolition contractor.

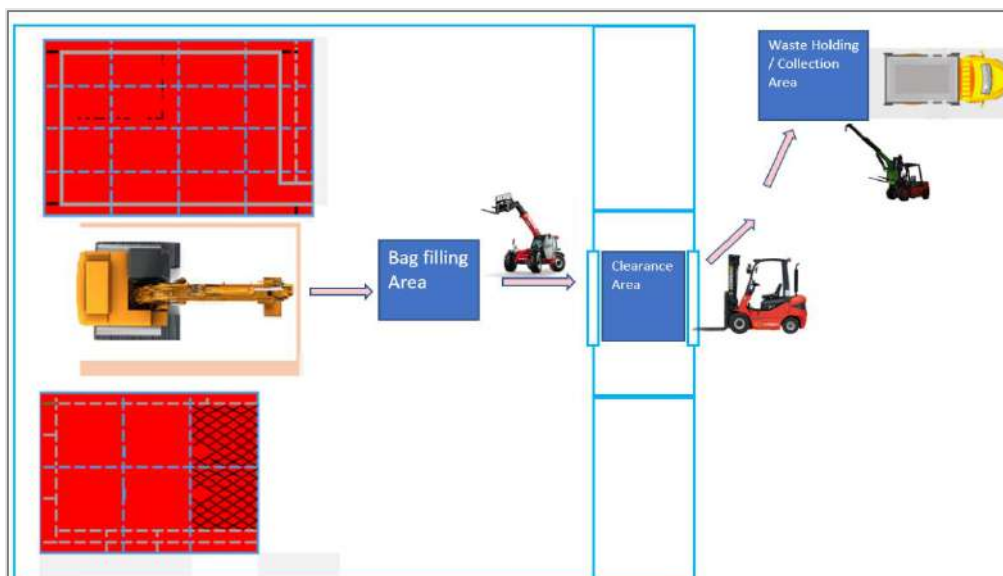


Figure 21 Sample of Clearance Area Layout

7.6 Packaging of Activated Waste

All waste will be radiologically tested prior to transport to either Lucas Heights or an NSW EPA licenced facility.

Waste designated as restricted solid waste will be packaged immediately in IP1 bags (see

Figure 22). The package will be taken to a clearance area for radiological checks (Refer to Figure 21 Sample of Clearance Area Layout). This package will then be placed into on-site temporary storage prior to loading in enclosed trucks for transport.

The IP1 package will be labelled with information and radiological characteristics of the package and records maintained as per Section 7.8.

Activated waste that is designated to return to Lucas Heights after appropriate radiological checks, will be placed in a 200L drum (see Figure 23).

[AG-1266](#) Packaging Waste from Classified Areas Guide specifies the requirements of waste packaging prior to collection by WMS.

The characteristics of this waste are recorded on the AF-2358 Waste Service Request Form together with the dose rate and contamination level measured by a qualified HPS.

All non-radiological waste will be re-purposed or recycled in accordance with the details identified.

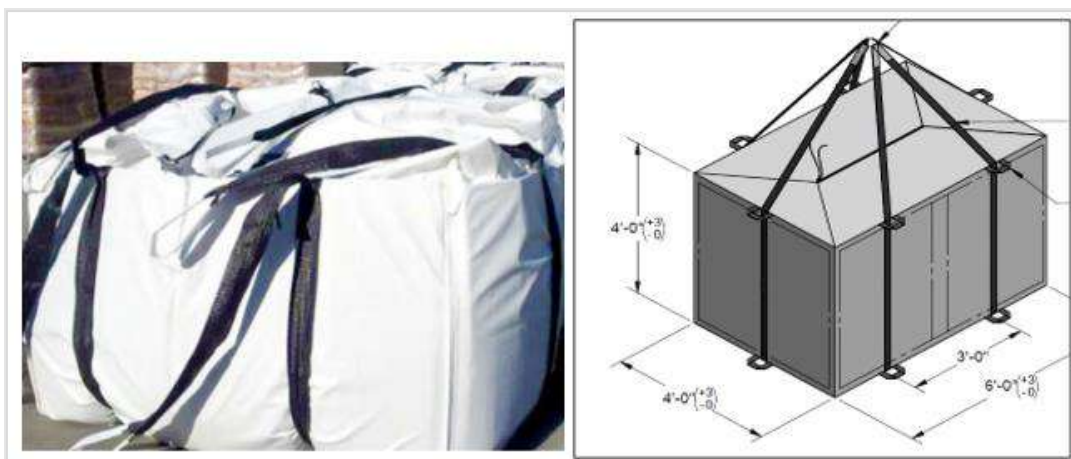


Figure 22 Sample 1P1 Bags



Figure 23 200L Steel Drum

7.7 Transport and/or Disposal of Activated Waste

7.7.1 Transfer of Waste to Lucas Heights

Secondary radioactive liquid waste produced by the D&D activities will be transferred to Lucas Heights. Other activated equipment such as the cyclotron will also be returned to Lucas Heights and managed by WMS in accordance with [AG-2451](#) Clearance of Radioactive or Contaminated Items.

Details of the cyclotron waste transfer is detailed in the Toll Cyclotron Removal and Transport Plan Rev 2.

7.7.2 Transfer of Waste to a Licenced Facility

Activated concrete waste (including reinforced steel) and other solid wastes that are identified as restricted solid waste under NSW EPA guidelines will be transported to an NSW EPA licenced facility for ultimate disposal.

7.7.3 Proposed Transport Routes to Licenced Facility

Activated solid waste that is classified as restricted waste according to Characterisation Report will be packaged in suitable bags and disposed to 'Cleanaway Kemps Creek Resource Recovery Park', which is

an Advanced Resource Recovery Treatment (ARRT) facility. The site accepts unsegregated solid restricted waste.

The proposed routes of transfer of waste to an NSW EPA licenced facility is detailed in Figure 24 below.

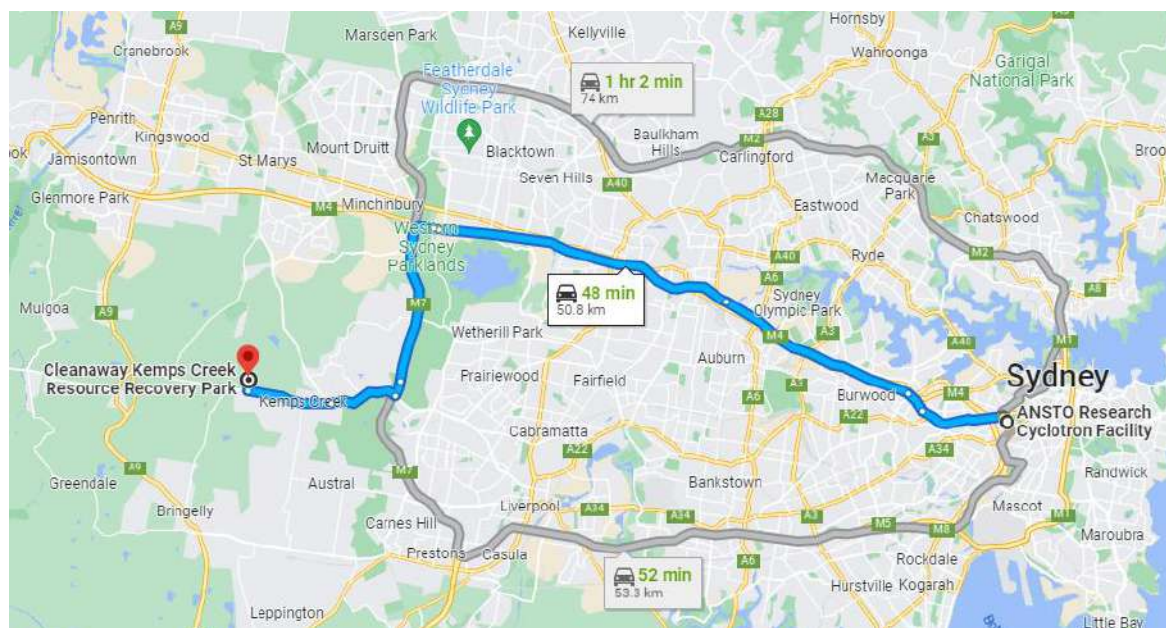


Figure 24 Proposed Transport Routes Cleanaway Kemps Creek Resource Recovery Park

Activated waste that is not approved as restricted waste for transport and disposal to the Cleanaway Kemps Creek Resource Recovery Park facility shown in Figure 24 above will be transported to Lucas Heights and stored under the ARPANSA-issued interim waste storage licence. The proposed routes of transfer of waste to Lucas Height are illustrated in

Figure 25 below.

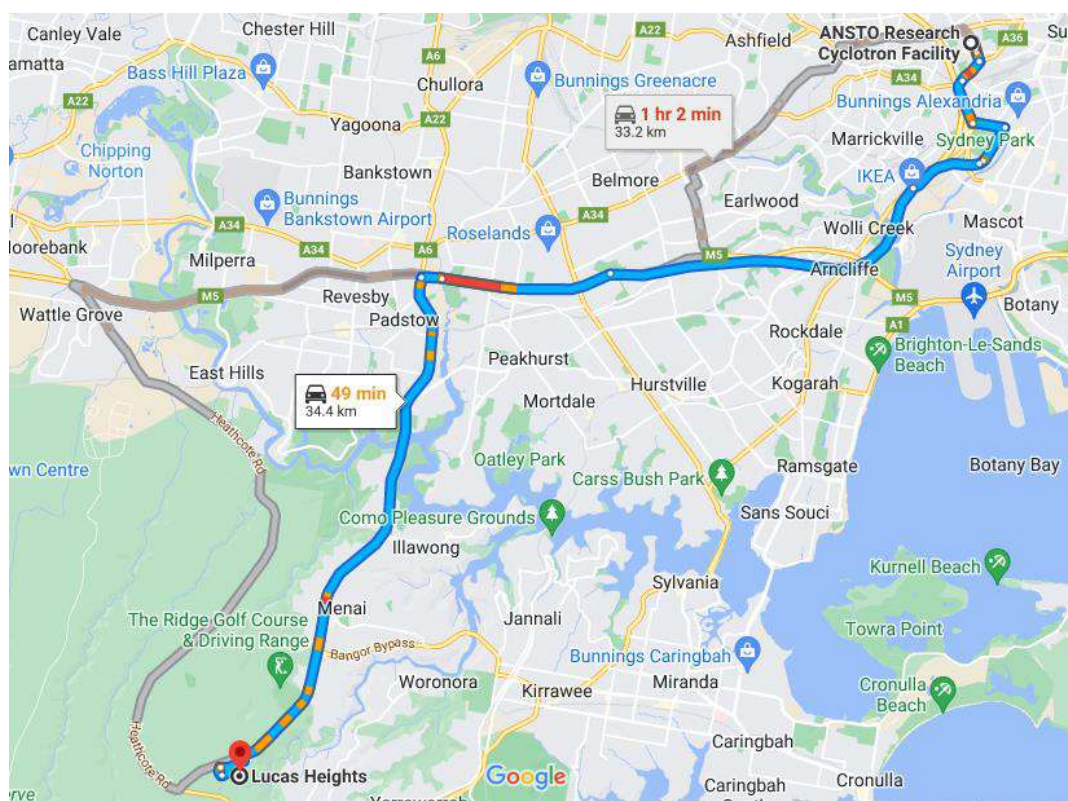


Figure 25 Proposed Transport Routes to Lucas Heights

7.8 Waste Package Record keeping

All documents pertaining to waste and materials management of the Camperdown Decommissioning Project will be managed in accordance with the Camperdown Decommissioning Document Management Plan (3). Examples of the records associated with D&D activities are detailed in Table 11 below.

Table 11 Waste Records

RECORDS	TYPE	CUSTODIAN TITLE	STORAGE LOCATION	RETENTION
Completed Waste Service Request (WSR) forms	Hard Copy	Waste Management Services	Completed orange WSR forms are stored in the Waste Management Services files or retained with the waste items	Indefinitely
Health Physics report	Electronic	RPS	Waste characterisation report	Indefinitely
Kemps Creek	Hard Copy / electronic	Decommissioning Project Team	Camperdown Waste clearance records	Indefinitely
Recycling facility	Hard Copy / electronic	Decommissioning Project Team	Camperdown Waste clearance records	Indefinitely

8 RADIATION PROTECTION

The Decommissioning Project Team is committed to maintaining and enhancing standards of radiation safety by limiting the likelihood of incurring exposures, the number of people exposed, and the magnitude of their individual doses to ALARA, and considering economic and societal factors. This means that the level of protection should be the best under the prevailing circumstances and should provide for adequate margin of benefit over harm.

ANSTO has an internal radiation protection service that is available to provide timely local expertise. Within the service are radiation protection advisors (RPA) who will advise the project manager and team on radiation protection issues, safe working practices, relevant standards, and the optimisation of operational radiation protection measures. They will also advise HPSs on areas of the worksite that require radiation monitoring surveys.

ANSTO Radiation Safety Standard (AE-2310) has been applied to D&D activities that will be engaged in at the Camperdown facility. The standard describes the following principles in detail:

- Justification
- Optimisation of Radiation Protection
- Dose Limitation
- Defence in Depth
- Safety Culture

These 5 principles and their applicability to the Camperdown Decommissioning Project are discussed below.

8.1 Justification

It is expected that workers will receive radiation exposure during the Camperdown Decommissioning Project. However, considerable institutional knowledge of the operation, maintenance, repairs, modifications, and history of the Camperdown Facility has assisted the development of the Safety Assessment Report and this Decommissioning Plan in the justification and optimisation to minimise radiological exposures during D&D activities.

8.2 Optimisation of Radiation Protection

D&D activities have been risk assessed (11) and the level of radiation protection has been optimised so it represents the best that can be achieved under the prevailing circumstances.

8.3 Dose Limitation

The limits of radiation dose for occupationally exposed workers completing D&D activities are identified in the Dose Estimate (12). These estimates are used to identify a boundary that individual exposures from planned work should not exceed. The dose limits are determined and set by the RPA in consultation with the Decommissioning Project Team.

The Dose Estimate (12) is based on maximum dose rates measured during characterisation of the facility and the estimated time to complete D&D activities. The estimate of individual and collective doses for D&D activities is approximately 0.6mSv and 8.3mSv respectively.

Camperdown D&D activities will not result in any direct radiation exposure to members of the public.

8.4 Defence in Depth

The defence in depth principle for radiation protection during the Camperdown Decommissioning Project has been incorporated into the planning and risk assessment of all D&D activities. Option 4 (see Table 2) provides the best benefits of time, distance and shielding and therefore optimises defence in depth principle.

Decommissioning activities have additional engineered provisions to reduce potential exposures, which are discussed in Section 6.7.

[AP-2511](#) Radiation Protection Requirements in Radiological Classified Areas identifies the type and level of Personal Protective Equipment (PPE) for working in radiological classified areas and provides a further level of defence in depth.

8.5 Safety Culture

The Decommissioning Project Team will engage radiation protection specialists to maintain and enhance standards of radiation safety during all D&D activities. Workers will be consulted in the development of SWMES, toolbox talks, task improvements etc. thereby promoting and maintaining a strong safety culture.

8.6 Radiological Classification of Areas

The ANSTO Radiation Safety Standard ([AS-2310](#)) and the Classification of Contamination and Radiation of areas define the systems of radiological classification of areas and the employment of measures to control, prevent, limit, and review occupational exposure (actual or potential) to ionising radiation.

This system of radiological classification helps ensure that occupational dose limits are not exceeded and is part of the process of ensuring that doses to individuals are optimised. It does this by identifying how areas across the Camperdown Facility will be classified during various stages of the D&D works.

8.7 Radiation Monitoring

Radiation monitoring will be conducted during D&D activities of the Camperdown facility, including radiological surveys taken in the workplace and the measuring of individual's exposure to radiation using personal and area dosimetry.

The need for a workplace monitoring program will be determined by risk assessment of the radiological hazards of all D&D activities.

All workers undertaking D&D activities with a potential radiological exposure will be monitored in accordance with AG-2521 Personal Dosimetry. This will include the supply of dosimetry, analysis of internal dosimetry (whole body monitoring, bioassay, and air sampling) and a dose record keeping service provided by RPS.

Task and special external individual monitoring may be warranted for optimisation purposes, for incident/ event assessment or for assessment of non-uniform exposures. Such monitoring programs would be developed by the RPA in conjunction with the Camperdown Decommissioning Project.

8.7.1 Radiation Monitoring Instrumentation

Radiological monitoring equipment is selected based on the radiological conditions in the area.

8.7.2 Monitoring of the Environment

Dust from D&D activities will be removed from the airstream by engineered methods, typically by filtration. These will be monitored to minimise the radiological emissions to the environment. Secondary liquid wastes will be collected and analysed by WMS for contaminant levels prior to either discharge or storage.

8.8 Transport & Movement of Radioactive Materials

The transport of radioactive material from the Camperdown Facility is described in Section 7.7.

8.9 Review & Audit of the Radiation Protection

A project RPA will conduct reviews and make recommendations based on the radiological conditions within the Camperdown Facility during evolving D&D activities, especially where:

- Radiological area classification is required to be assessed and updated.
- There is a trend towards increasing radiation or contamination levels in an area.
- There is a specific radiological concern.

9 SAFETY ASSESSMENT

During all stages of the Camperdown Decommissioning Project, the workers, the public and the environment must be protected from hazards resulting from D&D activities.

9.1 Identification of Hazards & Initiating Events

During the evaluation, workshops were conducted on each of potentially risky activities to identify and document hazards and risks associated with the Camperdown Decommissioning Project. This Decommissioning Plan was used as the basis for the safety assessment. The Safety Assessment (11) was conducted in accordance with 'WHS Hazard Identification and Risk Assessment Guide' ([AG-2390](#)) and the associated 'Risk Analysis Matrix' ([AG-2395](#)) and looked at the following criteria:

- Safety during normal operations (planned radiological exposures & controls)
- Identified internal initiators leading to exposures
- Identified external initiators leading to exposures

A summary of the risk assessments (11) for the Camperdown Decommissioning Project are provided in Table 12.

Table 12 Summary of Risk Assessments

Decommissioning Activity	Summary
	ACCIDENT SCENARIOS- REMOVAL OF EQUIPMENT
Exposure to Radiation during dismantling	The radiological survey of the Camperdown Facility has shown that vast majority of the items to be dismantled have a contact dose rate below 10 $\mu\text{Sv/h}$, however, the maximum dose has been recorded from the vault room 0061 door at 160 $\mu\text{Sv/h}$ (13). Without considering controls in place, workers could unknowingly spend more than a quarter of the task duration (i.e. > 1 hour), close to the door during dismantling, which may result in a Minor (0.02 – 0.1 mSv). The inherent risk associated with this scenario has been assessed as Low. To minimise the radiological exposure a detailed SWMES will be prepared and reviewed prior to undertaking specific decommissioning work in consultation with SMEs supported by daily toolbox talks on each day's work plan and safety precaution requirements. Adequate radiological training will be provided to the decommissioning crew, and EPDs will be utilised for the workers to monitor the dose.
Exposure to H₂S Gas during equipment dismantling	This scenario considers the risk of a worker being exposed to H₂S gas during routine level measurement of the wastewater tanks. The wastewater tanks in the basement collect the wastewater from wash basins in various laboratories and the laundry used for washing lab overcoats and overshoes. The washing of overcoats and overshoes is still being carried out to clean the dirty apparel generated by the personnel maintaining the facility and personnel visiting the facility to plan the decommissioning process. The tanks are presumed to have accumulated sludge along with the organic matter from the washings with significant bacterial load to generate enough H₂S gas to be of concern. All 3 wastewater tanks are connected to the site active ventilation system. Under certain abnormal conditions, it is credible although less likely that the H₂S gas could accumulate and reach dangerous concentration level in the basement. Exposure to the accumulated H₂S gas could

Decommissioning Activity	Summary
	lead to fatal injury, therefore, this event is qualitatively assessed to result in a Severe (Death or permanent injury) physical injury consequence. In the past 5 years there have been 2 cases of detection of alarm levels (>10PPM) in the basement. This had occurred even with the engineered control of the ventilation extract present and operational. It is conservatively assumed that, in the absence of the control provided by the ventilation extract, the H₂S level in the basement could be above the lethal limit. The risk is considered Very High. In order to minimise the potential of exposure to H₂S gas during equipment dismantling a number of critical controls measures have been taken into account. • CC-01 ventilation of the basement area The basement itself is serviced by the building HVAC system. Air movement is from the far end of the basement towards the exhaust outtakes placed near the ceiling, above the wastewater tanks. Note: This control will remain operational until the wastewater tanks are removed from the facility. After the removal of the wastewater tanks the control can be dismantled as per the decommissioning schedule. • CC-02 H₂S gas sensor and alarm in the basement A real time H₂S sensor, monitor and alarm is installed in the basement. Alarm speakers are placed both in the basement and at the top of the entry staircase to the basement. The alarm is connected to the ANSTO Camperdown building management system, the mimic panel at ANSTO Camperdown security office and to Lucas Heights ASOC. Note: This control shall remain operational until the wastewater tanks are removed from the facility. After the removal of the wastewater tanks this control can be dismantled as per the decommissioning schedule. We advise that the ventilation system be maintained in functioning order during the equipment dismantling and removal phase of the Camperdown Decommissioning Project to minimise the potential risk of exposure to H₂S gas and to ensure that the systems are not removed until all equipment exposed to radiation and the wastewater tanks are removed from the Camperdown Facility. Based on implementation of the critical control identified in the risk assessment, the residual risk is assessed is Low.
Dropping or Uncontrolled Lowering of the Cyclotron Tank or Roof Plugs	Dropping or uncontrolled lowering of the cyclotron from the planned height would most likely result in damage to the cyclotron tank. Assuming that the shielding provided by the tank would be lost if the cyclotron were dropped or lowered in an uncontrolled manner, personnel in the vicinity could be exposed to a maximum dose rate of 65 µSv/h at contact as this is the highest dose rate measured from within the Cyclotron (13). The radiation exposure to personnel is estimated as 65 µSv, which is a Minor (0.02 – 0.1 mSv). Due to the height of the lift, and weight of the cyclotron, it is credible that workers could be crushed under the falling load causing fatalities. Hence, this scenario is assessed to result in a Severe (death or permanent injury) physical injury consequence. As the area around the proposed lift has high foot traffic of public, an unknowing member of the public who is in the area during the lift could also be fatally injured. Hence, this scenario is assessed to result in a Severe (death or permanent injury) consequence. The causes that may lead to a load drop or uncontrolled lowering have been identified in an independent ANSTO study of the lift plan and in the HAZID Workshop with input from the lifting contractors and WHS. The identified causes are listed below: • Human error in rigging, operating the crane during the lifting including snagging (or swinging loads) onto buildings, temporary structures, fixtures, or trees. • Rope or rigging failure, structural failure of plug (worn or weakened) due to damage or incorrect sizing.

Decommissioning Activity	Summary
	• Inadequate crane maintenance resulting in crane component fault, or spurious crane component fault. • Environmental conditions including high winds - resulting in swinging loads. Crane toppling could be due to the following: • Environmental issues such as wet ground resulting in outrigger sinking. • Crane outrigger component faults, structural failure, potentially resulting in crane toppling during lifting. <u>Crane toppling</u> If the crane outriggers and stabilising components suffered a catastrophic failure during the lift, it could result in the toppling of the crane. This could result in severe injuries to workers and/or member of the public, hence, this scenario is qualitatively assessed to result in Severe (death or permanent injury) physical injury consequence. If the suspended load drops on the liquid oxygen tank, then it could result in a metal fire causing damage to the tanks resulting in loss of critical oxygen supply to the RPA. Also, If the load is dropped on the substation, it could result in damage to the electricity supply to the building. Both these incidents could cause severe injury to workers or the public, which are similar to the consequences discussed in this section above. The incident could also result in financial damages of more than AUD 500k but less than AUD 2 million. Hence, this scenario has been assessed to result in a Moderate (\$500k - \$2m) financial consequence. The likelihood crane failure rate is assessed as Unlikely (10^{-3} pa to 0.01 pa). The inherent risk associated with this scenario has been assessed High for potential Physical Injury. The following safety critical controls will be applied to minimise the risk of dropping a suspended load during lifting activities while removing the cyclotron. • CC-03: Certified Crane with Large Safety Factor. The crane used by the lifting contractor will have a SWL rating far greater than the maximum expected load of 26t, along with the use of rated and certified slings and lifting equipment. Including a pre-lift load-cell check to confirm crane lifting capacity and safety factors. • CC-04: Qualified and Trained Crane Operators and Riggers with Spotters Qualified and trained operators will ensure that no personnel are under the suspended load and carry out the lift operation only during low wind conditions using guide ropes to manage the load swing and ensuring that the crane does not contact any other structure while the suspended load is being manoeuvred. • CC-05: Crane Lift Exclusion Zone Additional barriers will be installed around the crane lift activities to ensure that the crane effective lift area is restricted for personnel access and is away from the liquid oxygen and electrical substation. These barriers will prevent the consequences. To ensure that the lifting operation is conducted as per ANSTO Lifting Standards, and the lift rig is adequate for the lift: • Prior to undertaking any lifts, the contractor will need to ensure that the cyclotron tank lift points are in good condition to sustain the weight, and the lifting setup is adequate to lift the cyclotron and the roof plugs. • Lifting contractor must avoid lifting the cyclotron and the roof plugs over the oxygen tank and the electrical substation. • Prior to lifting the cyclotron and plugs, the lifting contractor must liaise with RPA hospital and plan for measures to ensure the oxygen supply to the hospital is not interrupted in the unlikely event of damage to the liquid oxygen tank.

Decommissioning Activity	Summary
	Based on implementation of the critical controls identified in the risk assessment, the residual risk is assessed is Low .
Collision of suspended Load during Cyclotron Tank/ Roof Plug Removal	While lifting and manoeuvring the cyclotron or the roof plugs during their removal, the load could swing uncontrollably due to high wind condition or human error and could impact a worker or building wall, electrical substation, or the liquid oxygen tank. This could result in damage to the high voltage electrical cables or liquid oxygen tanks, and cause significant injury to the workers or electrocution, it could also cause damage to the equipment and financial damage, this scenario has been qualitatively assessed as Severe (death or permanent injury) and Moderate (\$500k - \$2m) financial consequence. The inherent risk associated with the scenario has been assessed as High. The following safety critical controls will be implemented to minimise a crane incident during Cyclotron removal. • CC-04: Qualified and Trained Crane Operators and Riggers with Spotters Qualified and trained operators will ensure that no personnel are under the suspended load and that the lift operation is only carried out during low wind conditions using guide ropes to manage the load swing and ensuring that the crane does not contact any other structure while the suspended load is being manoeuvred. • CC-05: Crane Lift Exclusion Zone Additional barriers will be installed around the crane lift activities to ensure that the crane effective lift area is restricted for personnel access and is away from the liquid oxygen and electrical substation. These Barriers will prevent the consequences. The critical controls as well as the following safety related controls will be applied to minimise the risk of crane incident during lifting activities to remove the Cyclotron. • Well planned crane travel path – (clear path). • Daily toolbox talks on each day's work plan and safety precaution requirements. • Cranes are inherently slow-moving vehicles. Based on implementation of the critical controls identified in the risk assessment, the residual risk is assessed is Low.
Forklift Incidents during dismantling	The dismantling and removal of plant equipment from the facility will require the use of forklift and other large mobile lifting machines, as several heavy equipment will be dismantled in this phase of decommissioning. Forklifts will be used to assist in the loading and unloading of heavy items on to the disposal trucks. With trucks, forklifts and personnel all operating in the same area there is a probability of a traffic accident resulting in physical injury. This scenario could result in Major (serious injury but recovery possible) physical injury. Which has been assessed as Medium risk. The following safety critical controls will be implemented to minimise the risk of a forklift incident during equipment dismantling and removal stage. • CC-06: Exclusion Zone Around Forklift Operation An exclusion zone will be implemented around the forklift operating area to isolate the decommissioning workers from the forklift operating area. This will prevent any personnel from getting close to the forklift operation area. The following safety related controls will be applied to minimise the risk of a forklift incident during dismantling activities: • All forklifts and mobile lifting equipment will be fitted with safety equipment such as reversing sensors, cameras, or audible warning devices, flashing lights etc. • All workers in the building must wear PPE – i.e., high-visibility work gear as specified by the SWMES.

Decommissioning Activity	Summary
	• Daily toolbox talks will be held on each day's work plan and safety precaution requirements. • There will be a carefully planned and documented dismantling process • Loads will be transported in boxes and secured on pallets • Trained and experienced workers will be employed for all decommissioning activities. • The rote for for pallet jacks/ small forklift will be well-planned, with walls removed for additional manoeuvring space. Based on implementation of the critical control identified in the risk assessment, the residual risk is assessed is Low.
Lead (Pb) Exposure and Inhalation of Dust During Dismantling Activities	During dismantling and removal of equipment from the Camperdown Facility, workers will be required to manually handle the lead blocks and loose lead shavings used for shielding and heavy metal including lead dust accumulated in and on the equipment being dismantled. If the accumulated dust is not removed as per the SWMES due to human error, then this could lead to workers being exposed to the lead and heavy metal dust. The hazardous material pre-demolition register shows that the highest concentration of lead and other metal dust in the items to be dismantled under this phase has been detected in the air handling units 190 µg/0.1 m³ in room 0049 south top ducting (13). As the level of lead and other heavy metal dust found in pockets in the building is considerably higher than the permissible limit, the impact of exposure to lead dust without taking any controls into account has been qualitatively assessed as Major (Long term illness or serious injury, but recovery probable) physical injury. The inherent risk associated without controls is assessed as High. The following safety critical controls will be implemented to minimise the risk of Lead or heavy metal exposure to the workers during equipment dismantling and removal stage. • CC-07: Approved Hazardous Waste Removal Contractor Employed The removal of the equipment will be carried out by an approved hazardous waste removal contractor who will be experienced in handling lead blocks and material containing heavy metal dust. • CC-08: PPE – Use of Appropriate Respiration Protection Equipment (RPE) Workers, involved in the physical equipment dismantling and building & vault demolition tasks will wear appropriate RPE (e.g., P3 masks) and leather gloves to prevent exposure to the hazardous dust particles and lead. The following measures will be applied to minimise the risk of exposure to dust during dismantling of equipment at the Camperdown Facility: • Detailed SWMES will be prepared and reviewed prior to undertaking specific decommissioning work in consultation with SME. • Appropriate clothing, such as overalls and gloves will be worn by staff. • Daily toolbox talks on each day's work plan and safety precaution requirements. • Lifting devices will be implemented where possible. With the identified safety controls above, the residual likelihood is assessed as Low.
Building Fire	During the dismantling and removal activities there is a possibility of localised fire incident due to flammable material such as hydraulic fluid or other flammable material catching fire. This event is not expected to result in radioactive release as both 18F and 11C (produced at the facility) are short-lived isotopes as such, residual 18F and 11C activity from previous operations is considered to have been decayed away as the facility has been in shutdown mode since end of 2021.

Decommissioning Activity	Summary
	If the personnel in the building are unable to evacuate quickly, then they may inhale a large quantity of smoke. Therefore, the worst inherent impact from a local fire is qualitatively assessed as Major (Long term illness or serious injury >5 days off (LTI)) physical injury. The inherent risk associated with a building fire has been assessed as Medium. Although the risk of a fire in the building has been assessed as medium, no critical controls have been identified for this scenario. The Camperdown Facility is equipped with a VESDA fire detection and alarms (EWIS) system, which will sound an alarm in case a fire is detected in the building. The alarm will warn personnel inside the vault, allowing them to evacuate the building. Fire detection systems are installed in all areas of the Camperdown Facility, along with a sprinkler system in the main building, including the control room. The fire alarm system will be maintained in an operational state, if practicable, until decommissioning. To minimise the risk of fire during dismantling and removal of the equipment from the Camperdown Facility minimal fire loading will be maintained. That, along with a fire alarm system, evacuation procedures, portable fire extinguishers mean the residual likelihood is assessed as Low.
Exposure to Asbestos	The pre demolition survey of the facility, completed in March of 2023, states that many items to be dismantled such as the duct work joints, valve gaskets in various rooms and vaults and various parts of the backup generator contain non-friable asbestos (14). According to the pre-demolition report, many electrical distribution boards to be demolished under this phase might contain asbestos. If the asbestos containing materials (ACMs) are dropped or mishandled due to human error during dismantling, it could cause the asbestos fibres to become airborne and result in workers being exposed to asbestos. If a worker is exposed to enough of the asbestos fibres, then it could result in fatal injury. Therefore, the consequence of this scenario has been qualitatively assessed as Severe (death, permanent disability, or permanent ill health) Physical Injury. The inherent risk associated with asbestos has been assessed as High. The following safety critical controls will be implemented to minimise the risk of asbestos exposure to the workers during equipment dismantling and removal stage. • CC-09: Class B Licensed ACM Removalist Employed to Remove Items Containing Asbestos The demolition of the main building will be carried out by a contractor who holds a valid class B licence to remove asbestos containing material and will be experienced and use appropriate PPE including appropriate RPE (e.g., P3 masks) while dealing with ACM. • CC-10: Exclusion Zone Around Active Demolition Area An exclusion zone will be created using barriers to prevent workers from entering the active dismantling and demolition zone. Barriers will prevent any personnel from getting close to the hazards area, preventing the consequences. With the identified critical controls above, the residual likelihood is assessed as Low.
	ACCIDENT SCENARIOS- BUILDING DEMOLITION
Exposure to Radiation During Main Building Demolition	The radiological surveys of the Camperdown Facility have confirmed that the maximum gamma radiation source is in the vault 0061 wall, which has been measured at 55 µSv/h (13). If the boundary between radioactive vaults and the nonradioactive main building area is not clearly demarcated and communicated to the decommissioning workers, there the workers might accidentally demolish the activated vault area. This scenario is assessed to result in a Minor (0.02 – 0.1 mSv) radiological impact as the demolition contractors are classified as members of the public for radiological exposure. The inherent risk associated with this scenario has been assessed as Low. To minimise the potential of exposure to radiation during main building demolition, a dose assessment based on measured and calculated dose rates (12) will be developed for the project and individual tasks, based on the Characterisation Report and radiation survey. EPD will also be used to monitor the worker dose uptake. The active and non-active sections will be clearly demarcated.

Decommissioning Activity	Summary
Incident During Hot Cutting Steel Rebars	This size of the concrete blocks will be reduced by cutting the steel using an oxyacetylene torch. Although the hot cutting operation could result in impacts such as release of toxic fumes, flying sparks, exposure to infrared radiation, the burn injury caused by the torch flame has been considered as the bounding case for this assessment. The steel cutting will be a manual task and while cutting a steel rebars, there is a possibility for the worker to accidentally move a live torch close to himself or another worker assisting in the cutting task resulting in burn or eye injury. this scenario has been qualitatively assessed to result in a Moderate (medical attention, <5 days LTI) physical injury. The inherent risk associated with the Building Fire has been assessed as High. The following safety critical controls will be implemented to minimise the risk of injury due to accidental exposure to oxyacetylene torch during steel rebar cutting. • CC-11: Experienced Oxyacetylene Welders Employed The task of cutting concrete reinforcement bars to reduce the size of the building waste will be carried out by workers who are experienced in using an oxyacetylene torch and are wearing appropriate personnel protection equipment. With the identified Critical Control above, the residual risk is assessed as Low.
Dropped load during building demolition	The demolition work involves breaking up the main building structure before being loaded on to a truck for offsite disposal. If the upper structure demolition work is not carried out as per the plan due to human error, then there is a possibility for large fragments of the building material to fall to the ground in an uncontrollable manner. If building fragment falls onto a worker or a member of the public, then it could lead to fatal injury. Therefore, this scenario is assessed to result in a Severe (Death or permanent injury) physical injury consequence. The inherent risk associated with this scenario has been assessed as High. The following safety critical controls will be applied to minimise the risk of injury due to uncontrolled fall of the building materials. • CC-10: Exclusion Zone Around Active Demolition Area An exclusion zone will be created using barriers to prevent workers from entering the active dismantling and demolition zone. Barriers will prevent any personnel from getting close to the hazards area, preventing the consequences. • CC-12: SWMES for Heavy Lifting Activities SWMES will be developed to identify task hazards including handling of tools when working at height and demolition workers to ensure that the active demolition zone is cleared of personnel before continuing to demolish the structures. Additionally, trained and experienced workers will be employed for all decommissioning activities. With the identified critical controls above, the residual risk is assessed as Low.
Structural Failure During Demolition of the Main Building	A building structure, such as a ceiling or a wall, could become unstable while being demolished and fall uncontrollably, due to human error. If the building structure falls onto a machine or workers around the demolition zone, this could result in a severe injury/death. Therefore, this scenario is qualitatively assessed to result in a Severe (Death or permanent injury) physical injury. The inherent risk associated with this scenario has been assessed as High. The following safety critical controls will be applied to minimise the risk injury due to falling ceiling or wall during demolition activities. • CC-10: Exclusion Zone Around Active Demolition Area An exclusion zone will be created using barriers to prevent workers from entering active dismantling and demolition zones. Barriers will prevent any personnel from getting close to the hazard areas, preventing the consequences.

Decommissioning Activity	Summary
	• CC-13: Structural Engineering Expert to Sign off the Demolition Stages The integrity of the structure will be assessed by a structural expert and demolition will be planned according to the expert's advice. As for all demolition work, demolition of the main building will be undertaken by experiences licenced contractors, following detailed and approved SWMES. With the identified critical controls above, the residual risk is assessed as Medium.
Exposure to Dust During Main Building Demolition	Since the area around the Camperdown Facility is open to public access and there is high public traffic due to the presence of the surrounding health precinct, the escape of dust from the Camperdown Facility demolition site could also result in dust exposure to members of the public. However, due to the dilution effect from natural air currents and the transient nature of the members of the public, it is qualitatively assessed that any dust exposure to members of the public would result, at most, in respiratory irritation. If the workers are exposed to the dust for a prolonged period, then, it could result in long term illness or death. Therefore, this scenario is qualitatively assessed to result in a Severe (death or permanent injury) physical injury consequence and Minor (first aid) physical injury to the members of the public. The inherent risk associated with this scenario has been assessed as High. • CC-14: Dust Mitigation and Monitoring A dust suppression system that uses water sprinklers to suppress the dust generated during the demolition activities will be employed during the demolition activities. In addition, regular dust monitoring of the Camperdown Facility will be carried out at various locations in the building and if the dust alarm is activated then all demolition work will be stopped. Work will only recommence after the source of the dust is identified and control methods are reviewed to minimise the generation of, or the impact of, the dust. Work will only recommence after the contractor has satisfied ANSTO that the dust source or control method used has in fact reduced the dust levels to acceptable levels. Monitoring will be increased to demonstrate 24 continuous hours of dust levels within allowable limits. • CC-08: PPE – Use of Appropriate Respiration Protection Equipment (RPE) Workers who are involved in the physical equipment dismantling and building & vault demolition tasks must wear appropriate RPE (e.g., P3 masks) and leather gloves to prevent exposure to the hazardous dust particles and lead. Scaffolding with barriers that act to suppress dust will be implemented during the demolition of the Camperdown main building. If dust above the alarm level is detected during monitoring, then the contractor must undertake a review of the demolition process and control measures and, take appropriate actions to control the dust generation. With the identified critical controls above, the residual risk is assessed as Medium for workers and Very Low for a members of the public.
Exposure to Asbestos	According to an extensive hazardous material survey of the Camperdown Facility, titled the "Hazardous Materials Pre-Demolition Register" and compiled in March of 2023, many building materials contain non-friable asbestos (14). The pre-demolition report also presumes that certain areas that were not able to be inspected might contain friable asbestos. Damaging the asbestos containing material (ACM) during demolition of the main building could result in workers being exposed to asbestos. The non-friable asbestos could be crushed due to human error, an uninspected area of the building that is demolished could contain asbestos, which could cause asbestos to become airborne. This could result in a worker being exposed to asbestos leading to fatal injury. Therefore, the consequence of this scenario has been qualitatively assessed as Severe (death, permanent disability, or permanent ill health). The inherent risk associated with this scenario has been assessed as High.

Decommissioning Activity	Summary
	The following safety critical controls will be implemented to minimise the risk of asbestos exposure to workers during equipment dismantling and removal stage: • CC-09: Class B Licensed ACM Removalist Employed to Remove Items Containing Asbestos The demolition of the main building will be carried out by a contractor who holds a valid class B licence to remove asbestos containing material and will be experienced and use appropriate PPE including appropriate RPE (e.g., P3 masks) while dealing with ACM. • CC-10: Exclusion Zone Around Active Demolition Area An exclusion zone will be created using barriers to prevent workers from entering the active dismantling and demolition zone. Barriers will prevent any personnel from getting close to the hazards area, preventing the consequences. Prior to undertaking the work, the workers will clearly articulate the identified non-friable asbestos and other heavy metals detected by the hazardous material demolition register and the areas not inspected are presumed to contain friable asbestos in the demolition contract. With the identified critical controls above, the residual risk is assessed as Low.
Exposure to Dust During Transportation of Building demolition material	For this scenario it is assumed that friable asbestos removed from the Camperdown Facility will not be transported as normal demolition waste as per regulatory guidelines. If, due to human error, the dust mitigation measures required to keep the building material dust from escaping out of the transport truck are not maintained, then workers or the members of the public could be exposed to dust containing non-friable ACM and heavy metals. The dust will be released into outdoor area, and it will also be a transient and revealed failure resulting in an exposure for a brief period. Hence, the inherent impact of the scenario has been qualitatively assessed as Negligible (Minimal effects / very small injury not requiring treatment) physical injury. The inherent risk associated with this has been assessed as Very Low. To minimise the risk of asbestos exposure to workers and members of the public, the demolition of the main building will be carried out by an experienced contractor who holds a valid class B licence to remove asbestos containing material (CC-09).
Traffic Incident During Waste Transportation	During transportation of the building waste from the Camperdown Facility to the contracted recycler, the truck could be involved in a traffic accident causing the release into the environment of building waste containing heavy metals and asbestos. If a truck carrying a full load of building waste, travelling at or below the speed limit on a public road has an accident, then it could result in the contents of the truck to spill out of containment resulting in a Moderate (Short term (<1 yr) effects or confined to site or breaching statutory requirements) environmental consequence. The inherent risk associated with this scenario has been assessed as Low. To minimise the risk of a traffic accident during transportation of the demolition waste to the contracted recycler, the truck drivers must be experienced in heavy haulage and hold a current Heavy Rigid (HR) class licence.
	ACCIDENT SCENARIOS- DEMOLITION OF VAULTS
Exposure to Radiation Due to Accidental Cutting of Activated Material	The demolition of the vault will require careful planning as there are sections of the vault that are activated. It is intended that the activated sections of the vaults will be separated from the non-activated sections and disposed of as restricted waste. The radiological surveys of the Camperdown Facility have confirmed that the maximum gamma radiation source is in the walls of the vault 0061. The maximum dose rate has been measured to be 35 µSv/h at a 1 meter distance and 55 µSv/h at contact (13). ANSTO proposes to wire saw the concrete structures to carefully separate the activated sections. However, if a worker accidentally cuts out the activated section assuming it to be non-activated or if the activated area is incorrectly marked out and

Decommissioning Activity	Summary
	a worker thereby handles the activated waste as per the non-activated waste handling procedure, then a worker might receive a radiation dose. It is qualitatively assumed that a worker could be in proximity to the activated waste during the removal and disposal process for a maximum period of 2 hours. It is assessed to result in a Minor (0.02 – 0.1 mSv) radiological consequence. If the worker erroneously handles the activated section of the waste as non-activated and remains in contact with the waste for a prolonged period, then it could also result in worker receiving an extremity dose. It is assessed as Minor (>0.5 – 5 mSv) extremity dose – radiological consequence. The inherent risk associated with this scenario has been assessed as Very Low. To minimise this risk, the following will be implemented during demolition of the vault structures of the Camperdown Facility: • Concrete characterisation and CORIS identifying hot spot, which will assist in the demarcation of the active and nonactive section of the vault and communicated to the workers dismantling the vaults. • Radiation surveys prior to commencement of work. • Carefully planned and detailed decommissioning procedures. • Dose monitoring of the workers, using EPD. • Adequate training given to the decommissioning crew. • Daily toolbox talks on each day's work plan and safety precaution requirements. • Restricting access into vaults (distance control).
Structural Failure During Demolition of the Vaults	During demolition of the vault structure, there is a possibility for other parts of the structure such as the ceiling or wall adjacent to the section being demolished to become unstable and fall uncontrollably, due to human error. The radiological surveys of the vault structure have shown that parts of the vault wall, ceiling and flooring have been activated. Hence, this assessment considers the potential inhalation dose from the activated concrete dust generated during the collapse of a wall or ceiling section. SR-90 has been assumed as the species responsible for the gross beta measurement obtained from the vault samples to simulate the worst-case scenario. A structural failure will be a revealed failure, which will result in immediate evacuation of the vicinity hence, the exposure duration has been assumed to result in a Minor (0.02 – 0.1 mSv) radiological consequence. An uncontrolled toppling or fall of the wall or ceiling due to human error could result in serious physical injury to the workers i.e., if a large concrete block of wall or ceiling falls on a worker then, it could credibly cause crush or injury resulting in a permanent disability or fatality. Therefore, the physical injury the impact has been assessed as Severe (Death or permanent injury). The inherent risk associated with this has been assessed as Very Low for radiological exposure and High for potential physical injury. To minimise the risk injury due to falling ceiling or wall during demolition activities, the following safety critical controls will be applied. • CC-10: Exclusion Zone Around Demolition Operation Area Exclusion zone will be created using barriers to prevent workers from entering the active dismantling and demolition zone. Barriers will prevent any personnel from getting close to the hazards area, preventing the consequences. • CC-13: Structural Engineering Expert to Sign off the Demolition Stages The integrity of the structure will be assessed by a structural expert and demolition will be planned according to the experts advise.

Decommissioning Activity	Summary
	Additionally, detailed SWMES will be prepared and reviewed prior to undertaking specific decommissioning work in consultation with SME, these will be supported by daily toolbox talks on each day's work plan and safety precaution requirements to further provide knowledge about regarding the risk involved. With the identified Critical Controls above, the residual risk is assessed as Very Low for radiological exposure and Medium for potential physical injury.
Loss of Containment of Liquid Waste	Slurry is expected to be generated during the process of wire sawing the vault structure to segregate the activated and non-activated sections. If the wire sawing cuts into activated concrete, then the slurry generated during this process could seep into the soil under the floor structure resulting in a potential environmental impact. Following removal of the building and slab, the soil will be tested for contamination and remedial actions will be taken to return the site to a condition as per Stage 5 of the decommissioning process. If the wire sawing process were not monitored by the workers due to human error, then there is a possibility for the saw to deviate from the cutting path and cut through the activated concrete. This could contaminate the lubrication slurry used for wire sawing and expose the workers involved in the cutting operation. The radiological exposure has been assessed to result in Minor (>0.02 – 0.1 mSv). The inherent risk associated with this scenario has been assessed as Low. To minimise the risk of spread of contamination into the ground, bunding will be implemented to prevent the release of contaminated slurry into the environment. Additionally, the slurry that will be produced during cutting will be tested for radioactive species.
Dropped Load during vault Demolition	The demolition work involves breaking up the concrete structure before being loaded onto a truck for offsite disposal. If the breaking up of the upper structure is not carried out as per the decommissioning plan due to human error, then for large fragments of debris could fall uncontrollably to the ground. If debris falls onto a worker, then it could lead to fatal injury. Therefore, this scenario is assessed to result in a Severe (Death or permanent injury) physical injury consequence. The inherent risk associated with this has been assessed as High. The following safety critical controls will be applied to minimise the risk injury due to uncontrolled fall of the building materials. • CC-10: Exclusion Zone Around Active Demolition Area An exclusion zone will be created using barriers to prevent workers from entering the active dismantling and demolition zone. Barriers will prevent any personnel from getting close to the hazards area, preventing the consequences. • CC-12: SWMES for Heavy Lifting Activities SWMES will be developed to identify task hazards including handling of tools by demolition workers when working at height and to ensure that the active demolition zone is cleared of personnel before continuing to demolish the structures. Additionally, use of appropriate PPE, and trained and experienced workers will be employed for all decommissioning activities. With the identified Critical Controls above, the residual risk is assessed as Medium.
Exposure to Dust during Vault Demolition	Dust from the demolition work could build up in the work area and result in workers being exposed to concrete dust generated during the demolition or heavy metals such as lead and copper, which are present in the trench of vault room 0061 and wall paint, as identified by the pre demolition survey (13). Exposure to the dust generated during the demolition work could also result in radiological impact to workers nearby. If workers are exposed to the dust for a prolonged period, then it could credibly result in long term illness or death. Therefore, this scenario is qualitatively assessed to result in a Severe (Death or permanent injury) physical injury consequence. The inherent risk associated with this scenario has been assessed as High.

Decommissioning Activity	Summary
	The following safety critical controls will be applied to minimise the risk injury. CC-14: Dust Mitigation and Monitoring A dust suppression system, which uses water sprinklers to suppress the dust generated during the demolition activities will be employed during the demolition activities. Along with the dust suppression system, regular dust monitoring of the Camperdown Facility will be carried out at various locations in the main building and, if the dust alarm is activated, then all demolition work will be stopped. The work will only recommence after the source of the dust is identified, and control methods are reviewed to minimise the issue of the dust, and after the contractor satisfies ANSTO that the dust source or control method have in fact reduced the dust levels to acceptable levels. Monitoring will also be increased to demonstrate 24 continuous hours of dust levels within limits. CC-15: Local Air Scrubbers The air scrubber will provide a temporary dust control system for capturing and removing hazardous dust such as RCS where the workers will be situated in the enclosure. The scrubber is an off-the-shelf system and will include a long running duct, set up with 3-stage filtration, HEPA Filtration (filtering up to 99.97% of dust captured), a powerful centrifugal fan and floor hood. The hood will be positioned as closely as possible to where D&D activities are being undertaken and the potential dust generated will be extracted into the HEPA filter. CC-08: Use of Appropriate Respiration Protection Equipment (RPE) Workers, involved in the physical equipment dismantling and building & vault demolition tasks will wear appropriate RPE (e.g., P3 masks) and leather gloves to prevent exposure to hazardous dust particles and lead. Additionally, scaffolding with barriers that act as dust suppression and daily toolbox talks on each day's work plan and safety precaution requirements will be implemented to reduce the risk of dust exposure. With the identified critical controls above, the residual likelihood is assessed as not credible and therefore the residual risk is not assessed any further.
Exposure to Asbestos	According to an extensive hazardous material survey of the Camperdown Facility, the "Hazardous Materials Pre-Demolition Register" compiled in March of 2023, many building materials contain non-friable asbestos (14). The pre demolition report also assumes that areas that could not be inspected could contain friable asbestos. Damaging the ACM during demolition of the main building could result in workers being exposed to asbestos. The non-friable asbestos could be crushed due to human error or demolition of uninspected area of the building containing friable asbestos, which could cause asbestos to become airborne. This could result in a worker being exposed to asbestos leading to fatal injury. Therefore, the consequence of this scenario has been qualitatively assessed as Severe (Death, permanent disability, or permanent ill health) physical injury. The inherent risk associated with this scenario has been assessed as High. The following safety critical controls will be implemented to minimise the risk of asbestos exposure to the workers during equipment dismantling and removal stage. CC-09: Class B Licensed ACM Removalist Employed to Remove Items Containing Asbestos The demolition of the main building will be carried out by an experienced contractor who holds a valid class B licence to remove asbestos containing material and who will use appropriate PPE including appropriate RPE (e.g., P3 masks) while dealing with ACM. CC-10: Exclusion Zone Around Active Demolition Area An exclusion zone will be created using barriers to prevent workers from entering the active dismantling and demolition zone. Barriers will prevent any personnel from getting close to the hazards area, preventing the consequences.

Decommissioning Activity	Summary
	Prior to undertaking the work, the workers will clearly articulate the identified non-friable asbestos and other heavy metals detected by the hazardous material demolition register and the areas not inspected are presumed to contain friable asbestos in the demolition contract. With the identified safety controls above, the residual likelihood is assessed as Medium.
Traffic Incident During Waste Transportation	The transportation truck could be involved in a traffic accident resulting in a potential environmental release of building waste containing heavy metals, asbestos, and restricted waste during transportation of the waste generated from vault demolition to the contracted recycler or the disposal facility at Kemps Creek to dispose the restricted waste. If a truck carrying a full load of building waste travelling at the speed limit on a public road has an accident, then the contents of the truck could spill out of its containment resulting in a Moderate (Short term (<1 yr.) effects or confined to site or breaching statutory requirements) environmental consequence. The inherent risk associated with this scenario has been assessed as Low. To minimise the risk of a traffic accident during transportation of the demolition waste to the contracted recycler, the truck drivers must be experienced in heavy haulage and required to hold a current HR class licence.

9.2 Evaluation of Occupational & Public Exposure During Decommissioning

It is not expected that the Camperdown Decommissioning Project will have an adverse effect on the health of operating staff, contractors or the public.

An evaluation of potential public exposure during decommissioning shows there are no credible radiological events that could affect the safety of the public. There are, however, credible events that could affect the safety of ANSTO and contractor personnel. With controls in place the residual risks of these events is judged to be tolerable.

9.3 Evaluation of Potential Exposures

As part of the risk assessments, potential exposures to both industrial and radiological hazards were considered and are described in the following sections.

9.3.1 Exposures to Industrial Hazards

Several hazardous scenarios have been identified and risk assessed as summarised in Table 12. The bulk of the risks associated with Camperdown Decommissioning Project are industrial in nature.

Some of the potential industrial hazard exposures include, but are not limited to:

- Manual handling, sprain injuries or strain due to lifting of heavy items or repeated actions or fatigue.
- Eye injury from power tools.
- Electric shock/ electrocution due to faulty tools and equipment.
- Electrocution due to damage to unknown electrical cables
- Exposure to high frequency noise due to use of dismantling equipment.
- Fall from heights.

- Injury due to slip trip or fall caused by obstructions in the path.

The analysis indicates that when controls are in place the risks are **Medium** to **Very Low** and are controlled by good safety practice and procedures.

9.3.2 Exposure to Radiological Hazard

A summary of some of the potential radiological risk during Camperdown Decommissioning Project are identified in Table 12. The analysis indicates that when controls are in place the risks are **Medium** to **Very Low**.

10 ENVIRONMENTAL IMPACT ASSESSMENT

ANSTO's Environmental Policy ([AB-7100](#)) outlines the importance of meeting the highest environmental protection standards. This is demonstrated in ANSTO's achievement and commitment to ISO 14001, the international standard for designing and implementing an environmental management system. This certification is implemented by ANSTO's Environmental Monitoring Group a key part of which is the Environmental Monitoring Program which looks after important programs such as:

- ANSTO's stack monitoring system
- Environmental gamma monitoring system
- Soil, groundwater & stormwater monitoring
- Weather monitoring
- Analytical services (gross alpha/ beta, tritium and gamma activity in environmental samples)

Further to this, ANSTO collaborates and shares information openly with the public and regulatory authorities such as

- NSW Environmental Protection Authority (NSW EPA)
- Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).
- Sydney Water Corporation

The Camperdown Decommissioning Project has undertaken a self-assessment of the potential impact of decommissioning the Camperdown Facility on the environment in accordance with the EPBC Act.

Due to the controls in place (extract system, low levels of activation and the limited amount of waste that will be produced), the preliminary self-assessment indicates the environmental impact from decommissioning of the Camperdown Facility will be very low and is unlikely to require any further environmental assessment and controls under the EPBC Act.

The self-assessment will be submitted to DAWE for their review to determine if further action is required i.e. (Environmental Impact Statement EIS).

10.1 Control of Airborne Emissions

The following airborne emissions are expected to be produced during the process of decommissioning the Camperdown Facility:

- Dry airborne particles (dust), and
- Airborne particles (aerosols).

No gaseous products are expected to be produced. The dust generated during demolition shall be controlled by dust suppression systems (Section 6.7.3) .

10.2 Control of Solid Wastes Generated During Camperdown Dismantling

Solid concrete waste arising from the dismantling of the vault rooms will be transported to a suitable disposal facility as restricted solid waste (*RSW*).

SRW will be packaged and transported for storage within waste management facilities on the ANSTO site.

10.3 Control of Liquid Wastes Generated During Camperdown Dismantling

The dismantling operation will be designed to minimise the production of contaminated slurry/ liquid waste as far as practicable.

All the demolition of the non-active concrete at the Camperdown Facility is anticipated to be undertaken by industry standard demolition practices.

Slurry is expected to be generated during the process of wire sawing the activated concrete to segregate the activated and non-activated sections. To minimise the spread of contamination into the ground, bunding will be implemented to prevent the release of contaminated slurry to the environment. Additionally, the slurry that will be produced during cutting will be tested for radioactive species.

10.4 Prevention of Contamination of Soils Groundwater During Camperdown Dismantling

Processes used to dismantle the Camperdown Facility will be selected to prevent or minimise the risk of irradiated materials contaminating the sub-soil in the facility footprint.

Following demolition and removal of all identified radioactive material, the area and sub-soil will be tested to ensure that the area is actually clear of any radioactive species above the clearance limit for the site.

Results will be compared to baseline levels previously established by a scoping survey of the area outside of the building footprint. The certificate of analysis for the survey (Certificate Number: 220810) describes the soil in the sample as having low concentrations of naturally occurring radionuclides, which were commensurate with worldwide background soils concentrations. The report also indicated there were no artificial radionuclides.

10.5 Surface Runoff and Sediment

The Camperdown Decommissioning Project area is situated on a solid concrete floor within a building, and any runoff from wet cutting processes will be controlled within the work area by careful control of cutting direction, by bunding of the work area, and ultimately by local collection of liquid wastes in a pit containing a multistage filtration system to remove sediments and fines. There will be no runoff to the environment external to the building from the demolition of the activated concrete.

10.6 Hazardous (Non-Radiological) Waste

Hazardous materials such as lead, lead-based paints and other toxic heavy metal-based paints are known to have been used on surface finishes of many components. These will be disposed of at a purpose-built facility in accordance with NSW EPA requirements.

10.7 Clearance

Clearance of waste at ANSTO is divided into 3 main categories based on their physical form and emitted dose rate. Waste categorisations relevant to the Camperdown Decommissioning Project are contained in Plans and Arrangements (9) and are summarised below:

- Free Release waste – waste that meets the criteria for exemption or clearance (activity concentration and activities of radionuclides)
- Contact Handled radioactive solid waste – radioactive solid waste that is above the exemption levels and has a radiation contact dose **below** 2 mSv/hr.
- Remote Handled radioactive solid waste - radioactive solid waste that is above the exemption levels and has a radiation contact dose **above** 2 mSv/hr.

11 EMERGENCY PLANNING

In the event of a site-specific emergency, personnel will be required to evacuate the area and assemble in a designated muster area. All personnel are to remain mustered until directed otherwise by emergency response personnel.

Up to date staffing lists are to be kept at each dedicated muster point and be readily available to account for workers working on site.

Muster points will be identified during various stages of decommissioning, and sign posted.

Camperdown Facility or site maps will be displayed showing muster points, safety equipment locations, including fire extinguishers, spill kits and first aid kits.

All emergency evacuations will be logged in the GRC (Governance, Risk, Compliance) Cloud for investigation. This system aids ANSTO in managing its assurance activities, compliance frameworks, risk management, incident reporting, and related issues.

12 PHYSICAL PROTECTION AND SAFEGUARDS

The physical protection measures and safeguards in place at the Camperdown Facility are commensurate with the associated threat level.

The risk and control measures taken to ensure physical protection during decommissioning of the Camperdown Facility are assessed in Appendix I . The risk to security has been assessed as **Very Low**.

12.1 Source description

The Camperdown Facility has no security enhanced sources as per ARPANSA [RPS 11](#) and is undergoing decommissioning. The bulk of the controlled material is contained in the activated concrete of the cyclotron and beam vaults within the Facility. Therefore, the plans and arrangements requirements given in Schedule A1 of ARPANSA [RPS 11](#) do not apply to decommissioning the Camperdown Facility.

There is no radioactive material external to the building.

Table 13 Material Location – Camperdown Facility

Controlled Material	Source	Location	Notes
Activated Concrete-	Vaults Concrete Walls, ceiling and floor	Room 0053, 0061, 0060, 0061	1000 TON
Activated Metal and rebar.	Vaults Concrete Walls, ceiling and floor	Room 0053, 0061, 0060, 0061	Material is contained within the concrete structure and will be not be segregated.
Cyclotron		Cyclotron room 0053	Mixed fission products have been extracted from process and retained in process columns
Liquid Waste	Waste generated from misting operations	low level liquid waste collected from demolition operations	The waste will be collected, tested by WMS and will be disposed of according to current Characterisation Report.
Transport containers containing Activated Waste	Demolished Vaults Concrete Walls, ceiling and floor	IP1 bags containing material located in temporary location on demolition site	IP1 bags will then be transported using public roads onto a truck

12.2 Facility Floor Plan

Plans of the Camperdown Facility is shown Appendix B .

12.3 Emergency Contacts

In the case of a security event or emergency incident, the ASOC must be notified immediately by phone on either 9717 3333 or x 888. The trained ASOC operators will then follow standard operating procedures to coordinate a response and contact relevant personnel. Key emergency contacts are shown in Table 14.

Table 14 Security contacts

Role	Number
Manager Nuclear Security	x 9127
Manager Emergency Operations	0436 617 913
ANSTO Security Operations Centre Incident Management	(02) 9717 3333 or x 888
Camperdown Facility Building Manager	0400 867 069
Camperdown Decommissioning Program Manager	0488 988 992

12.4 Security Risk Assessment

In accordance with the ANSTO risk management methodology a security risk assessment was conducted on the Camperdown Facility (see Appendix I).

12.5 Facility Protective Security Measures

The protective security measures at ANSTO are set out in AG-5534 ANSTO Security Plan (AG-5534 ANSTO (Agency) Security Plan). The protective security measures are designed to protect radioactive material from loss, theft or compromise.

Physical protection measures to be installed during decommissioning of the Camperdown Facility include:

- Limiting site access to only people involved with D&D activities;
- Site patrols;
- Signage;
- Lighting; and
- Fenced Perimeters and hoardings.

ANSTO security procedures and requirements are documented in the ANSTO Security Manual. All staff are trained in these procedures and requirements with a copy being readily available on the staff intranet.

These procedures and requirements are enforced through an enforcement regime in which employees may be subject to disciplinary action if they fail to comply.

12.6 Personnel Security

Personnel security training and awareness commensurate with the demolition

13 FINAL RADIOLOGICAL SURVEY DESIGN

In line with the Camperdown regulatory plan (Section 3.7), on completion of Camperdown Facility D&D activities (decontamination, dismantling and demolition) a final radiological survey will be performed. The site beneath the building consists of the land leased by ANSTO, as outlined in the area and perimeter drawing, (Figure 26).

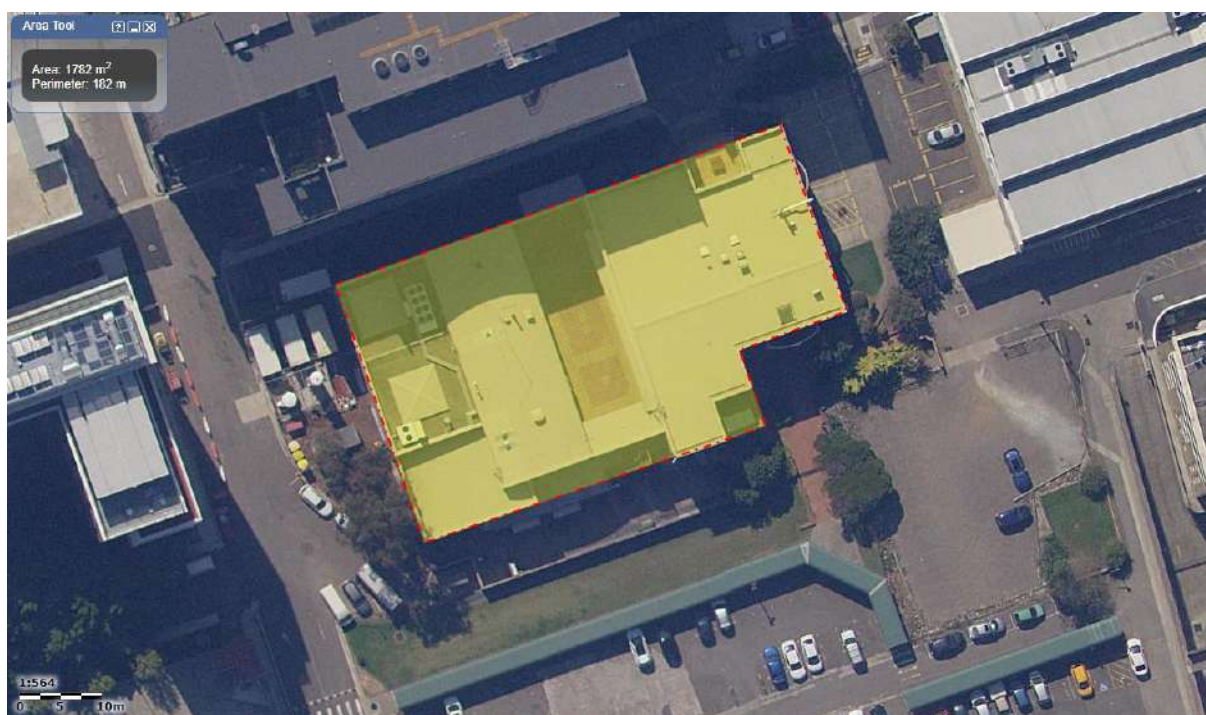


Figure 26 Sketch of Site Survey, Area and Perimeter

ANSTO's Radiation Protection Services (RPS) will perform a walk over survey, using the SpirPack Backpack system. The SpirPack contains a 3 inch x 3 inch sodium iodide detector connected to a tablet with GPS mapping capabilities. Data collected from the survey will be used to develop a "heat map" of the area of interest. The heat map will show the relative spatial distribution and variations across the site of gamma emitting radiological material within the survey area. The area is approximately 1782 m², with a perimeter of approximately 182m.

The data plotted in the heat map, can be presented in both 'counts per second' (cps) or micro-Sieverts per hour (μSv/h).

Results of the walk over survey will be used to confirm that no elevated areas of radioactivity remain in the survey area as well as provide ambient dose rate data for any dose assessments from external radiation for future uses of the site.

Results of the final radiological survey will be compared with results of an earlier (pre-decommissioning) baseline radiological characterisation survey (4) to demonstrate that the decommissioning objectives have been achieved.

The final radiological survey will demonstrate that the site on which the Camperdown Facility stood is in a safe state; and meets ARPANSA's requirements and criteria for residual radioactivity allowing restricted or unrestricted release from regulatory control (surrender of the decommissioning licence).

Design and implementation of the survey will be discussed with ARPANSA during the planning period for the survey. ANSTO will develop procedures to describe the approach to conducting the survey and the activities for demonstrating compliance with the release requirements and criteria. These procedures will then be submitted to ARPANSA for review and approval.

The survey data will be documented in a final radiological survey report and submitted to ARPANSA for review and approval. The results of the survey will be a major portion of final decommissioning reporting.

After completion of all D&D activities, appropriate decommissioning reporting documents will be prepared to comprehensively record what has been done during decommissioning and to demonstrate that the end state for the site has been achieved.

A final decommissioning report will summarise the D&D activities undertaken, including dismantling of the Camperdown Facility; waste management, including clearance of radioactive materials or objects from regulatory control; the final status of the site at the time for release from regulatory control or for conversion to other (nuclear) use; and any remaining restrictions on the site. The final decommissioning documentation will show as far as practicable that all radioactive materials present at the beginning of decommissioning are accounted for and their ultimate destination is confirmed.

14 FORMAL LICENCE SURRENDER

The Camperdown Facility is currently operated under the Facility Licence F0251 issued by ARPANSA. To proceed with decommissioning and fulfill its make-good obligations under the lease, ANSTO must successfully apply for a decommissioning licence from ARPANSA. Once this licence is obtained, the Facility Licence F0251 will be superseded.

Completion of D&D activities and final radiation surveys are prerequisites for surrendering the decommissioning licence. ANSTO can only surrender the decommissioning licence and the least from SLHD once these requirements are met.

15 REFERENCES

- 1) [*Australian Radiation Protection and Nuclear Safety Act 1998*](#)
- 2) ARPANSA Regulatory Guide – [Regulatory Guide: Decommissioning of Controlled Facilities](#)
- 3) NRCF-0010-PM-0001, Document Management Plan
- 4) NRCF-1200-RT-0003, Report on The Characterisation of the Camperdown Facility
- 5) NRCF-1200-RT-0001, Camperdown Decommissioning Historical Site Assessment
- 6) Certificate Number 220810 Certificate of Analysis Camperdown Soil Samples
- 7) NRCF-1200-RT-0003, Camperdown Due Diligence Contamination Assessment External Soil Samples
- 8) ANSTO PSC 001811, ANSTO Camperdown Decommissioning Peer Review Report by Jacobs
- 9) NRCF-1750-PM-0001, Camperdown Plans and Arrangements
- 10) NRCF-0010-PM-0004, Camperdown Project Management Plan
- 11) ANSTO-T-TN-2022-05, Safety Assessment of ANSTO Camperdown Decommissioning
- 12) NRCF-1200-RT-0007, Camperdown Decommissioning Dose Estimate
- 13) NRCF-1200-RT-0002, Preliminary Site Investigation Report for Camperdown facility
- 14) M B Environmental Consulting, Hazardous Materials Pre-Demolition Register, ACS277679, March 2023.
- 15) ANSTO, Cyclotron Removal and Transport, Toll Group, May 2022

16 ANNEXURES

Appendix A Codes of Practice, Procedures and Guides

A.1 NSW Govt Codes of Practice

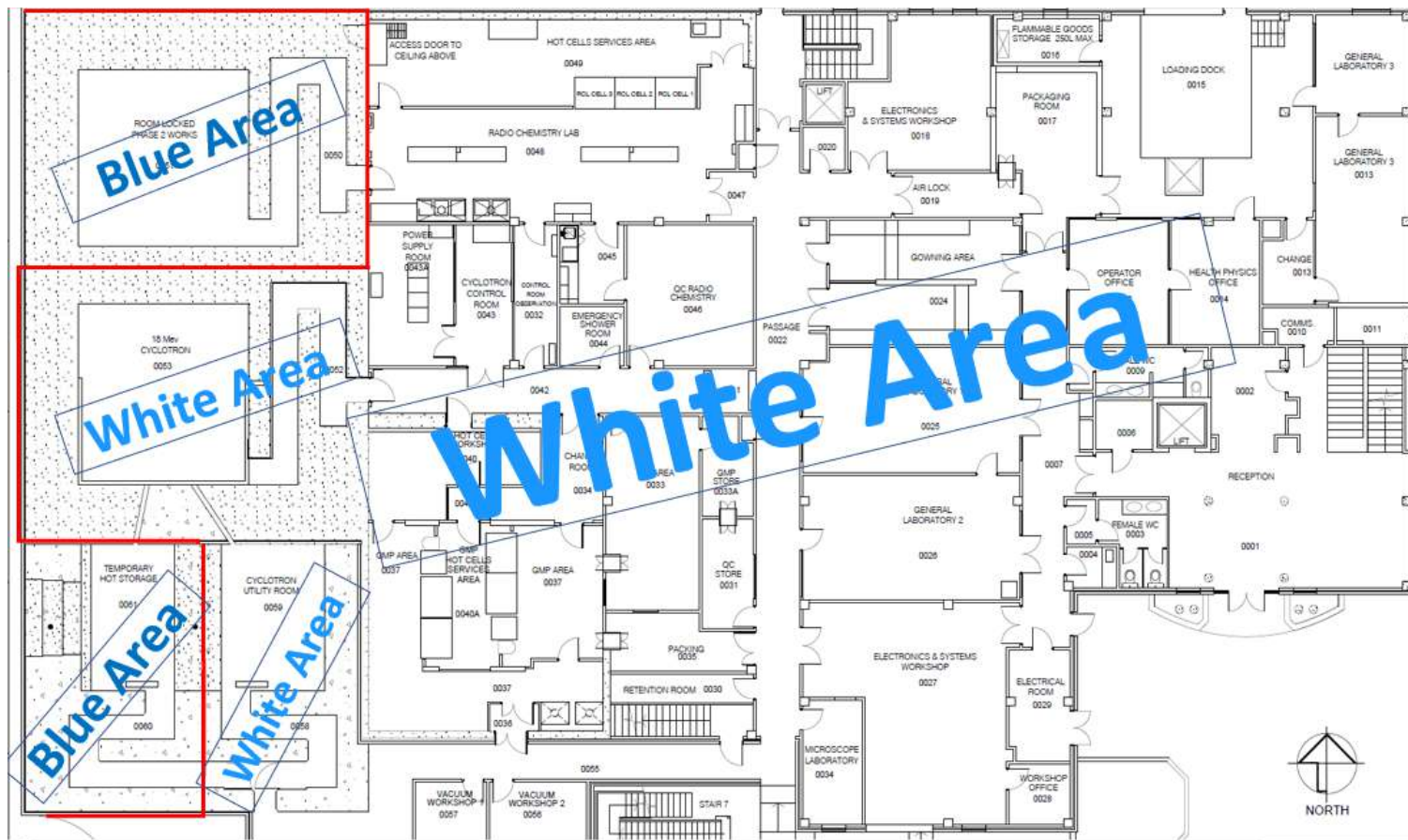
a.	SafeWork NSW, Code of Practice Managing-electrical-risks-in-the-workplace https://www.safework.nsw.gov.au/_data/assets/pdf_file/0010/50230/Managing-electrical-risks-in-the-workplace-COP.pdf Aug 2019
b.	SafeWork NSW, Code of Practice Managing the risks of respirable crystalline silica from engineered stone in the workplace, 2022
c.	SafeWork NSW, Code of Practice Lead work, 2022
d.	SafeWork NSW, Code of Practice Mobile Crane, 2022
e.	SafeWork NSW Code of Practice Demolition Work, 2014
f.	SafeWork NSW, Code of Practice Hazardous Manual Task, 2022
g.	Safework NSW, Code of Practice How-to-manage-and-control-asbestos-in-the-workplace 2022
h.	Safework NSW, Code of Practice How-to-manage-work-health-and-safety-risks, 2022
i.	Safework NSW, Code of Practice Managing-electrical-risks-in-the-workplace 2022
j.	Safework NSW Code of Practice, Managing-the-risk-of-falls-at-workplaces, 2022
k.	Safework NSW, Code of Practice Managing-the-risks-of-plant-in-the-workplace 2022
l.	Safework NSW Code of Practice Work-health-and-safety-consultation,-cooperation-and-coordination, Aug 2019
m.	Safework NSW, Code of Practice Managing the risks of respirable crystalline silica from engineered stone in the workplace, 2022
n.	Safework NSW, Code of Practice Lead work, 2022
o.	Safework NSW, Code of Practice Mobile Crane, 2022
p.	Safework NSW, Model Code of Practice: Excavation work, 2020
q.	Safework NSW, Model Code of Practice: Managing noise and preventing hearing loss at work, 2020
r.	Safework NSW, Model Code of Practice: First aid in the workplace, 2019
s.	Model Code of Practice: Managing psychosocial hazards at work, 2022

A.2 ANSTO Procedures and guides

a.	AG6685 – Construction Safety,
b.	AG2467 – Risk Management of hazardous manual tasks
c.	AP-2522 – Risk Management of Asbestos (Asbestos Management Plan)
d.	AG-2058 – Work Health and Safety Training Handbook
e.	AG-2304 – Electrical Safety Guide
f.	AG2406 – Safe Work at Heights
g.	AG-2493 – Plant Risk Management Process
h.	AB-0002, Work Health, Safety Community & Environment Policy
i.	AE-2310, Radiation Safety Standard
j.	AG-6288, Radiation Safety Best Practice guide

Appendix B Layout of the existing Camperdown Facility

B.1 Ground Floor Layout – Area Classification of Ground Floor



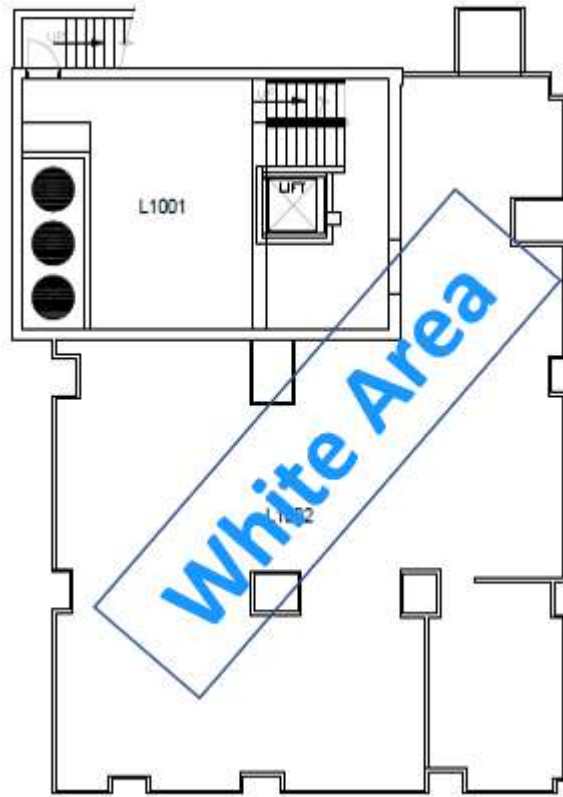
Ground Floor

B.2 First Floor Layout of the Camperdown Facility – Area Classification of First Floor



First Floor

B.3 Basement Floor Layout of the Camperdown Facility –Area Classification of Basement Area



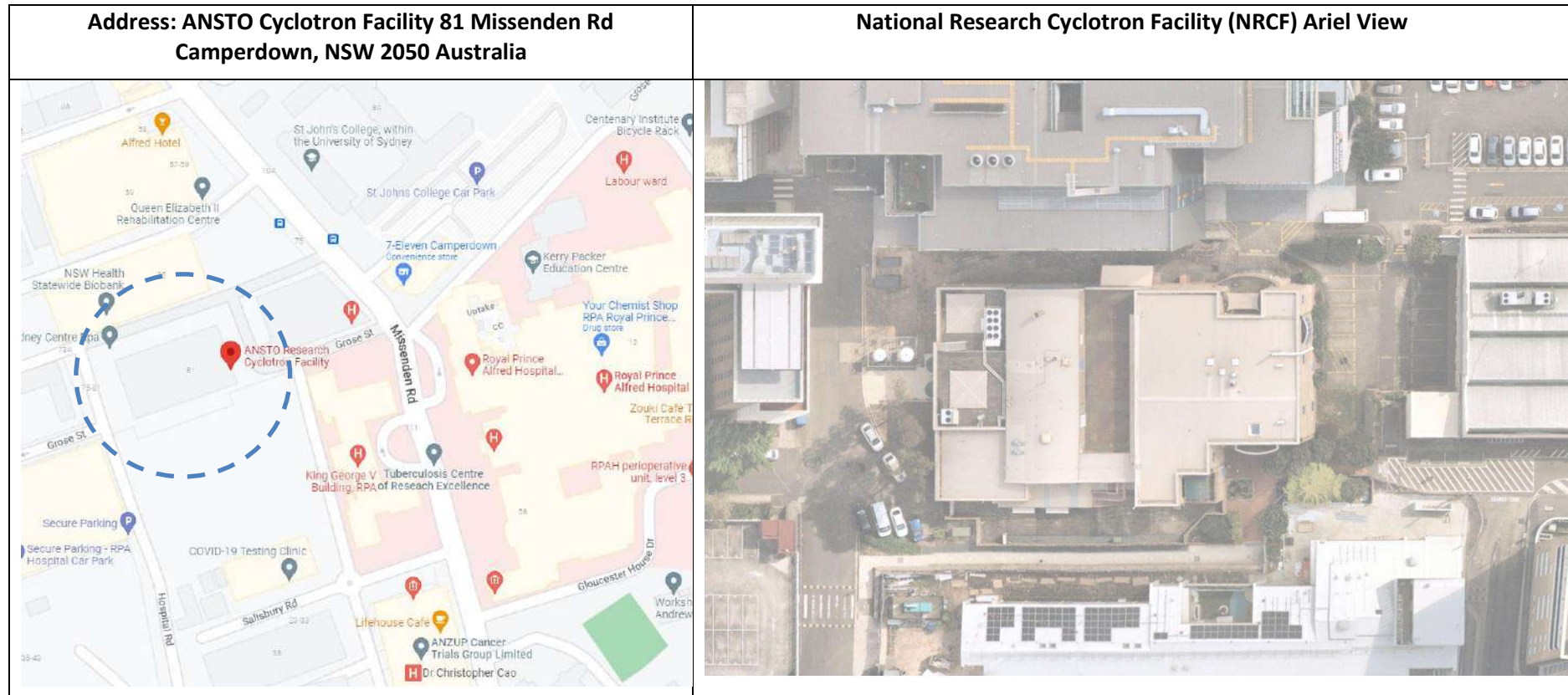
Basement Floor

B.4 Vault Layout of the Camperdown Facility during demolition – Area Classification of Vault Area during demolition and erection of enclosure.

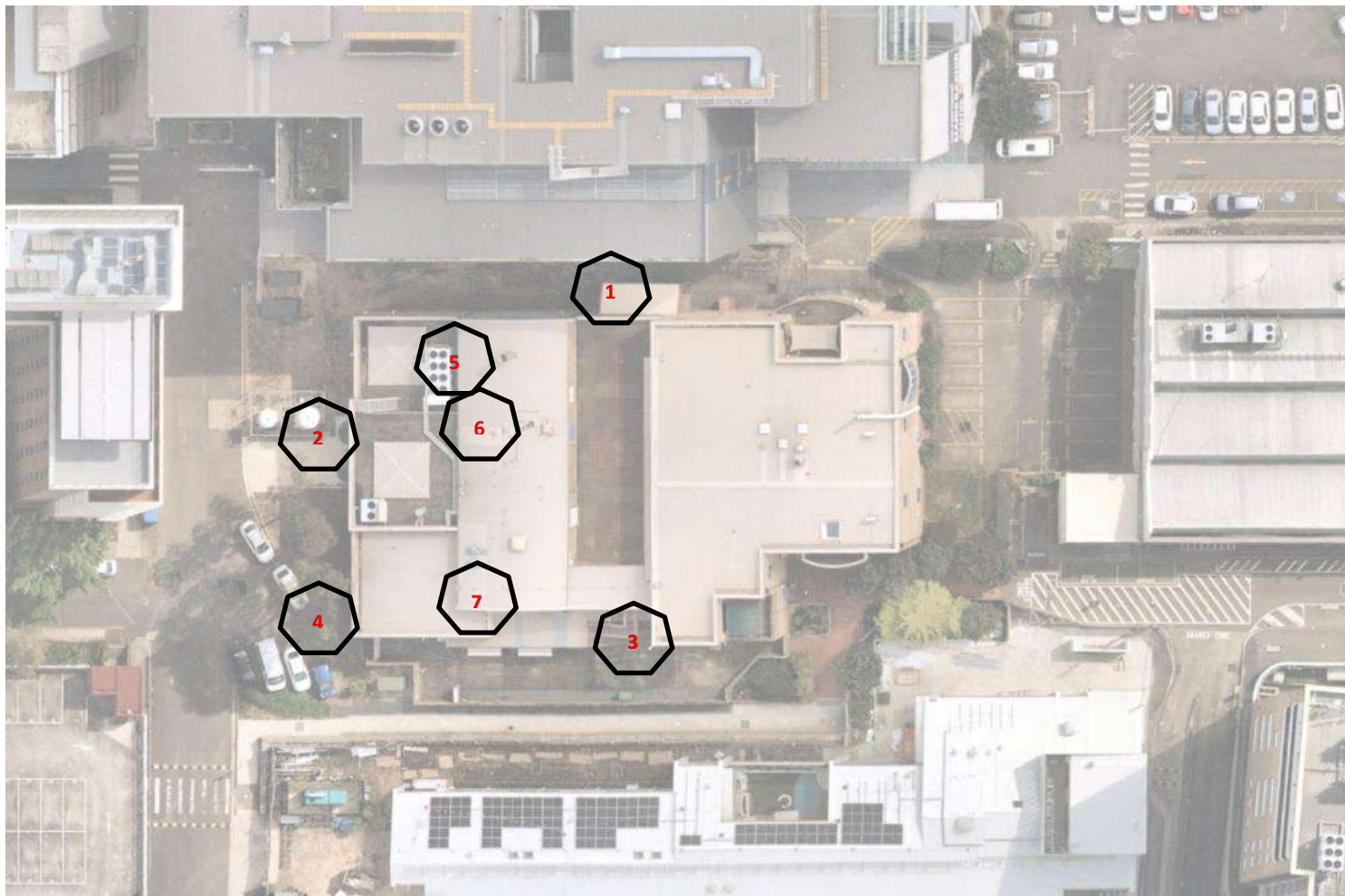


Vault Demolition Phase

Appendix C Location and Layout of the existing Camperdown Facility



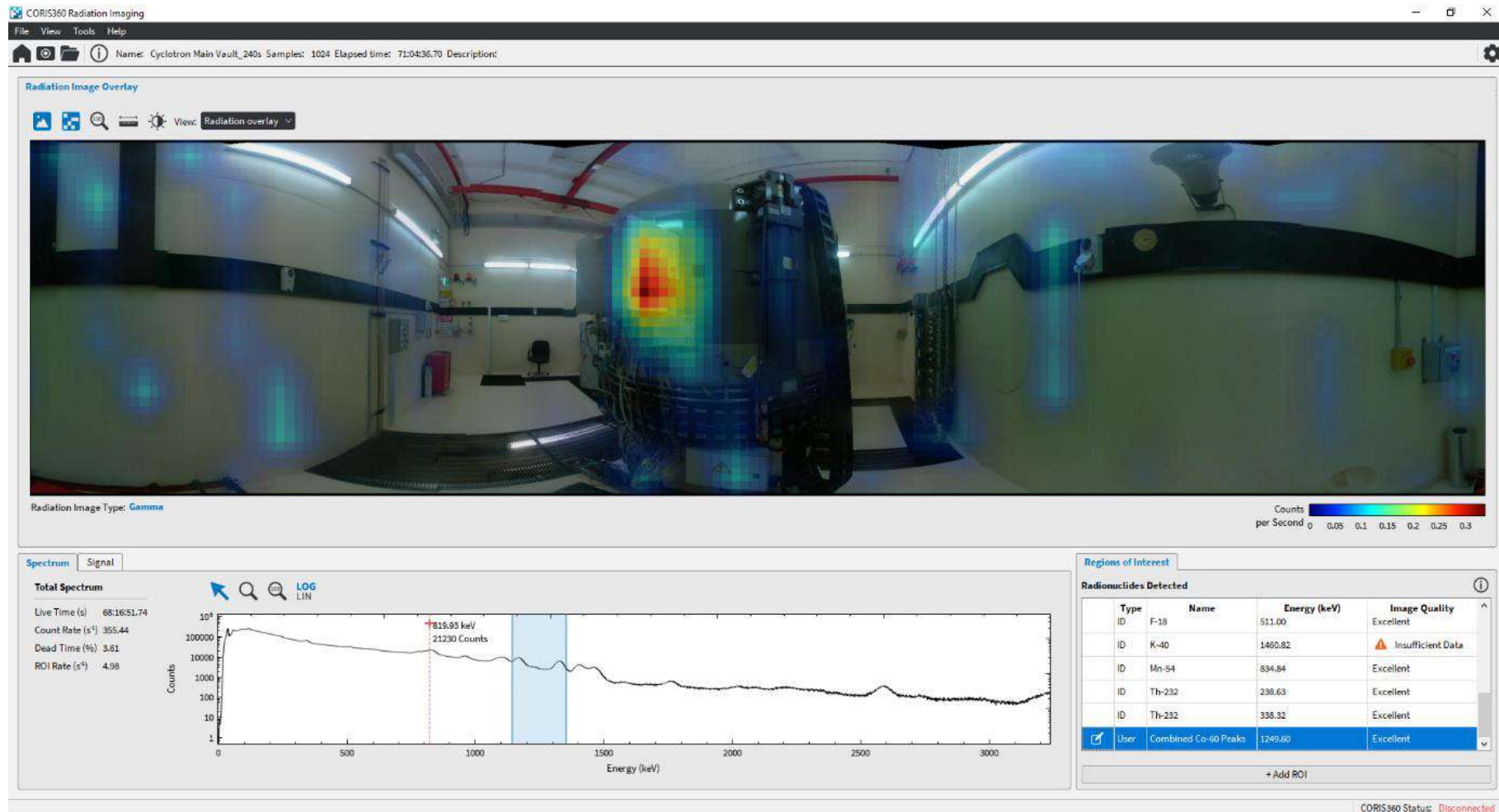
Appendix D National Research Cyclotron Facility (NRCF) - External View



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Appendix E CORIS 360 Imagine, Room 0053 with Radiation Image Overlay for Co-60 energies



Option 1 - Removal of min 450mm of the concrete activated during the operations of the cyclotrons

- Proposed remove a part of wall
- Proposed remove a part of floor
- Demo estimator
- Existing trenches
- Existing block wall with gypsum plasterboard

Red Area Boundary

Blue Area Boundary

Conveyors (40x300)
Set-up loading area in room 0048 where drums will be loaded with the waste and weighed.

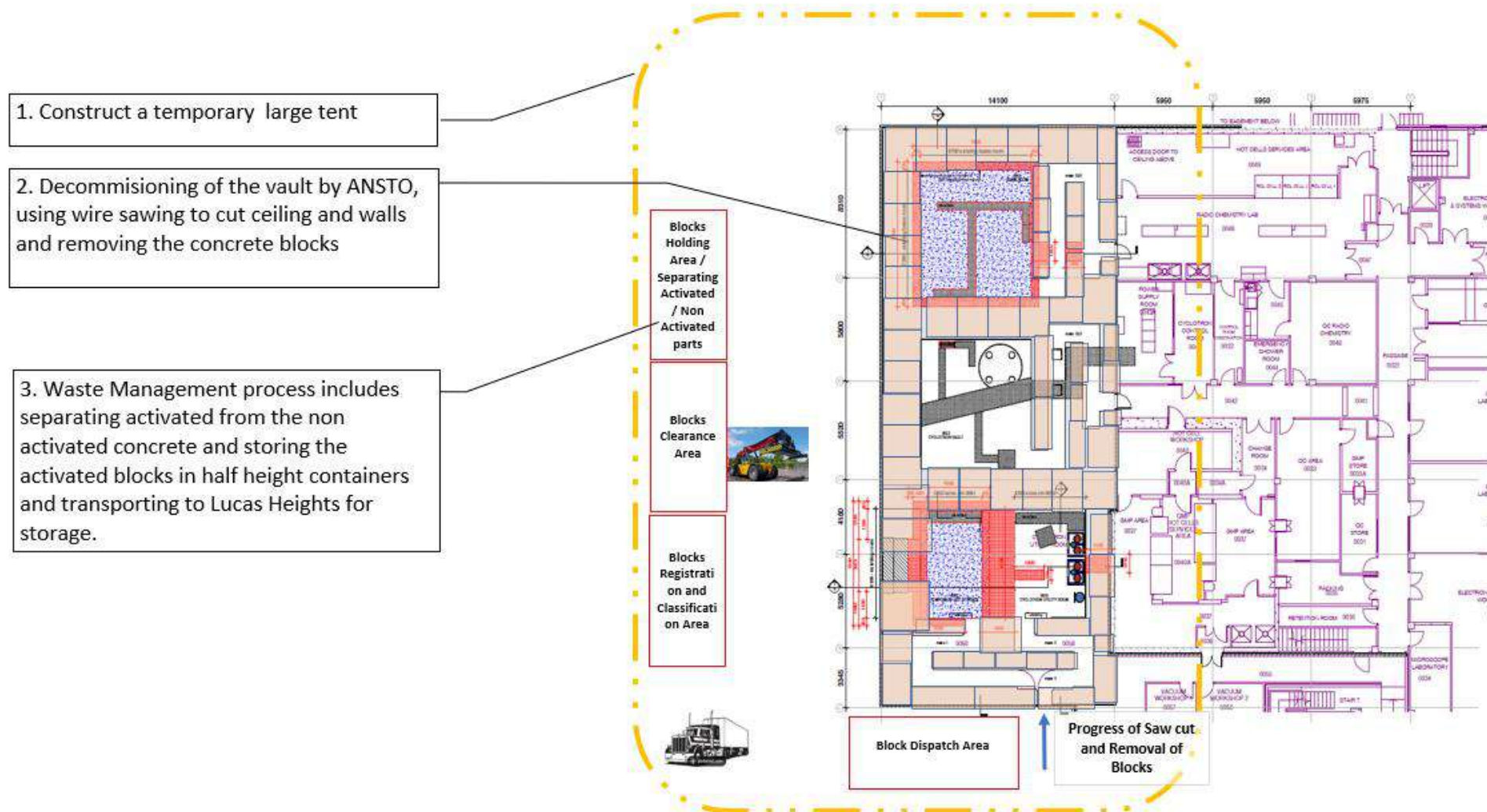
Build a temporary wall to separate loading area from drum clearance area

Filled Drum Holding Area - Move drum to filled drum holding area in room 0049, where they are dried if required, sealed, and cleaned of internal contamination ready for clearance

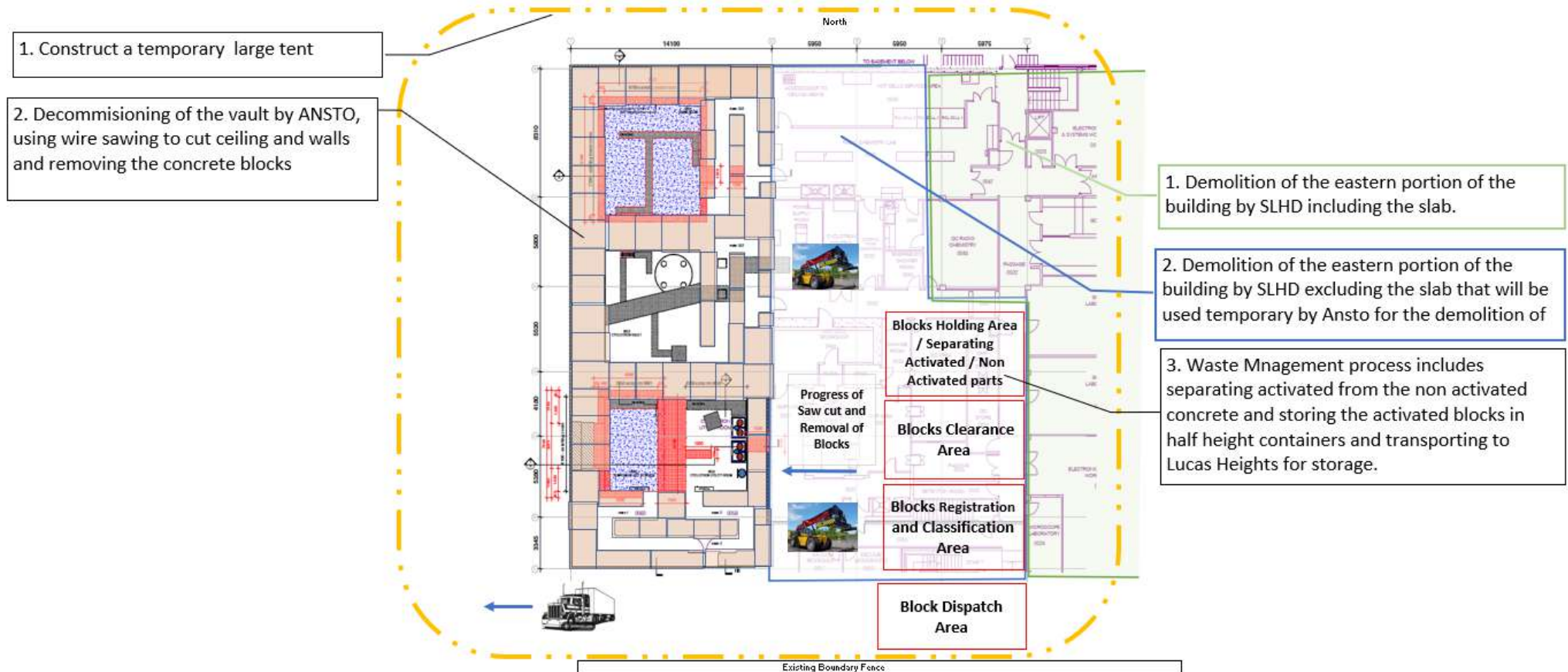
Manage waste drum
Clear drum from drum clearance area in room 0047.
Move drum to drum registration and classification area in room 0018 (see section 6.11) for registration in SAP, labeling, weighing, radiological scanning, and assignment of transport classification.
Move drum to dispatch area in room 0015 using the monorail where it will be placed on a pallet, wrapped, surveyed, cleared for transport and loaded to a Partech truck for transport.
Transport palletised drums to ANSTO using existing WMS procedures.
Waste operations take ownership drums

Waste Loading Area
Set-up loading area in room 0048 where drums will be loaded with the waste and weighed.
1. Place the drum on a scale in room 0048
2. Loading Reinforcement - Manually load drum with steel reinforcement sections or until dose rate limit is reached or 250kg is loaded.
3. Loading Concrete Waste - Place the drum on a scale in room 0048 under the conveyor and run conveyor until 250kg of concrete waste is loaded to drum.

Move drum to drum registration and classification area in room 0018 for registration in SAP, labeling, weighing, radiological scanning, and assignment of transport classification.
Move drum to dispatch area in room 0015 using the monorail where it will be placed on a pallet, wrapped, surveyed, cleared for transport and loaded to a Partech truck for transport.
Transport palletised drums to ANSTO using existing WMS procedures.
Waste operations take ownership drums



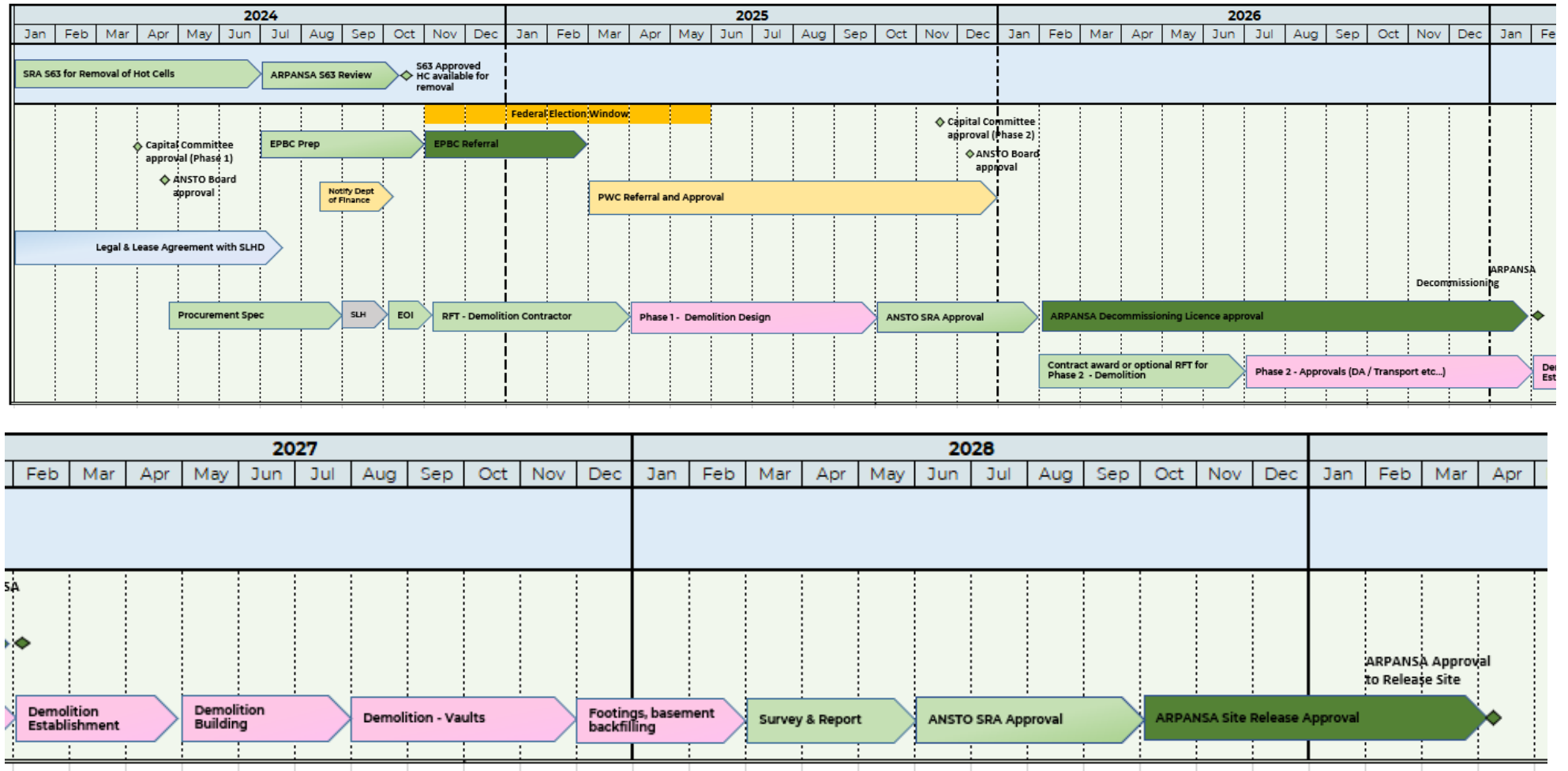
F.3 Option 3 – Deferred Removal of Vaults



Appendix G Document Map



Appendix H Camperdown Decommissioning Tentative Project Schedule



Appendix I Security Risk Assessment

A summary of the outcomes of the risk assessment is provided below. The risk assessment details are also provided in this Appendix.

No.	ANSTO Ref No	Risk Description	Risk Level
1.	CAMSEC 1	Risk of theft of radiological material from unauthorised persons (including contractors) accessing the facility.	Very Low
2.	CAMSEC 2	Risk of sabotage (physical) of radiological material from unauthorised persons (including contractors) accessing the facility	Very Low
3.	CAMSEC 3	Risk of non-compliance with radiological waste/materials security regulations (including ARPANSA, RPS11)	Very Low
4.	CAMSEC 4	Risk of an incident during the transportation of radioactive waste/material for the facility	Very Low

INITIAL ASSESSMENT

This initial assessment has taken the listing of risks provided by ANSTO Security and considered those relevant to .

This initial assessment: i) Describes the risk and identifies potential Causes and Consequences

ii) Identifies Preventive Controls

Definitions

D&A: Detection and Assessment

D: Delay

R: Response (Security)

No.	ANSTO Ref No	Threats / Causes	Risk Description	Consequence/s	Preventive Control/s
1.	CAMPSEC 1 CAMPSEC 5	Criminal activity Persons who may want to carry out a malicious act Insider threat Targeted incident by issue motivated persons or group	Risk of theft of radiological material by unauthorised persons (including contractors) accessing the facility.	Removal of radiological material could lead exposure to the public Removal of radiological material could lead to subsequent dispersal Harm to staff / public Significant reputational damage to ANSTO	Staff and contractors undergo personal security and radiation training screening prior to coming on site (D&A) Insider threat strategy (D&A, D and R) Access control (D&A) Random Internal/ external Security Patrol

					Fencing around the perimeter (D) Random Internal/ external Security Patrol (R) Note: This risk relates to the unauthorised removal of nuclear material hence the requirements given in Clauses 4.9 – 4.20 in IAEA NSS 13 apply.
2.	CAMPSEC 2 CAMPSEC 5	Criminal activity Persons who may want to carry out a malicious act e.g., disrupt the facility or cause a radiological release to the community Insider threat Targeted incident by issue motivated persons or group	Risk of sabotage (physical) of radiological material by unauthorised persons (including contractors) accessing the Camperdown Facility.	Release of radioactive material Harm to staff / public Significant reputational damage to ANSTO	Staff and contractors undergo personal security screening prior to coming on site (D&A) Insider threat strategy (D&A, D and R) Access control in all key facilities (D&A) Random Internal/ external Security Patrol (R) Fencing around the perimeter (D)
3.	CAMPSEC 3 CAMPSEC 4	Inadequate security measures for unsealed radioactive sources Lack of appropriate protective security measures Poor record keeping for sources/materials Insider Threat	Risk of non-compliance with radiological sources/materials security regulations (including ARPANSA, RPS11)	Non-compliance could result in harm to ANSTO's reputation, loss of material and sources.	Experienced Radiation Protection Services support (D&A)• Experienced Safety support (D&A) Audit Requirements (D&A) Radiation Protection Services support (D&A) Note: none of the requirements given in action groups A,B,D,E in ARPANSA RPS 11 Schedule D apply as the waste is security category 5.
4.	CAMPSEC 4	Persons with malicious intent may disrupt or sabotage transportation Targeted incident by issue motivated persons or group	Risk of an incident during the transportation of radioactive waste	Release of radioactive material Harm to staff / public Significant reputational damage to ANSTO	Transport plan (D&A, D & R) Communications strategy (R) Random Internal/ external Security Patrol (R).

		Leak of sensitive information relating to the material and transport arrangements • Accident during transportation			
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RISK ASSESSMENT

(Performed after Initial Assessment)

This risk assessment takes the risk description and other information from the initial assessment table. For each risk:

- i) An assessment is made of the Inherent likelihood and Inherent Impact i.e. pre-controls. The descriptors (Unlikely, Major etc) are taken from the tables in AG 2395 Risk matrix.
- ii) Using these the Inherent Rating (Low, Medium etc) is read from AG 2395 Risk Matrix.
- iii) To assess how much the Controls identified in the initial assessment (previous table) might reduce the risk, their effectiveness is judged. Quite often the Preventive Controls will be effective at reducing the likelihood but will not significantly effect the impact.
- iv) The residual likelihood is then estimated from the Inherent likelihood and probably reducing if the Preventive Controls are considered effective. Same for Impact.
- v) The final residual risk Rating is then read from AG 2395. This is what the risk is estimated to be if all the Controls (both Existing and To Plan) are effective as assumed.

Note that this whole process requires judgement and different people may arrive at different assessments.

No.	ANSTO Ref No	Risk Description	Inherent Likelihood	Inherent Impact	Inherent Risk Rating	Preventive Control Assessment	Residual Likelihood	Residual Impact	Residual Risk Rating
1	CAMPSEC 1 CAMPSEC 5	Risk of theft of radiological material by unauthorised persons (including contractors) accessing the facility.	Highly Unlikely	Minor	Very Low	Effective	Extremely Unlikely	Minor	Very Low
Explanation	The inherent likelihood is assessed as "highly unlikely" because:i) The radiological material is contained within the cyclotron and concrete vaults and would be very difficult to acquire and utilise ii)) The secondary waste that generated from demolition activities is not expected to be contaminated..The inherent impact is judged conservatively as minor because of the low level of activities within the activated concrete and cyclotron. The residual likelihood is judged to be lower because the preventive controls are likely to be effective.								

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2	CAMPSEC 2 CAMPSEC 5	Risk of sabotage (physical) of radiological material by unauthorised persons (including contractors) accessing the facility.	Highly Unlikely	Minor	Very Low	Effective	Extremely Unlikely	Minor	Very Low
Explanation	This risk of sabotage (physical) has similarities to Risk 1 because the same material is involved.								
3	CAMPSEC 3 CAMPSEC 5	Risk of non-compliance with nuclear security regulatory requirements	Highly Unlikely	Minor	Very Low	Effective	Extremely Unlikely	Minor	Very Low
Explanation	Given that the facility has undertaken comprehensive characterisation and build an understanding of the activation level of the waste to be generated. the inherent likelihood of this type of event is taken as highly unlikely. This is reduced in the residual likelihood given that the preventive controls are effective. The Inherent Impact is taken as minor by reference to the consequence table in AG 2395, as there may be interest from the minister if waste is mis categorised and disposed of incorrectly.								
4	CAMPSEC 4 CAMPSEC 5	Risk of non-compliance with radiological sources/materials security regulations (including ARPANSA, RPS11)	Unlikely	Minor	Very Low	Effective	Very Unlikely	Minor	Very Low
Explanation	However, given that the facility is being decommissioned and demolished, there will be large amount of activated concrete. This concrete will packaged in IP1 and transported to a licenced restricted facility. Packages will be analysed prior to dispatch to ensure compliance with security, waste facility licence etc.The preventive controls are assessed as effective, and this reduces the residual likelihood to low.The Inherent Impact is taken as moderate by reference to the consequence table in AG 2395.								
5	CAMPSEC 5 CAMPSEC 5	Risk of an incident during the transportation of nuclear material / radioactive source for the facility	Very Unlikely	Minor	Very Low	Qualified	Very Unlikely	Minor	Very Low
Explanation	This risk is adapted from the Site Security Risk dataset. There are few movements of nuclear material / radioactive source relating to the facility, the materials are protected inside massive shielding flasks and there are documented procedures for the movements. These facts tend to reduce the likelihood of incidents. The inherent likelihood is taken as very unlikely, and no credit is taken for the qualified preventive controls which leaves the same residual likelihood. The quantities of transported radioactive materials are large but the activated concrete is considered restricted waste and will be transferred to a licenced Facility. The Cyclotron will be transported to Lucas height for storage. Overall, the consequence has been assessed conservatively as Minor part of the radiological risk assessment supporting the decommissioning project.								



EPBC Referral Self-Assessment on Impacts to the Environment for the Decommissioning of the National Research Cyclotron Facility

This self-assessment informs the decision by ANSTO to whether a referral to the Minister for the Environment is required for the proposed action.

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1. Purpose and scope

1.1 Purpose

Under the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)* an action will require approval from the minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance.

In addition, under the EPBC Act,

1. any person who proposes to take an action which is either situated on Commonwealth land or which may impact on Commonwealth land, and/or
2. representatives of Commonwealth agencies who propose to take an action that may impact on the environment anywhere in the world,

will require approval from the minister if the action has, will have, or is likely to have, a significant impact.

1.2 What is an action?

‘Action’ is defined broadly in the EPBC Act and includes: a project, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things.

1.3 Matters of National Environmental Significance

Matters of National Environmental Significance Matters of national environmental significance are:

- listed threatened species and ecological communities
- migratory species protected under international agreements
- Ramsar wetlands of international importance
- the Commonwealth marine environment
- World Heritage properties
- National Heritage places
- the Great Barrier Reef Marine Park, and
- nuclear actions, and
- a water resource, in relation to coal seam gas development and large coal mining development.

1.4 What is a significant impact?

A ‘significant impact’ is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. You should consider all of these factors when determining whether an action is likely to have a significant impact on matters of national environmental significance.

1.5 When is a significant impact likely?

To be ‘likely’, it is not necessary for a significant impact to have a greater than 50% chance of happening; it is sufficient if a significant impact on the environment is a real or not remote chance or possibility. If there is scientific uncertainty about the impacts of your action and potential impacts are serious or irreversible, the precautionary principle is applicable. Accordingly, a lack of scientific certainty about the potential impacts of an action will not itself justify a decision that the action is not likely to have a significant impact on the environment.

This self-assessment incorporates the referral thresholds as indicated in:

- [Significant Impact Guidelines 1.1 - Matters of National Environmental Significance](#)
- [Significant impact guidelines 1.2 - Actions on, or impacting upon, Commonwealth land and Actions by Commonwealth Agencies](#)

1.6 How to use this form

The completion of this form should be informed by the results of [AF-1376 Project Environmental Planning Checklist](#)

Project team

- Project team should complete **section 2** of this form and attach relevant project documents which can support how the proposed action will or will not have a significant impact on matters of national environmental significance.
- The information to be provided in this form will inform the responses required within the EPBC referral.

Regulatory and Governance in consultation with project team

- A search using the protected matters search tool must be conducted. This search will inform many of the inputs in **section 4**.
- Using the information provided by the project team, answer the questions in **section 4**.
- Questions in **green** and **red** must be answered.
 - Where any question in **red** is answered yes, a referral must be submitted.
- Where a question in **green** has been answered yes, information (informed by the protected matters search) in **blue** must be completed, subsequent questions in orange must be answered.
- All questions in **yellow** must be answered.
- **Where an inherent likelihood (consulting AG-2395) is rated 'likely' or above, information on 'Mitigation controls', 'Certainty of control effectiveness', and 'Significance assessment' must be completed.**

Results of self-assessment

- Where a proposed action is determined to require referral, this self-assessment should be provided as an attachment to the referral.
- Where a proposed action is determined not to require referral, this self-assessment should be saved in the appropriate project and Regulatory and Governance team information management systems.

2. Description of the Action (Project team to lead input)

2.1 Project description

Embed in this document.

- In Word, go to the 'Insert' tab on the ribbon above.
- Select 'Object' under the 'Text' section in the ribbon.
- In the dialogue box, click the tab 'Create from file'. Find the location of the PMST PDF you saved.
- Check the box 'Display as icon', then press 'Ok'.

Create link from Sharepoint

- After saving the file in Sharepoint / Onedrive – create a link to it, remembering to add staff who can view it, and paste below.

Provide a description of the proposed action, preferably as documented project plan

The Australian Nuclear Science and Technology Organisation (ANSTO) is proposing to commence the decommissioning of the National Research Cyclotron Facility (NRCF), located within the inner Sydney city suburb of Camperdown, NSW.

2.2 Alternatives to undertaking the proposed action

Provide details of alternatives to undertaking the proposed action.

The options considered by ANSTO were:

- Removal of Activated Concrete Only - Maintaining Remaining Building
- Removal of Entire Vaults - Maintaining Remaining Building
- Deferred Removal of Vaults
- Full Building Demolition (standard demolition methods)

Option 4 - Demolish Building in Full was determined to be the most viable D&D method by having the greatest potential benefits with the least challenges along with being the best option for minimising project risks.

2.3 Timing duration and frequency of the activity and its impacts

Provide details of the intended duration, timing (including day/night and seasonal) and frequency of higher impact activities.

Estimated start date – Demolition establishment in December 2026.

Estimated end date – Site release to NSW Health in February 2029.

2.4 Context of the proposed action

Describe the location, geographical context, current uses of the land where the proposed action is proposed.

- a. What is the location of the proposed action and proximity to significant infrastructure?
- b. Reasons behind the selection of the site for the proposed action.
- c. Is the action being conducted on Commonwealth land?
- d. What are the historic uses of the land?
- e. What are the current uses of the land?
- f. What are the current uses of land which may be indirectly impacted by the action?
Consider land uses which may be impacted from: the altering of watercourses, increased traffic.

This research facility, located near the Royal Prince Alfred (RPA) Hospital within the grounds of the Sydney Local Health District in the inner-south west suburb of Camperdown, NSW.

The facility operated for 30 years until 2021 when the site moved to a permanent state of shutdown.

Central to this facility is the cyclotron, a small machine which acts as a particle accelerator to produce a small number of niche radioisotopes used largely for research purposes and in radiopharmaceuticals.

Research into new radiopharmaceuticals and the production of nuclear medicines are now wholly carried out from ANSTO's Lucas Heights campus in southern Sydney. ANSTO supplies around 80 per cent of Australia's nuclear medicines directly from this campus, producing up to 12,000 patient doses each week.

ANSTO is a lease holder of the building which houses the cyclotron facility. As part of its lease obligations with Sydney Local Health District, ANSTO is required to decommission the facility and demolish the building. The site will then be returned to Sydney Local Health District. The future use of the site will be incorporated into SLHD's master planning for the RPA Hospital campus.

Details of the proposed action are contained in the Decommissioning Plan.

2.5 Sensitivity of the environment

Describe the environmental setting (native bushland, urbanised, revegetated), conditions and specific sensitivities or vulnerabilities.

Camperdown Facility

The NRCF is located on leased land at 81 Missenden Rd, Camperdown NSW, approximately 5 km southwest of the Sydney central business district. The facility consists of a 2-story building with a basement and equipped underground transfer system to the Royal Prince Alfred Hospital running eastward along Grose Street outside of the leased premises. The current cyclotron facility was commissioning 2011 with the installation of the 18 MeV cyclotron. As mentioned in section 1.1.1, prior to the current cyclotron and associated infrastructure, the building housed the 30 MeV National Medical Cyclotron (NMC), jointly operated by ANSTO and the Royal Prince Alfred Hospital. The NMC and the building were constructed from 1987 and operational from 1991. The original cyclotron was decommissioning in 2010 (see EPBC referral 2010/5645 - Decommissioning of NMC and Camperdown Facility). Prior to the NMC, the area was used for light industrial / warehousing by the Royal Prince Alfred Hospital.

The NRCF is immediately located within the Royal Prince Alfred hospital precinct of the Sydney Local Health District and as such is highly trafficable with pedestrians and vehicles. The facility is located in proximity to commercial, high density residential, educational (e.g. the University of Sydney) and sporting facilities.

The entirety of the project's delineated boundaries, including the cyclotron facility, adjacent thoroughfares, and the designated waste management site, have been fully established and operational.

A due diligence soil contamination assessment was conducted by Getex in April 2022. No gross contamination from the samples taken from the site were above investigation levels. Further analysis of radiological contamination from these sample was conducted by ANSTO – the radioactivity in the soil samples was consistent with soils found in the region.

Road transport from Camperdown to Kemps Creek and Lucas Heights

The decommissioning strategy for the facility will include utilising local, major state and highway roads for the conveyance of dismantled equipment and waste materials. The designated transport route to the Kemps Creek waste management facility and ANSTO's Lucas Heights facility will incorporate a network of primary roads, potentially traversing both residential and commercial zones. Additionally, the route is planned to navigate through or near water catchment regions and watercourses, employing well-established roads, expressways, and motorways. The transport routes will likely pass near to remnant native bushland. The ecological condition of these road verges will vary between highly degraded / highly weed infested, to minimally disturbed parklands. The approved packaging and coverings for the waste and reusable equipment will employ controls to significantly minimise the risk of any release of contaminants to the environment as a result of the normal transport activity or in the event of an accident.

The transport of waste to the Kemps Creek facility will be conducted by a suitably licenced waste transporter to transport restricted waste.

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The transport of low level radioactive solid waste and reusable equipment will be transported to the LHSTC by ANSTO staff using ANSTO heavy vehicles. These activities will be conducted in accordance with Radiation Protection Series C-2 ARPANSA Code for the Safe Transport of Radioactive Material, rev 1.

Kemps Creek Waste Management Facility

The Kemps Creek facility is a waste collection and management facility licensed by the NSW Environment Protection Authority (EPA). The facility is of highly degraded nature. ANSTO understands the facility is operated to contain and treat surface and groundwater contaminants to prevent contamination to the wider environment.

ANSTO Lucas Heights Science and Technology Centre (LHSTC)

ANSTO's Lucas Heights Science and Technology Centre is situated approximately 29 km to the south-west of the Sydney CBD. The nearest suburban areas are Engadine (1.7 km away), Barden Ridge (2.6 km away), and Heathcote (3.2 km away). The OPAL nuclear reactor is situated within the LHSTC. The LHSTC is of a highly disturbed nature, as a result of the establishment of the site in the mid-1950's, which involved the clearing of the site to near-bedrock. The LHSTC is situated on Commonwealth land and is not subject to NSW State environmental legislation (refer section 7A Australian Nuclear Science and Technology Organisation Act 1987) and local planning provisions.

The current condition of the environment relative to the LHSTC is that of a well-maintained urban campus fit for car, truck and pedestrian thoroughfare.

The low level solid radioactive waste will be stored in the appropriate ARPANSA licensed waste storage facility for the type and activity of waste. Other reusable equipment being transported to Lucas Heights will be stored and repurposed in a safe manner to avoid any impact to the local environment.

The study area is located in the Sutherland Shire local government area and is surrounded on the eastern, western and southern sides by intact vegetation.

Threatened ecological communities

A search for threatened species using the Protected Matters Search Tool within the EPBC Referral Portal did not identify any threatened ecological communities near to the project site.

Two threatened ecological communities may be found along the likely transport routes, one for the transport route of restricted waste to the Kemps Creek Waste Management Facility - PCT849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion; and one along the route to the LHSTC – PCT1803 - Coastal Upland Swamp in the Sydney Basin Bioregion. This vegetation community is mapped as a small patch along the northern site boundary of the LHSTC near New Illawarra Road. .

Other (non-threatened) vegetation communities known to exist along the transport routes and LHSTC include:

- PCT835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion
- PCT920 - Mangrove Forests in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion
- PCT1776 - Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast
- PCT1787 - Red Bloodwood - Scribbly Gum - Stringybark open forest on sandstone ridges along the western side of the Woronora and Hornsby plateaus
- PCT1845 - Smooth-barked Apple - Red Bloodwood - Blackbutt tall open forest on shale sandstone transition soils in eastern Sydney
- Urban exotic/native vegetation.

Threatened species

A search for threatened species using the Protected Matters Search Tool within the EPBC Referral Portal identified 83 threatened faunal and floral species and 56 migratory species that are possibly found in vicinity of the project area. Due to the highly urbanised nature of the project area, none of the listed floral or faunal species are expected to be found within the project area. The transport route to ANSTO Lucas Heights will traverse through *Phascolarctos cinereus* (Koala) habitat. Transport movements will be planned during daytime hours, therefore it is unlikely that vehicle hits will be a risk to koalas.

Vegetation

The vegetation surrounding the facility is limited to ornamental shrubs with two medium-sized eucalypts (insert species here) likely planted around the time of the construction of the NMC.

The Lucas Heights site was developed from the 1950s and was, based on historical aerial photos, cleared of a majority of its native vegetation around 1955. There is limited to no remnant vegetation within the LHSTC.

Soil characteristics

There is no soil or vegetation of national environmental significance within the cyclotron facility.

The soil landscape is characterised Residual, Blacktown Soil Landscape. This type of landscape is characterized by gently undulating rises on Wianamatta Group shales and Hawkesbury Shale, local relief to 30 m, slopes usually <5% and broad rounded crests and ridges with gently inclined slopes. This landscape contains cleared Eucalypt woodland and tall open-forest (dry sclerophyll forest). The soils comprise of shallow to moderately deep (<100 cm) Red and Brown Podzolic Soils on crests, upper slopes and well-drained areas. Deep Yellow Podzolic Soils and Soloths on lower slopes and in areas of poor drainage. The limitations to development are moderately reactive highly plastic subsoil, low soil fertility and poor soil drainage Fill material

consisted of dark brown and brown loose and clayey loam fill, orange/yellow sand and reddish-brown clays within instances of crushed rock and . at depths ranging 0.0-1.35mbgl. Across the Site the natural soil horizons were reddish brown clays, dark red clays and white clays with minor instances of red shale rock at depths of 0.25m to 5.0m.

The bedrock underlying the Site to be Ashfield Shale of the Wianamatta Group consisting of laminate and dark grey siltstone and Bringelly Shale which consists of shale, with occasional calcareous claystone, laminate and coal. This unit is occasionally underlain by claystone and laminite lenses within the Hawkesbury Sandstone such as at Duffys Forest.

A Soil Contamination Assessment has been undertaken by Getex to assess for the presence of widespread/gross soil contamination. Soil samples were taken from 11 locations which were then analysed for a broad range of identified potential contaminants. This assessment determined the following:

- i) Some of the samples exhibited elevated pH levels marginally above the accepted criteria. This presents a low potential risk to current and future receptors.
- ii) The belowground presence of widespread/gross soil contamination was not identified from the concentrations detected for all contaminants.
- iii) No identified contamination would preclude the continued present Commercial/Industrial use under the current conditions.

The transport route will be along highways and main roads none of which contain soil or vegetation of national significance. Prior to transport approval of the route will be provided by the National Heavy Vehicle Regulator (NHVR) and Transport NSW

Commonwealth Heritage

The nearest National Heritage Place is the Cyprus Hellene Club – Australian Hall located approximately 2.1 kilometres to the north-east of the project site. Other National Heritage Place within 5 km include: Hyde Park Barracks to the north-east; Cockatoo Island to the north; the Sydney Opera House to the north-east, Sydney Harbour Bridge to the north-east, First Government House Site to the north-east, Centennial Park to the east. The Cubbitch Barta National Estate is situated to the south of the Lucas Heights Science and Technology Centre (LHSTC) where some low-level radioactive waste, instruments, infrastructure will be transported to.

Indigenous Heritage

No Indigenous heritage sites or values have been identified that are in proximity to the project area, or any proposed transport routes for reusable instruments/infrastructure or waste arising from the decommissioning of the facility.

As described in relation to Commonwealth heritage places, the Cubbitch Barta National Estate Area is located adjacent to the broader Lucas Heights site, which will be the end-location of the transportation route of reusable instruments/infrastructure from the project area. The instruments/infrastructure to be returned to Lucas Heights are to be held in facilities within the established Lucas Heights Science and Technology Centre. All items to be returned to Lucas Heights will be immobilised and do not present a risk of contamination to the surrounding environment, both during transportation to and storage at Lucas Heights. No direct or indirect impacts are expected to this heritage place.

Hydrology

Generally, the relief of the land slopes down from the east to the west, towards Johnston's Creek. Locally, surface runoff from the site is expected to drain to the north into the Johnston's Creek Catchment stormwater drainage system. The Johnston's Creek Catchment drains into Sydney Harbour, at Rozelle Bay. There are no water reservoirs within the near vicinity to the NRCF. No groundwater was observed through the soil sampling program (down to a depth of 5 m). There are two in-use registered monitoring bores within 500 m of the NRCF, both approximately 400 m to the north-east. It is highly unlikely these bores will be impacted by the proposed action.

During the planning stage, the project has engaged a civil stormwater consultant to provide an erosion and sediment control report and plan. This plan investigates the existing stormwater system within the immediate area along with outlining sediment and erosion controls to mitigate any environmental impacts encountered throughout the decommissioning phase of the project. This plan will be further developed through the engagement of the Principal Contractor.

A site visit was undertaken on 8 October 2024 to identify the existing site's stormwater drainage strategy and overland flow paths. Upon inspection, the site's topography was predominately grading from east to west, with the high point near the main entry (east) and the low end at the corner of Hospital Rd and the through road of the neighbouring 25 Lucas St site. The in-ground stormwater pit and pipe network followed a similar connection strategy. However, almost all inspected pits had varying levels of ponding / trapped water.

The natural low point of the site is at the corner of Hospital Rd and the through road of the neighbouring 25 Lucas St site. Existing electrical substations are also located at this point. Considering sediment and erosion control measures, the proposed above-ground sediment basin is to be positioned near the site's low point to allow gravity drainage of the surface flows from the wider site catchment. The sediment basin is to ensure adequate clearance and no impacts to the below-ground utilities servicing the substation.

2.6 Sources of information

(e.g. floral and faunal studies, heritage surveys – please embed or link as per the instructions provided in section 2.1)

Provide details of the sources of information obtained to inform the outcomes of this self-assessment.

3. Results of Protected Matters Search Tool (PMST)

Steps to generate a report out of the PMST.

- Go to: [https://pmst.awe.gov.au/#/map/\(m:ex/group/e3435f10-1e6d-479c-bfab-24cc54331913\)?lng=151.18123054504397&lat=-33.889274256835144&zoom=18&baseLayers=Imagery,ImageryLabels](https://pmst.awe.gov.au/#/map/(m:ex/group/e3435f10-1e6d-479c-bfab-24cc54331913)?lng=151.18123054504397&lat=-33.889274256835144&zoom=18&baseLayers=Imagery,ImageryLabels)

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- The link above should default to the Lucas Heights campus.
- Expand 'draw' on the left sidebar and click 'draw a polygon'
- Draw as close as possible to likely project area. Multiple areas can be drawn if there are more than one project site.
- Expand 'Report' and check the checkbox 'Drawings'.
- A new dialogue box will appear asking you to select a buffer distance. Select 2 km, this will generally encompass all features within the ANSTO Buffer Zone. Click 'Explore'
- A new dialogue box will appear, click 'Generate PDF Report'.
- Select the file from your downloads and save it a folder location.

Insert or link PMST report here.

[https://pmst.awe.gov.au/#/map/\(m:ex/group/e3435f10-1e6d-479c-bfab-24cc54331913\)?lng=151.18123054504397&lat=-33.889274256835144&zoom=18&baseLayers=Imagery,ImageryLabels](https://pmst.awe.gov.au/#/map/(m:ex/group/e3435f10-1e6d-479c-bfab-24cc54331913)?lng=151.18123054504397&lat=-33.889274256835144&zoom=18&baseLayers=Imagery,ImageryLabels)

4. Significance assessment for MNES

4.1 Nuclear Actions

Nuclear Actions	
EPBC Act s.21 Protection of the environment from nuclear actions	
Will the action involve:	☐ Establishing or significantly modifying a nuclear installation. A nuclear installation being: a) a nuclear reactor for research or production of nuclear materials for industrial or medical use (including critical and sub-critical assemblies); b) a plant for preparing or storing fuel for use in a nuclear reactor as described in paragraph a); c) a nuclear waste storage or disposal facility with an activity that is greater than the activity level prescribed by regulations made for the purposes of this section; d) a facility for production of radioisotopes with an activity that is greater than the activity level prescribed by regulations made for the purposes of this section. ☐ Transporting spent nuclear fuel or radioactive waste products arising from reprocessing ☐ Establishing or significantly modifying a facility for storing radioactive waste products arising from reprocessing ☐ Mining or milling uranium ores ☐ Establishing or significantly modifying a large-scale disposal facility for radioactive waste ☐ Decommissioning or rehabilitating any facility or area in which one of the above has been undertaken ☐ Any other type of action set out in the EPBC Regulations. For the avoidance of doubt, proposed projects involving the recovery of sands or rare earths may constitute a 'nuclear action' if the proposed project falls within the above definition. A decision about whether a disposal facility is large scale will depend on factors including the activity of the radioactive materials to be disposed of (see regulation 2.02 of the Environment Protection and Biodiversity Regulations 2000).

Did you answer 'Referral required' to any of the questions in the Significance Assessment?	Yes ☐	No ☒	If yes, an EPBC referral is required.
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4.2 Flora, Fauna and Ecological Communities

Are any listed threatened flora, fauna or migratory species, or ecological communities likely found within the project area?		Yes ☐	Provide relevant details of listings below and complete s.4.2.1 - 4.2.5	No ☒	Only complete s.4.2.5 (section in yellow) below, then proceed to s.4.3
Protected Matters Search – Listed threatened flora					
Common name	Scientific name	EPBC listing	Prescence text	Relevant to action (provide reason)	
Protected Matters Search – Listed threatened fauna					
Common name	Scientific name	EPBC listing	Prescence text	Relevant to action (provide reason)	
Protected Matters Search – Migratory					
Common name	Scientific name	EPBC listing	Prescence text	Relevant to action (provide reason)	
Protected Matters Search – Listed threatened ecological communities					
Community name		EPBC listing	Prescence text	Relevant to action (provide reason)	

Significance Assessment – Flora, Fauna and Ecological Communities						
<i>EPBC Act s.18 Listed threatened species and communities; s.20 Listed migratory species; s.26 Commonwealth land; s.28 Commonwealth agencies</i>						
Is there a real chance or possibility that the action will:		Detail of potential direct or indirect impact	Inherent Likelihood Use AG-2395	Mitigation controls (e.g. alternative locations and timing)	Certainty of control effectiveness (high, medium or low)	Significance assessment
4.2.1 MNES – Extinct in the wild species	4.2.1.a. adversely affect a captive or propagated population or one recently introduced / reintroduced to the wild.		Choose an item		Choose an item.	Referral required? ☐

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Significance Assessment – Flora, Fauna and Ecological Communities						
EPBC Act s.18 Listed threatened species and communities; s.20 Listed migratory species; s.26 Commonwealth land; s.28 Commonwealth agencies						
Is there a real chance or possibility that the action will:	Detail of potential direct or indirect impact	Inherent Likelihood Use AG-2395	Mitigation controls (e.g. alternative locations and timing)	Certainty of control effectiveness (high, medium or low)	Significance assessment	
☐ Species identified in PMST - complete this section	4.2.1.b. interfere with the recovery of the species or its reintroduction into the wild.	Choose an item		Choose an item.	Referral required? ☐	
4.2.2 MNES – Critically endangered, endangered, vulnerable species ☐ Species identified in PMST - complete this section	4.2.2.a. lead to a long-term decrease in the size of a population.	Choose an item		Choose an item.	Referral required? ☐	
	4.2.2.b. reduce the area of occupancy of the species.	Choose an item		Choose an item.	Referral required? ☐	
	4.2.2.c. fragment an existing population into two or more populations.	Choose an item		Choose an item.	Referral required? ☐	
	4.2.2.d. adversely affect habitat critical to the survival of a species.	Choose an item		Choose an item.	Referral required? ☐	
	4.2.2.e. disrupt the breeding cycle of a population.	Choose an item		Choose an item.	Referral required? ☐	
	4.2.2.f. modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	Choose an item		Choose an item.	Referral required? ☐	
	4.2.2.g. result in invasive species that are harmful to a critically endangered or endangered species becoming established in	Choose an item		Choose an item.	Referral required? ☐	

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Significance Assessment – Flora, Fauna and Ecological Communities

EPBC Act s.18 Listed threatened species and communities; s.20 Listed migratory species; s.26 Commonwealth land; s.28 Commonwealth agencies

Is there a real chance or possibility that the action will:		Detail of potential direct or indirect impact	Inherent Likelihood Use AG-2395	Mitigation controls (e.g. alternative locations and timing)	Certainty of control effectiveness (high, medium or low)	Significance assessment
	the endangered or critically endangered species' habitat.					
	4.2.2.h. introduce disease that may cause the species to decline.		Choose an item		Choose an item.	Referral required? ☐
	4.2.2.i. interfere with the recovery of the species.		Choose an item		Choose an item.	Referral required? ☐
4.2.3 MNES – Listed migratory species ☐ Species identified in PMST - complete this section	4.2.3.a. substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.		Choose an item		Choose an item.	Referral required? ☐
	4.2.3.b. result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.		Choose an item		Choose an item.	Referral required? ☐
	4.2.3.c. seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.		Choose an item		Choose an item.	Referral required? ☐
4.2.4 MNES – Critically endangered and endangered	4.2.4.a. reduce the extent of an ecological community.		Choose an item		Choose an item.	Referral required? ☐

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Significance Assessment – Flora, Fauna and Ecological Communities <i>EPBC Act s.18 Listed threatened species and communities; s.20 Listed migratory species; s.26 Commonwealth land; s.28 Commonwealth agencies</i>						
Is there a real chance or possibility that the action will:		Detail of potential direct or indirect impact	Inherent Likelihood Use AG-2395	Mitigation controls (e.g. alternative locations and timing)	Certainty of control effectiveness (high, medium or low)	Significance assessment
ecological communities ☐ Species identified in PMST - complete this section	4.2.4.b. fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission line.		Choose an item		Choose an item.	Referral required? ☐
	4.2.4.c. adversely affect habitat critical to the survival of an ecological community.		Choose an item		Choose an item.	Referral required? ☐
	4.2.4.d. modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.		Choose an item		Choose an item.	Referral required? ☐
	4.2.4.e. cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.		Choose an item		Choose an item.	Referral required? ☐
	4.2.4.f. cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – assisting invasive species, that are harmful to the listed ecological community, to become established, or – causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants		Choose an item		Choose an item.	Referral required? ☐

Significance Assessment – Flora, Fauna and Ecological Communities						
EPBC Act s.18 Listed threatened species and communities; s.20 Listed migratory species; s.26 Commonwealth land; s.28 Commonwealth agencies						
Is there a real chance or possibility that the action will:		Detail of potential direct or indirect impact	Inherent Likelihood Use AG-2395	Mitigation controls (e.g. alternative locations and timing)	Certainty of control effectiveness (high, medium or low)	Significance assessment
	into the ecological community which kill or inhibit the growth of species in the ecological community.					
	4.2.4.g. interfere with the recovery of an ecological community.		Choose an item		Choose an item.	Referral required? ☐
4.2.5 Commonwealth entity-specific matters This section must be completed.	4.2.5.a. involve medium or large-scale native vegetation clearance.	No clearance activities will be conducted.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐
	4.2.5.b. involve any clearance of any vegetation containing a listed threatened species which is likely to result in a long-term decline in a population or which threatens the viability of the species.	No clearance activities will be conducted.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐
	4.2.5.c. introduce potentially invasive species.	No live plant material is planned to be introduced through the decommissioning project.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐
	4.2.5.d. involve the use of chemicals which substantially stunt the growth of native vegetation.	Native vegetation in the surrounding area of the project area is limited to that of a highly urbanised landscape. The potential of emissions of radioactive contaminants to the environment are limited to the production of dusts from the	Very unlikely	- Tenting of vaults at time of wire-cutting concrete for offsite disposal. - Bunding to prevent the release of waste liquid to the environment.	High	Due to the engineering controls implemented, releases of airborne or liquid radioactive contaminants to the environment are considered unlikely. It is highly unlikely that any residual emissions are

Significance Assessment – Flora, Fauna and Ecological Communities

EPBC Act s.18 Listed threatened species and communities; s.20 Listed migratory species; s.26 Commonwealth land; s.28 Commonwealth agencies

Is there a real chance or possibility that the action will:	Detail of potential direct or indirect impact	Inherent Likelihood Use AG-2395	Mitigation controls (e.g. alternative locations and timing)	Certainty of control effectiveness (high, medium or low)	Significance assessment
	cutting of the concrete in the vault areas.		Local Air Scrubbers. • Dust suppression system. • Regular dust monitoring.		expected to stunt vegetation growth. Referral required? ☐
4.2.5.e. involve large-scale controlled burning or any controlled burning in sensitive areas, including areas which contain listed threatened species.	No controlled burning activities will be conducted.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐
4.2.5.f. cause a long-term decrease in, or threaten the viability of, a native animal population or populations, through death, injury or other harm to individuals.	Native vegetation in the surrounding area of the project area is limited to a highly urbanised landscape. The potential of emissions of radioactive contaminants to the environment are limited to the production of dusts from the cutting of the concrete in the vault areas.	Highly unlikely	Same as 4.2.5.d.	High	Due to the engineering controls implemented, releases of airborne or liquid radioactive contaminants to the environment are considered unlikely. Due to the urban environment of the project area, very limited native fauna exist in the vicinity, further lowering the likelihood. Referral required? ☐
4.2.5.g. displace or substantially limit the movement or dispersal of native animal populations.	The proposed action is being conducted within a highly urbanised area, within the Royal Prince Alfred Hospital health precinct. There are	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐

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Significance Assessment – Flora, Fauna and Ecological Communities

EPBC Act s.18 Listed threatened species and communities; s.20 Listed migratory species; s.26 Commonwealth land; s.28 Commonwealth agencies

Is there a real chance or possibility that the action will:	Detail of potential direct or indirect impact	Inherent Likelihood Use AG-2395	Mitigation controls (e.g. alternative locations and timing)	Certainty of control effectiveness (high, medium or low)	Significance assessment
	minimal native faunal species found, and highly unlikely to be any threatened species. Inherently, impacts from the proposed action to local fauna are expected to be highly unlikely.				
4.2.5.h. substantially reduce or fragment available habitat for native species.	No clearance activities will be conducted.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐
4.2.5.i. reduce or fragment available habitat for listed threatened species which is likely to displace a population, result in a long-term decline in a population, or threaten the viability of the species.	No clearance activities will be conducted.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐
4.2.5.j. introduce exotic species which will substantially reduce habitat or resources for native species.	No live plant or animal material is planned to be introduced through the decommissioning activities.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐

Did you answer 'Referral required' to any of the questions in the Significance Assessment?	Yes ☐	No ☒	If yes, an EPBC referral is required.
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4.3 Cultural Heritage

Are any listed World Heritage Places found in or within 2km of the project area?	Yes ☐	Provide details of relevant listings below and complete s.4.3.1 & s.4.3.3	No ☒	Only complete s.4.3.3 (section in yellow) below, then proceed to s.4.4
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Are any listed Commonwealth Heritage Places found in or within 2km of the project area?	Yes ☐	Provide details of relevant listings below and complete s.4.3.2 & s.4.3.3		
Protected Matters Search – Commonwealth Heritage Places				
Name	State	Listing status	Relevant to action (provide reason)	

Significance Assessment – Cultural Heritage EPBC Act s.12 World Heritage; s.15B National Heritage; s.26 Commonwealth land; s.27B Commonwealth Heritage Places Overseas, s.28 Commonwealth agencies					
Is there a real chance or possibility that the action will:	Detail of potential direct or indirect impact	Inherent Likelihood Use AG-2395	Mitigation controls (e.g. alternative locations and timing)	Certainty of control effectiveness (high, medium or low)	Significance assessment
4.3.1 MNES – World heritage properties ☐ Matter identified in PMST - complete this section	4.3.1.a. one or more of the World Heritage values to be lost.	Choose an item		Choose an item.	Referral required? ☐
	4.3.1.b. one or more of the World Heritage values to be degraded or damaged.	Choose an item		Choose an item.	Referral required? ☐
	4.3.1.c. one or more of the World Heritage values to be notably altered, modified, obscured or diminished.	Choose an item		Choose an item.	Referral required? ☐
4.3.2 MNES – National heritage places	4.3.2.a. one or more of the National Heritage values to be lost.	Choose an item		Choose an item.	Referral required? ☐
	4.3.2.b. one or more of the National Heritage values to be degraded or damaged.	Choose an item		Choose an item.	Referral required? ☐

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Significance Assessment – Cultural Heritage <i>EPBC Act s.12 World Heritage; s.15B National Heritage; s.26 Commonwealth land; s.27B Commonwealth Heritage Places Overseas, s.28 Commonwealth agencies</i>						
Is there a real chance or possibility that the action will:		Detail of potential direct or indirect impact	Inherent Likelihood Use AG-2395	Mitigation controls (e.g. alternative locations and timing)	Certainty of control effectiveness (high, medium or low)	Significance assessment
☐ Matter identified in PMST - complete this section	4.3.2.c. one or more of the National Heritage values to be notably altered, modified, obscured or diminished.		Choose an item		Choose an item.	Referral required? ☐
4.3.3 Commonwealth entity-specific matters This section must be completed	4.3.3.a. permanently destroy, remove or substantially alter the fabric of a heritage place.	No heritage places will be physically impacted by the proposed action.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐
	4.3.3.b. involve extension, renovation, or substantial alteration of a heritage place in a manner which is inconsistent with the heritage values of the place.	No heritage places will be physically impacted by the proposed action.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐
	4.3.3.c. involve the erection of buildings or other structures adjacent to, or within important site lines of, a heritage place which are inconsistent with the heritage values of the place.	No heritage places will be physically impacted by the proposed action.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐
	4.3.3.d. substantially diminish the heritage value of a heritage place for a community or group for which it is significant.	There are no heritage places in the vicinity of the proposed action.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐
	4.3.3.e. substantially alter the setting of a heritage place in a manner which is inconsistent with the heritage values of the place.	There are no heritage places in the vicinity of the proposed action.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐
	4.3.3.f. substantially restrict or inhibit the existing use of a heritage place as a cultural or ceremonial site.	There are no heritage places in the vicinity of the proposed action.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐

Did you answer 'Referral required' to any of the questions in the Significance Assessment?	Yes ☐	No ☒	If yes, an EPBC referral is required.
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4.4 Landscape, soils, geology and geotechnical

Significance Assessment – Landscape, soils, geology and geotechnical <i>EPBC Act s.26 Commonwealth land; s.28 Commonwealth agencies</i>						
Is there a real chance or possibility that the action will:	Detail of potential direct or indirect impact	Inherent Likelihood Use AG-2395	Mitigation controls (e.g. alternative locations and timing)	Certainty of control effectiveness (high, medium or low)	Significance assessment	
4.4.1 Commonwealth entity-specific matters This section must be completed	4.4.1.a. substantially alter natural landscape features.	The decommissioning activities will involve minimal soil/rock excavation once the building has been removed. The disturbed footprint will be returned to a level hardstand area for future use by NSW Health.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐
	4.4.1.b. cause subsidence, instability or substantial erosion.	Minimal and localised erosion may occur during the final stages of removal of the existing building and remediation.	Extremely unlikely	A sediment and erosion plan will be prepared and implemented by the appointed Principal Contractor. This plan will be informed by the hydrological assessment to ensure controls are appropriate throughout the project life.	High	The amount of erosion is expected to be minimal and contained. This is due to the flat nature of the land and the minimal excavation activities being conducted. Referral required? ☐
	4.4.1.c. involve medium or large-scale excavation of soil or minerals.	The proposed action will not excavate large volumes of soil or rock, these will be primarily	Unlikely	In the event of any soil contamination found beneath the	High	Likely not to be significant based on the unlikely nature of further

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Significance Assessment – Landscape, soils, geology and geotechnical <i>EPBC Act s.26 Commonwealth land; s.28 Commonwealth agencies</i>						
Is there a real chance or possibility that the action will:	Detail of potential direct or indirect impact	Inherent Likelihood Use AG-2395	Mitigation controls (e.g. alternative locations and timing)	Certainty of control effectiveness (high, medium or low)	Significance assessment	
		left in-situ subject to any soil contamination which is found which will be disposed of appropriately. Prior characterisation indicates that contaminated soils are not likely to be present.		facility, the remediation will be amended to appropriately characterise, treat and dispose of any contaminated soils.		excavation being required. Referral required? ☐
	4.4.1.d. alter coastal processes, including wave action, sediment movement or accretion, or water circulation patterns.	No impacts to coastal ecosystems expected due to the limited nature of the proposed action.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐
	4.4.1.e. permanently alter tidal patterns, water flows or water quality in estuaries.	No impacts to estuarine ecosystems expected due to the limited nature of the proposed action.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐
	4.4.1.f. reduce biological diversity or change species composition in estuaries.	No impacts to estuarine ecosystems expected due to the limited nature of the proposed action.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐
	4.4.1.g. extract large volumes of sand or substantially destabilise sand dunes.	No impacts to coastal dunal ecosystems expected due to the limited nature of the proposed action.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐

Did you answer 'Referral required' to any of the questions in the Significance Assessment?	Yes ☐	No ☒	If yes, an EPBC referral is required.
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4.5 Water (including surface and groundwater and the marine environment)

Is the proposed action likely to occur in or near to the Great Barrier Reef?	Yes ☐	Complete s.4.5.1 & s.4.5.4	No ☒	Only complete s.4.5.4
Is the proposed action likely to occur in or affect the quality of a RAMSAR listed wetland?	Yes ☐	Provide details of relevant listings below and complete s.4.5.2 & s.4.5.4		
Is the proposed action likely to occur in or affect the quality of the Commonwealth marine area?	Yes ☐	Complete s.4.5.3 & s.4.5.4		
Protected Matters Search – RAMSAR listed wetland				
Name	State	Listing status	Relevant to action (provide reason)	

Significance Assessment – Water (including surface and groundwater and the marine environment)					
EPBC Act s.16 Wetlands of international importance; s.23 Marine environment; s.24B Great Barrier Reef Marine Park; s.26 Commonwealth land; s.28 Commonwealth agencies					
Is there a real chance or possibility that the action will:	Detail of potential direct or indirect impact	Inherent Likelihood Use AG-2395	Mitigation controls (e.g. alternative locations and timing)	Certainty of control effectiveness (high, medium or low)	Significance assessment
4.5.1 MNES – Great Barrier Marine Park ☐ Matter identified in PMST - complete this section	4.5.1.a. modify, destroy, fragment, isolate or disturb an important, substantial, sensitive or vulnerable area of habitat or ecosystem component such that an adverse impact on marine ecosystem health, functioning or integrity in the Great Barrier Reef Marine Park results.	Choose an item		Choose an item.	Referral required? ☐
	4.5.1.b. have a substantial adverse effect on a population of a species or cetacean including its life cycle (for example, breeding, feeding, migration behaviour, life expectancy) and spatial distribution.		Choose an item		Choose an item.

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Significance Assessment – Water (including surface and groundwater and the marine environment)						
EPBC Act s.16 Wetlands of international importance; s.23 Marine environment; s.24B Great Barrier Reef Marine Park; s.26 Commonwealth land; s.28 Commonwealth agencies						
Is there a real chance or possibility that the action will:		Detail of potential direct or indirect impact	Inherent Likelihood Use AG-2395	Mitigation controls (e.g. alternative locations and timing)	Certainty of control effectiveness (high, medium or low)	Significance assessment
	4.5.1.c. result in a substantial change in air quality or water quality (including temperature) which may adversely impact on biodiversity, ecological health or integrity or social amenity or human health.		Choose an item		Choose an item.	Referral required? ☐
	4.5.1.d. result in a known or potential pest species being introduced or becoming established in the Great Barrier Reef Marine Park.		Choose an item		Choose an item.	Referral required? ☐
	4.5.1.e. result in persistent organic chemicals, heavy metals, or other potentially harmful chemicals accumulating in the marine environment such that biodiversity, ecological integrity, or social amenity or human health may be adversely affected.		Choose an item		Choose an item.	Referral required? ☐
	4.5.1.f. have a substantial adverse impact on heritage values of the Great Barrier Reef Marine Park, including damage or destruction of an historic shipwreck.		Choose an item		Choose an item.	Referral required? ☐
4.5.2 MNES – Wetlands of international importance (RAMSAR)	4.5.2.a. areas of the wetland being destroyed or substantially modified.		Choose an item		Choose an item.	Referral required? ☐
	4.5.2.b. a substantial and measurable change in the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland.		Choose an item		Choose an item.	Referral required? ☐

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Significance Assessment – Water (including surface and groundwater and the marine environment)						
EPBC Act s.16 Wetlands of international importance; s.23 Marine environment; s.24B Great Barrier Reef Marine Park; s.26 Commonwealth land; s.28 Commonwealth agencies						
Is there a real chance or possibility that the action will:		Detail of potential direct or indirect impact	Inherent Likelihood Use AG-2395	Mitigation controls (e.g. alternative locations and timing)	Certainty of control effectiveness (high, medium or low)	Significance assessment
☐ Matter identified in PMST - complete this section	4.5.2.c. the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependant upon the wetland being seriously affected.		Choose an item		Choose an item.	Referral required? ☐
	4.5.2.d. a substantial and measurable change in the water quality of the wetland – for example, a substantial change in the level of salinity, pollutants, or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health.		Choose an item		Choose an item.	Referral required? ☐
	4.5.2.e. an invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland.		Choose an item		Choose an item.	Referral required? ☐
4.5.3 Commonwealth marine environment	4.5.3.a. result in a known or potential pest species becoming established in the Commonwealth marine area.		Choose an item		Choose an item.	Referral required? ☐
☐ Matter identified in PMST - complete this section	4.5.3.b. modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity in a Commonwealth marine area results.		Choose an item		Choose an item.	Referral required? ☐
	4.5.3.c. have a substantial adverse effect on a population of a marine species or cetacean including its life cycle (for example, breeding, feeding, migration behaviour, life expectancy) and spatial distribution.		Choose an item		Choose an item.	Referral required? ☐

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Significance Assessment – Water (including surface and groundwater and the marine environment)						
EPBC Act s.16 Wetlands of international importance; s.23 Marine environment; s.24B Great Barrier Reef Marine Park; s.26 Commonwealth land; s.28 Commonwealth agencies						
Is there a real chance or possibility that the action will:		Detail of potential direct or indirect impact	Inherent Likelihood Use AG-2395	Mitigation controls (e.g. alternative locations and timing)	Certainty of control effectiveness (high, medium or low)	Significance assessment
	4.5.3.d. result in a substantial change in air quality or water quality (including temperature) which may adversely impact on biodiversity, ecological integrity; social amenity or human health.		Choose an item		Choose an item.	Referral required? ☐
	4.5.3.e. result in persistent organic chemicals, heavy metals, or other potentially harmful chemicals accumulating in the marine environment such that biodiversity, ecological integrity, social amenity or human health may be adversely affected.		Choose an item		Choose an item.	Referral required? ☐
	4.5.3.f. have a substantial adverse impact on heritage values of the Commonwealth marine area, including damage or destruction of an historic shipwreck.		Choose an item		Choose an item.	Referral required? ☐
4.5.4 Commonwealth entity-specific matters This section must be completed.	4.5.4.a. reduce biological diversity or change species composition on reefs, seamounts or in other sensitive marine environments;	No impacts to marine ecosystems expected as a result of the distance from and contained nature of the proposed action.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐
	4.5.4.b. alter water circulation patterns by modification of existing landforms or the addition of artificial reefs or other large structures.	No impacts to marine ecosystems expected as a result of the distance from and contained nature of the proposed action.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐
	4.5.4.c. substantially damage or modify large areas of the seafloor or ocean habitat, such as sea grass.	No impacts to marine ecosystems expected as a result of the distance from	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐

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Significance Assessment – Water (including surface and groundwater and the marine environment)						
EPBC Act s.16 Wetlands of international importance; s.23 Marine environment; s.24B Great Barrier Reef Marine Park; s.26 Commonwealth land; s.28 Commonwealth agencies						
Is there a real chance or possibility that the action will:	Detail of potential direct or indirect impact	Inherent Likelihood Use AG-2395	Mitigation controls (e.g. alternative locations and timing)	Certainty of control effectiveness (high, medium or low)	Significance assessment	
		and contained nature of the proposed action.				
	4.5.4.d. release oil, fuel or other toxic substances into the marine environment in sufficient quantity to kill larger marine animals or alter ecosystem processes.	Small amounts of radioactive dusts may be produced throughout the decommissioning activities which may enter local drainage systems..	Unlikely	Same as 4.2.5.d.	High	Due to the engineering controls implemented, releases of airborne or liquid radioactive contaminants to the environment are considered unlikely. Further the amount of activated material contained in the facility is sufficiently small enough that there is no risk of harming larger marine animals. Referral required? ☐
	4.5.4.e. release large quantities of sewage or other waste into the marine environment.	Discharge of wastes will be minimal.	Highly unlikely	Same as 4.2.5.d.	High	No large releases of radioactive or other wastes are expected to be discharged into the marine environment. Referral required? ☐
	4.5.4.f. measurably reduce the quantity, quality or availability of surface or ground water.	There is a possibility that radioactive dusts and other heavy metal contaminants	Highly unlikely	Same as 4.2.5.d.	High	No large releases of radioactive or other wastes are expected to be

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Significance Assessment – Water (including surface and groundwater and the marine environment) <i>EPBC Act s.16 Wetlands of international importance; s.23 Marine environment; s.24B Great Barrier Reef Marine Park; s.26 Commonwealth land; s.28 Commonwealth agencies</i>						
Is there a real chance or possibility that the action will:	Detail of potential direct or indirect impact	Inherent Likelihood Use AG-2395	Mitigation controls (e.g. alternative locations and timing)	Certainty of control effectiveness (high, medium or low)	Significance assessment	
		could be produced through the decommissioning activities, particularly wire-cutting of the vault concrete walls.		A sediment and erosion plan will be prepared and implemented by the appointed Principal Contractor. This plan will be informed by the hydrological assessment to ensure controls are appropriate throughout the project life.		discharged into the marine environment. Referral required? ☐
	4.5.4.g. channelise, divert or impound rivers or creeks or substantially alter drainage patterns.	No earthworks will be conducted as a result of the proposed action.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐
	4.5.4.h. measurably alter water table levels.	No earthworks or emplacement of new buildings which could disturb groundwater levels will be conducted as a result of the proposed action.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐

Did you answer 'Referral required' to any of the questions in the Significance Assessment?	Yes ☐	No ☒	If yes, an EPBC referral is required.
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4.6 Pollution

Significance Assessment – Pollution						
EPBC Act s.26 Commonwealth land; s.28 Commonwealth agencies						
Is there a real chance or possibility that the action will:	Detail of potential direct or indirect impact	Inherent Likelihood Use AG-2395	Mitigation controls (e.g. alternative locations and timing)	Certainty of control effectiveness (high, medium or low)	Significance assessment	
4.6.1 Commonwealth entity-specific matters This section must be completed	4.6.1.a. generate smoke, fumes, chemicals, nutrients, or other pollutants which will substantially reduce local air quality or water quality.	There is a possibility that radioactive dusts and other heavy metal contaminants could be produced through the decommissioning activities, particularly wire-cutting of the vault concrete walls.	Unlikely	Same as 4.2.5.d.	High	Due to the engineering controls implemented, releases of airborne or liquid radioactive contaminants to the environment are considered unlikely. The action should still be referred. Referral required? ☒
	4.6.1.b. result in the release, leakage, spillage, or explosion of flammable, explosive, toxic, radioactive, carcinogenic, or mutagenic substances, through use, storage, transport, or disposal.	Refer to 4.6.1.a. Transport of solid recyclable and restricted wastes to Kemps Creek Waste Management Facility, low-level solid radioactive waste to ANSTO Lucas Heights, and equipment to ANSTO Lucas Heights for repurposing will be conducted throughout the decommissioning activities.	Unlikely	Refer to 4.6.1.a. The transport of wastes will be conducted suitably enclosed vehicles. Activated components and wastes will be additionally transported in either 200L stainless steel drums or IP1 rated bags. Liquid radioactive wastes produced will	High	Refer to 4.6.1.a. Referral required? ☒

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Significance Assessment – Pollution						
EPBC Act s.26 Commonwealth land; s.28 Commonwealth agencies						
Is there a real chance or possibility that the action will:		Detail of potential direct or indirect impact	Inherent Likelihood Use AG-2395	Mitigation controls (e.g. alternative locations and timing)	Certainty of control effectiveness (high, medium or low)	Significance assessment
		Small amounts of liquid wastes may be produced and transported.		be treated and transported to ANSTO Lucas Heights in accordance with ANSTO Waste Operations procedures. Waste receipts for all wastes will be collected.		
	4.6.1.c. increase atmospheric concentrations of gases which will significantly contribute to the greenhouse effect or ozone damage.	No ozone depleting substances or significant quantities of GHG will be released to the atmosphere.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐
	4.6.1.d. substantially disturb contaminated or acid-sulphate soils.	A characterisation study has been conducted of the site. This study found there to be no substantial contamination from ANSTO's historical use of the site.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐

Did you answer 'Referral required' to any of the questions in the Significance Assessment?	Yes ☐	No ☒	If yes, an EPBC referral is required.
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4.7 People and communities

Significance Assessment – People and communities <i>EPBC Act s.26 Commonwealth land; s.28 Commonwealth agencies</i>					
Is there a real chance or possibility that the action will:	Detail of potential direct or indirect impact	Inherent Likelihood Use AG-2395	Mitigation controls (e.g. alternative locations and timing)	Certainty of control effectiveness (high, medium or low)	Significance assessment
4.7.1 Commonwealth entity-specific matters This section must be completed	4.7.1.a. substantially increase demand for, or reduce the availability of, community services or infrastructure which have direct or indirect impacts on the environment, including water supply, power supply, roads, waste disposal, and housing.	There will be some movements of trucks into and out of the project area, associated with the site establishment, transport of items/waste, and movement of demolition equipment. This will have limited local impacts on the roads around the project area.	Likely	A Traffic Management Plan (TMP) will be prepared in consultation with ANSTO and stakeholders (SLHD, local council, community etc.) to ensure the safety of pedestrian traffic, community around the site, along the routes to recycling facilities and around disposal tip.	Medium While the control effectiveness certainty is rated as medium, the low number of movements over a long period of time is expected to have a minimal impact to local roads. Referral required? ☐
	4.7.1.b. affect the health, safety, welfare or quality of life of the members of the community, through factors such as noise, odours, fumes, smoke, or other pollutants.	The primary potential impact is from dust production during the wire saw cutting of the activated concrete from the vaults.	Likely	Same as 4.2.5.d.	High Due to the engineering controls implemented, releases of airborne or liquid radioactive contaminants to the environment or into the local community are considered unlikely. ANSTO has conducted a risk assessment on the residual likelihood of impact to workers in the

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Significance Assessment – People and communities <i>EPBC Act s.26 Commonwealth land; s.28 Commonwealth agencies</i>						
Is there a real chance or possibility that the action will:		Detail of potential direct or indirect impact	Inherent Likelihood Use AG-2395	Mitigation controls (e.g. alternative locations and timing)	Certainty of control effectiveness (high, medium or low)	Significance assessment
						immediate vicinity of the decommissioning activities as extremely unlikely. Referral required? ☐
	4.7.1.c. cause physical dislocation of individuals or communities.	The action will not have any physical dislocation impacts on individuals or community.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐
	4.7.1.d. substantially change or diminish cultural identity, social organisation or community resources.	There will be no negative impact on social and community resources. The NMRC was used for research of potentially new medical radioisotopes. The NMRC has not been operational for 3 years.	Extremely unlikely	No further assessment.	Choose an item.	Referral required? ☐

Did you answer 'Referral required' to any of the questions in the Significance Assessment?	Yes ☐	No ☒	If yes, an EPBC referral is required.
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Consent to discharge industrial trade wastewater

Consent to discharge industrial trade wastewater

Sydney Water Corporation

and

AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION

ABN 47 956 969 590

Activity: PROCESSING OF RADIOACTIVE MATERIALS (ZA00)

Risk index: 05

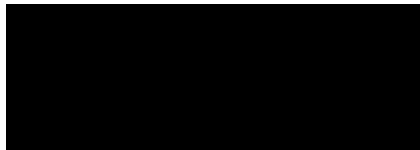
Consent No: 4423

Property Number: 3972483

This **CONSENT** is made on
Executed for and on behalf of
Sydney Water Corporation

day: 22 month: 08 year: 2022

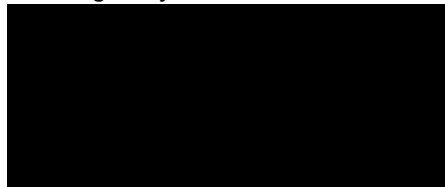
By



Manager Major Customers

In the presence of:

Witness



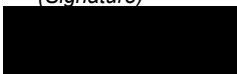
(Print name of witness)

Executed for and on behalf of
the Customer:



(Signature)

By



General Manager AME

(Print name and position of person signing)

who warrants s/he has sufficient authority to execute this consent.

In the presence of:

Witness



(Signature)



(Print name of witness)

This consent must be executed by the Customer prior to execution by Sydney Water and submitted by the Customer to Sydney Water for its consideration. Submission of a consent executed by the Customer under no circumstances obliges Sydney Water to enter into or complete the consent. Submission of an executed consent by the Customer constitutes an application for a consent which Sydney Water may in its reasonable discretion reject, or with the consent of the Customer modify any of the proposed terms thereto.

Consent to Discharge Industrial Trade Wastewater

SCHEDULE 1

(SUBJECT TO PUBLIC DISCLOSURE)

TRADE WASTEWATER WHICH MAY BE DISCHARGED

1. Trade wastewater substances

- (a) The Customer may discharge trade wastewater into the Sewer in a manner whereby the substance characteristics of the trade wastewater are of a type and discharged at a rate, level or concentration equal to or less than that described in this schedule.
- (b) The Customer must not discharge trade wastewater into the Sewer in a manner whereby the trade wastewater discharged;
 - (i) contains, possesses or produces a substance characteristic not provided in, or which may be determined as being contrary to that described in this schedule.
 - (ii) is at or of a rate, level, or concentration not provided in, or which may be determined as being contrary to, that described in this schedule.

Substance	LTADM (kg/day)	MDM (kg/day)	Standard (mg/L)
Biochemical Oxygen Demand	8.00	25	
Suspended Solids	65.00	200	600
Ammonia	4.00	15	100
Total Dissolved Solids	350.00	1500	10000
Zinc	0.45	2	5

Radioactivity¹

- {Alpha}	12.500 Bq/L
- {Beta}	125.000 Bq/L
- {Tritium}	195,000.000 Bq/L
- Radium-228	5.000 Bq/L

¹ The waste water discharged to sewer must comply with drinking water reference activity concentrations for radionuclides at the Cronulla Sewage Treatment Plant (CSTP) as specified in Schedule 1(c). The drinking water reference activity concentrations in Schedule 1 (c) correspond to an annual dose constraint of 0.1 mSv/yr and are based on the methodology specified in the World Health Organisation's (WHO) Guidelines for Drinking Water Quality (2022) and using the conversion factors as specified in the RADIATION PROTECTION AND SAFETY OF RADIATION SOURCES: INTERNATIONAL BASIC SAFETY STANDARDS, General Safety Requirements Part 3 No. GSR Part 3 - TABLE III.2A. WORKERS: COMMITTED EFFECTIVE DOSE PER UNIT INTAKE e(g) VIA INHALATION AND INGESTION (Sv/Bq). The discharge point activity concentrations assume an agreed dilution factor of 25 as previously determined by tracer measurement and known flow rates.

Consent to Discharge Industrial Trade Wastewater

RADIOACTIVITY

Compliance with the World Health Organisation (WHO), WHO Guidelines for drinking-water quality: Fourth edition incorporating the first and second addenda 21 March 2022, and the Australian and New Zealand Conservation Council (ANZECC) Guidelines for Fresh and Marine Water Quality 2000 [Volume 3 Primary Industries — Rationale and Background Information (Irrigation and general water uses, stock drinking water, aquaculture and human consumers of aquatic foods)].

- (i) The WHO recommended reference level of committed effective dose is 0.1 mSv/yr from one- year consumption of drinking-water. This reference level of dose represents less than 5% of the average effective dose attributable annually to natural background radiation and therefore an insignificant additional risk to human health in the whole lifetime.
- (ii) The ANZECC recommended reference level of committed effective dose is 1.0 mSv/yr for the calculation of activity concentration equivalent values for specific radionuclides in irrigation and stock drinking waters.
- (iii) below the WHO reference level of committed effective dose of 0.1 mSv/yr, the drinking-water is acceptable for life-long human consumption and action to further reduce the radioactivity is not necessary.
- (iv) Below the ANZECC reference level of committed effective dose of 1.0 mSv/yr, the water is acceptable for use as irrigation and stock drinking waters
- (v) For screening purposes, the current recommended guideline values in the WHO Guidelines for Drinking-Water Quality (3rd Ed., 2004) are 0.5 Bq/L for gross alpha and 1 Bq/L gross beta activity. These values are 0.5 Bq/L for gross alpha and 0.5 Bq/L for gross beta activity in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, October 2000), after discounting the contribution due to potassium-40. This is the standard that is applied by ANZECC to irrigation and stock drinking waters. Both these sets of values are used for screening purposes only, to determine if further analysis may be required. If the WHO reference level of committed effective dose of 0.1 mSv/yr (WHO Guidelines for Drinking-Water Quality 4th Ed., 2022) is not exceeded, the water is acceptable for life-long human consumption.

To ensure compliance at the Cronulla Sewage Treatment Plant (CSTP) with drinking water reference concentrations for radionuclides, average monthly activity concentrations of discharges by ANSTO to the Sydney Water Corporation sewer shall not exceed 25 times the reference activity concentrations for radionuclides as determined by the application of the methodology specified in the WHO Guidelines for drinking-water quality recommendations, corresponding to the reference level of dose of 0.1 mSv/year.

The drinking water reference concentrations for specific radionuclides are calculated by the following formula taken from the WHO Guidelines (2022);

$$\begin{aligned} \text{GL (Bq/L)} &= \text{IDC}/(\text{h}_{\text{ing}} \times \text{q}) \\ &= 0.0001 \text{ (Sv/year)}/[\text{h}_{\text{ing}} \text{ (Sv/Bq)} \times 730 \text{ (L/year)}] \\ &= \frac{1.4 \times 10^{-7}}{\text{h}_{\text{ing}}} \end{aligned}$$

where:

GL = guidance level activity concentration of radionuclide in drinking-water (Bq/L)
IDC = individual dose criterion, equal to 0.0001 Sv/year (or 0.1 mSv/year) for this calculation,
 h_{ing} = dose coefficient (or dose conversion factor) for ingestion by adults (Sv/Bq)
q = annual ingested volume of drinking water, assumed to be 730 L/year

The dose coefficients factors to be applied are those specified in the International Atomic Energy Agency, "RADIATION PROTECTION AND SAFETY OF RADIATION SOURCES, :INTERNATIONAL BASIC SAFETY

Consent to Discharge Industrial Trade Wastewater

STANDARDS, General Safety Requirements Part 3 No. GSR Part 3 - TABLE III.2A. WORKERS:
COMMITTED EFFECTIVE DOSE PER UNIT INTAKE e(g) VIA INHALATION AND INGESTION (Sv/Bq)".

Guidance activity concentrations for some radionuclides for which their presence in ANSTO liquid effluent discharges should be assessed are given in the following table.

Radionuclides	Dose Coefficient h_{ing} (Sv/Bq) [[IAEA Safety Series No. 115 1996]]	Drinking Water Guidance Level Activity Concentration (Bq/L), equivalent to 0.1 mSv/year	Activity Concentration Equivalent (Bq/L) in Liquid effluent discharge From ANSTO (25 x Drinking water reference activity concentration)
Tritium	1.8×10^{-11}	7800	195000
Cobalt-60	3.4×10^{-9}	40	1000
Strontium-89	2.6×10^{-9}	54	1350
Strontium-90	2.8×10^{-8}	5	125
Iodine-131	2.2×10^{-8}	6	150
Caesium-134	1.9×10^{-8}	7	175
Caesium-137	1.3×10^{-8}	10	250
Radium-226	2.8×10^{-7}	0.5	12.5
Uranium-238	4.5×10^{-8}	3	75
Plutonium-239	2.5×10^{-7}	0.6	15

Where concentrations of unspecified alpha and beta particle emitting radionuclides are measured, the guidance activity concentrations for radionuclides that may be present in ANSTO effluent discharges and which have the most restrictive guidance activity concentration levels shall be used to demonstrate compliance.

In the case of unspecified alpha particle emitting radionuclides, the activity concentration equivalent for radium-226 i.e. 12.5 Bq/L (12.5×10^3 Bq/m³), based on an agreed dilution factor for ANSTO's discharges of 25, shall be used to demonstrate compliance. Where the presumed most restrictive alpha emitting radionuclides can be shown to be insignificant fraction of the overall alpha emitting components in the effluent, then the activity concentration equivalent of the next most restrictive radionuclides shall be used.

In the case of beta particle emitting radionuclides, the activity concentration equivalent for strontium-90 i.e. 125 Bq/L (125×10^3 Bq/m³), also based on an agreed dilution factor for ANSTO's discharges of 25, shall be used to demonstrate compliance. Where the presumed most restrictive beta emitting radionuclides can be shown to be insignificant fraction of the overall beta emitting components in the effluent, then the activity concentration equivalent of the next most restrictive radionuclides shall be used.

For a mixture of two or more radionuclides disposed of by discharge to sewer, the sum of the quotients obtained by dividing the average concentration over the month of each radionuclides present in the liquid discharges by the activity concentration equivalents permitted in ANSTO discharges for that radionuclide, taking into account the agreed dilution factor of 25 at the CSTP, shall not exceed 1.

For unspecified alpha and beta emitting radionuclides and tritium discharged to the sewer, the following quotient summation shall be satisfied.

$$\frac{aC_{\alpha}}{12.5 \times 10^3} + \frac{aC_{\beta}}{125 \times 10^3} + \frac{aCH^3}{195,000 \times 10^3} \leq 1$$

aC_{α} is the activity concentration (Bq/m³) for unspecified alpha particle emitting radionuclides.
See Schedule 2 Item 2 (a).

Consent to Discharge Industrial Trade Wastewater

$aC\beta$ is the activity concentration (Bq/m³) for unspecified beta particle emitting radionuclides. See Schedule 2 Item 2 (a).

aCH^3 is the activity concentration (Bq/m³) for tritium. See Schedule 2 Item 2 (a).

(d) **Tritium**

The customer shall continue to minimise the levels of Tritium in the wastewater stream.

(e) **Radium-228**

To confirm that Ra-228 is < 5 Bq/L in the wastewater discharged to sewer, the ANSTO monthly composite sample shall be analysed specifically for Ra-228 content. See Schedule 2 Item 2 (a).

Consent to Discharge Industrial Trade Wastewater

RECONCILIATION PROCEDURES:

LONG TERM AVERAGE DAILY MASS:

The Long Term Average Daily Mass is a twelve month arithmetic average of ALL daily mass discharges as calculated for each composite sample. The Daily Mass discharged is to be calculated for each of the above substances, and checked against the above Long Term Average Daily Mass (kg/day) on the basis of average concentrations of substances discharged (mg/L) over any 24 hour period as determined from composite samples, obtained by either the Customer (in accordance with Schedule 2) or Sydney Water, or a combination of sample results by both.

This average concentration (mg/L) is to be multiplied by the total discharge (kL) as recorded by the Customer's discharge flow meter over the 24 hour period in order to calculate the Daily Mass of substances discharged (kg). Exceeding the Long Term Average Daily Mass does not constitute a Breach.

ACCEPTANCE STANDARD:

The Composite Sample Concentration is to be determined for each of the above substances, and checked against the above Acceptance Standard (mg/L) for each sample obtained. Exceeding the Acceptance Standard constitutes a Breach and will also incur an increased Quality Charge as detailed in Schedule 3.

The Discrete Sample Concentration is to be determined for each of the substances identified at Schedule 2, 2 (b) and checked against the above Acceptance Standard (mg/L) for each sample obtained. Exceeding the Acceptance Standard constitutes a Breach.

MAXIMUM DAILY MASS:

This average concentration (mg/L) is to be multiplied by the total discharge (kL) as recorded by the Customer's discharge flow meter over the 24hour period in order to calculate the Daily Mass of substances discharged (kg). Exceeding the Maximum Daily Mass constitutes a Breach.

2. The trade wastewater discharged must at all times have the following properties:

- | | |
|----------------------------------|---|
| Temperature | - Not to exceed 38 degrees Celsius. |
| Colour | - Determined on a system specific basis |
| pH | - Within the range 7.0 to 10.0. |
| Fibrous material | - None which could cause an obstruction to Sydney Water's sewerage system. |
| Gross solids (other than faecal) | - A maximum linear dimension of less than 20 mm, a maximum cross section dimension of 6 mm, and a quiescent settling velocity of less than 3 m/h. |
| Flammability | - Where flammable and/or explosive substances may be present, the Customer must demonstrate to the satisfaction of Sydney Water that there is no possibility of explosions or fires occurring in the sewerage system. The flammability of the discharge must never exceed 5% of the Lower Explosive Limit (LEL) at 25° Celsius. |

3. Rate of discharge of waste to sewer:

- (a) Instantaneous maximum rate of pumped discharge 11.5 litres per second
- (b) Maximum daily discharge 1000 kilolitres
- (c) Average daily discharge 420 kilolitres

RECONCILIATION PROCEDURE:

The data obtained from applying these procedures is to be checked by the interface of a chart recorder to the Customer's flow metering equipment, or by the installation of flow metering equipment by Sydney Water, for a minimum of 7 days.

Consent to Discharge Industrial Trade Wastewater

SCHEDULE 2

(SUBJECT TO PUBLIC DISCLOSURE)

SAMPLING, ANALYSIS, FLOW RATES AND VOLUME DETERMINATION

1. The Customer must provide and make available for the purpose of sampling and analysis;
 - (a) Sampling point located at pre-treatment discharge excluding domestic sewage prior to the point of connection to the Sewer.
 - (b) Equipment necessary to allow collection of composite automatic samples on either a flow proportional or a time basis.
2. The Customer is to undertake collection and analysis of samples in accordance with the schedule detailed below:
 - (a) Composite samples are to be obtained:
 - (i) over one full production day by combining equal volumes taken at equal intervals. The volumes are to be such that at least 5,000 millilitres are obtained over the full day. The reading of the Flowmeter meter is to be obtained at the commencement and conclusion of the sampling day.
 - (ii) on 23 August 2022 and every 22 days thereafter. If trade wastewater is not discharged on this day, then the sample is to be taken on the next day that trade wastewater is discharged. Trade wastewater includes all non-domestic wastewater discharged to sewer from the premises, including cleaning waste.
 - (b) Discrete samples are to be obtained as detailed below, and analysed according to the procedures and methods specified in Sydney Water's published analytical methods, to determine the concentrations or levels of the following substance characteristics:

pH	at the start and finish of each sample day
Ammonia (as N)	at the finish of each sample day
 - (c) Composite samples are to be analysed according to the procedures and methods specified in Sydney Water's published analytical methods, or methods otherwise agreed to and detailed hereunder, to determine the concentrations or levels of the following substance characteristics:

Biochemical Oxygen Demand
Suspended Solids
Ammonia
Total Dissolved Solids
Zinc
 - (d) The Customer, or the laboratory contracted by the customer, is to submit results of analyses to Sydney Water within 21 days from the date the sample was taken. All analysis results are to be submitted on the sample analysis report provided as appendices 1 and 2 to this Consent or in such format as may be specified from time to time by Sydney Water.
 - (e) All data requested on the sample analysis report must be provided.
 - (f) Sydney Water must be notified in writing within 7 days of;
 - (i) any failure to obtain samples in accordance with the provisions of Schedule 2; or
 - (ii) any loss of any analytical data.

Where data is unavailable, lost or not provided, the Quality Charge, as detailed in Schedule 3, will be assessed on the basis of the highest Composite Sample concentration recorded in the 12 months prior to the date of the missing sample data.

Consent to Discharge Industrial Trade Wastewater

3. The volume of wastewater discharged must be obtained from the reading of the total flow on the Customer's flow metering system.

The rate of waste discharged is to be obtained by the reading of the instantaneous flow rate indicator on the Customer's flow metering system, or from any chart recorder interfaced to the Customer's flow metering system.

The flow metering system is to be calibrated at least annually at the Customer's expense, by a person or company approved by Sydney Water and a copy of the calibration certificate supplied to Sydney Water within one month of such certificate being received by the Customer.

If the Customer's flow metering system fails to record data for any period, Sydney Water is to be advised in writing by the Customer within 7 days of any such failure becoming known by the Customer. An estimate of any data not recorded is to be made as follows:

Average of the waste discharged, registered for the four weeks before and/or after the failure to record.

Consent to Discharge Industrial Trade Wastewater

SCHEDULE 3

(SUBJECT TO PUBLIC DISCLOSURE)

PAYMENTS

[REDACTED]
 [REDACTED]
 [REDACTED]

[REDACTED]

[REDACTED]
 [REDACTED]
 [REDACTED]



██████████

11

5

101

██████████

3

5

Consent to Discharge Industrial Trade Wastewater

SUBSTANCE

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]
[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

■ [REDACTED]

[REDACTED]

■ [REDACTED]

[REDACTED]

■ [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]

Consent to Discharge Industrial Trade Wastewater

SCHEDULE 4 ADDITIONAL REQUIREMENTS

1. EFFLUENT IMPROVEMENT PROGRAM

N/A

2. WASTE MANAGEMENT PLAN

The existing pre-treatment will result in the generation of 1 tonne per annum of waste substances in the form of a sludge containing generally liquid. The waste substances are, and will continue to be disposed of, in compliance with the requirements of The Environment Protection Authority.

3. OTHER REQUIREMENTS

- a) A Backflow Containment Device must be installed and maintained at the water meter outlet/property boundary in line with Sydney Water's Responsibilities Of Connected Customers Policy.
- b) Backflow individual/zone protection is required on any tap located within 5m of the trade waste apparatus.
- c) The customer may be required to provide Sydney Water with a reading from their trade wastewater discharge flowmeter on the first day of each quarter:
 - i. January
 - ii. April
 - iii. July
 - iv. October.

d) GREEN WASTE

All green waste discharged from SUEZ at Lucas Heights 2 is deemed to be trade waste. The green waste must be collected in the ANSTO holding tanks. All trade waste discharged to sewer must be sampled and analysed for all pollutants listed in schedule 1.

e) INSPECTIONS

A Sydney Water representative/s may enter the premises at any time subject to ANSTO's security requirements. ANSTO is a designated protected site.

f) RADIOACTIVITY

ANSTO will analyse all wastewater discharged to the Sydney Water Sewerage System for the following radionuclides. The results of the wastewater analysis must be submitted to Sydney Water on the monthly ANSTO report.

- Alpha
- Beta
- Tritium
- Radium-228

Consent to Discharge Industrial Trade Wastewater

SCHEDULE 5 APPARATUS, PLANT AND EQUIPMENT

EXISTING:

[REDACTED]

PROPOSED: N/A

Consent to Discharge Industrial Trade Wastewater

SCHEDULE 6 SPECIAL CONDITIONS

1. DANGEROUS DISCHARGES

In this Schedule, the term “may pose a danger to the environment, the Sewer or workers at a sewage treatment plant”;

- (a) means an occurrence whereby matter is discharged to the Sewer which either alone or in conjunction with other matter discharged cannot be adequately treated or may cause corrosion or a blockage, explosion or the production of dangerous gases in the Sewer or may adversely affect the operation of a sewer or sewage treatment plant; and
- (b) includes, but not so as to restrict the generality of paragraph (a), matter or substances, which is or are;
 - (i) toxic or corrosive;
 - (ii) petroleum hydrocarbons;
 - (iii) heavy metals;
 - (iv) volatile solvents;
 - (v) phenolic compounds;
 - (vi) organic compounds.

2. UNINTENDED DISCHARGES

- (a) For purposes of avoiding unintended discharges to the Sewer or the stormwater drainage system, all matter and substances on the Premises must be processed, handled, moved and stored in a proper and efficient manner.
- (b) Any substance on the Premises which, if discharged to the Sewer, may pose a danger to the environment, the Sewer or workers at a sewage treatment plant or may harm any sewage treatment process must be handled, moved and stored in areas where leaks, spillages or overflows cannot drain by gravity or by automated or other mechanical means to the Sewer or the stormwater drainage system

3. NOTIFICATION

In the event of a discharge of matter to the sewer that poses or may pose a danger to the environment, the Sewer or workers at a sewage treatment plant the Customer must immediately notify:

- a. Cronulla Control Room
Tel: (02) 9527 8310
- b. Sydney Water’s 24 hour emergency line 13 20 90.

4. PROVISION OF SAFE ACCESS

The Customer shall provide safe access to Sydney Water employees visiting the site. In the event that unsafe conditions are identified the Customer must take reasonable steps to correct unsafe conditions and create safe access.

Sydney Water employees must also comply with the Customer’s safety policies and procedures and any directions from the Customer’s staff while on the Customer’s site.

5. ELECTRONIC REPORTING OF SAMPLE ANALYSIS RESULTS

Sydney Water reserves the right to vary this consent to specify the option of reporting by electronic mail as outlined in Schedule 2, 2 (d).

Consent to Discharge Industrial Trade Wastewater

SCHEDULE 7

1. Premises for which Consent is granted
ANSTO NEW ILLAWARRA RD, LUCAS HEIGHTS NSW 2234
2. Industrial or other commercial activities for which Consent is granted
PROCESSING OF RADIOACTIVE MATERIALS (ZA00)

4. The date for purposes of clause 3.1 is 01 August 2022
5. The period for purposes of clause 3.2 is 24 months
6. The receiving Treatment Plant is CRONULLA Wastewater Treatment Plant / Water Recycling Plant

Consent to Discharge Industrial Trade Wastewater

SCHEDULE 8

NOTICES AND COMMUNICATION ADDRESSES

SYDNEY WATER	MANAGER MAJOR CUSTOMERS PO Box 399 PARRAMATTA 2150	TEL: 13 20 92 A.H: 13 20 90
CUSTOMER:	CHIEF EXECUTIVE OFFICER AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION LOCKED BAG 2001 KIRRAWEE DC NSW 2232	TEL: (02) 9717 3111 FAX: (02) 9717 9277

SCHEDULE 9

AUTHORISED OFFICERS

SYDNEY WATER:	MANAGER MAJOR CUSTOMERS PO Box 399 PARRAMATTA 2150	TEL: 13 20 92 A.H: 13 20 90
Email: businesscustomers@sydneywater.com.au		
CUSTOMER:	CHIEF EXECUTIVE OFFICER AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION LOCKED BAG 2001 KIRRAWEE DC NSW 2232	TEL: (02) 9717 3111 FAX: (02) 9717 9277

SCHEDULE 10

NOMINATED REPRESENTATIVES

SYDNEY WATER:	MANAGER MAJOR CUSTOMERS PO Box 399 PARRAMATTA 2150	TEL: 13 20 92 A.H: 13 20 90
CUSTOMER:	MANAGER WASTE MANAGEMENT SERVICES AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION LOCKED BAG 2001 KIRRAWEE DC NSW 2232	TEL: (02) 9717 3111 FAX: (02) 9717 9277

Consent to Discharge Industrial Trade Wastewater

APPENDIX 1 (Example)

SAMPLE ANALYSIS REPORT (COMPOSITE) DISCHARGE METER

Consent Number:	4423
Company Name:	AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION, ANSTO
Company Address:	ANSTO NEW ILLAWARRA RD, LUCAS HEIGHTS NSW 2234
Sample Type:	
☐ 6 (composite, manual time based)	Start date: ____/____/____
☐ 7 (composite, manual flow proportional)	Finish date: ____/____/____
☐ 8 (composite, automatic time based)	Start time: ____:____ am/pm
☐ 9 (composite, automatic flow proportional)	Finish time: ____:____ am/pm
grabs taken in sample period: ____	Initial meter reading: ____ KL
sample intervals min/kL ____	Final Meter reading: ____ kL
mL per grab: ____	Volume discharged: ____ kL

Laboratory:		
Substance	Acceptance Standard (mg/L)	Measured Concentration(mg/L)
AMMONIA (AS N)	100	
BIOCHEMICAL OXYGEN DEMAND	NA	
SUSPENDED SOLIDS	600	
TOTAL DISSOLVED SOLIDS	10000	
ZINC	5	

COPY OF ORIGINAL ANALYTICAL LABORATORY REPORT TO BE ATTACHED

NOTE: LABORATORY REPORT MUST CERTIFY NATA REGISTRATION FOR EACH ANALYSIS

Comments: _____

Customer Signature: _____ Date: ____/____/____

Designation: _____

OFFICE USE ONLY

Sample No:

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EMAIL TO:



Consent to Discharge Industrial Trade Wastewater

APPENDIX 2 (Example)

SAMPLE ANALYSIS REPORT (DISCRETE SAMPLE)

Consent Number:	4423
Company Name:	AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION, ANSTO
Company Address:	ANSTO NEW ILLAWARRA RD, LUCAS HEIGHTS NSW 2234

Sample Type:	DISCRETE
Start Date: ____/____/____	Start time: ____:____ am/pm
Finish Date: ____/____/____	Finish Time: ____:____ am/pm

Laboratory:

Substance	Acceptance Standard (units or mg/L)	Measured Units or Concentration.
pH at start	7 – 10	
pH at finish	7 – 10	
Ammonia (as N)	100	

COPY OF ORIGINAL ANALYTICAL LABORATORY REPORT TO BE ATTACHED
NOTE: LABORATORY REPORT MUST CERTIFY NATA REGISTRATION FOR EACH ANALYSIS

Comments: _____

Customer Signature: _____ Date: ____/____/____
Designation: _____

OFFICE USE ONLY

Sample No:

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EMAIL TO:



Consent to Discharge Industrial Trade Wastewater

GENERAL CONDITIONS

Recitals:

- A. Under its Operating Licence, Sydney Water provides sewerage services and treats and disposes of trade wastewater. The objectives of Sydney Water include operating as an efficient business, maximising the net worth of the State's investment and exhibiting a sense of social responsibility by having regard to the interests of the community. Sydney Water has special objectives of reducing risks to human health and preventing degradation of the environment.
- B. Sydney Water is granted licences by the Environment Protection Authority, which are subject to conditions to discharge pollutants. A change to a licence condition may require that variations be made to a consent granted by Sydney Water.
- C. In the conduct of its business operations, Sydney Water must comply with its obligations, duties and responsibilities under the Act and its Operating Licence and the Protection of the Environment Administration Act 1991, the Protection of the Environment Operations Act 1997 and the Protection of the Environment Legislation Amendment Act 2011.
- D. The customer requests that Sydney Water grant consent to the customer for purposes of discharge of trade wastewater from the premises to the sewer.

Sydney Water grants to the customer consent to discharge trade wastewater, subject to the terms and conditions specified in this consent. The customer accepts the consent and agrees to be bound by the terms and conditions of this consent:

1. Definitions and interpretation

- 1.1 In this consent, unless the contrary intention appears;

Acceptance standards means Sydney Water's published concentration limits for certain substances in trade wastewater.

Act means the Sydney Water Act 1994.

Business Customer Representative means an officer of Sydney Water who is authorised to enter land or buildings for purposes of carrying out his or her duties in relation to Sydney Water's trade wastewater service.

Consent means this consent together with its attached schedules and appendices. Any definitions or standards referred to in this consent but not contained in it are deemed to form a part of this consent with necessary changes being made to accommodate their inclusion.

Authorised officer means:

- with respect to Sydney Water, the person from time to time holding the position pertained in schedule 9 or such other person or position as may be nominated by Sydney Water from time to time;
- with respect to the customer, the person identified, and includes the details specified, in schedule 9 or as may be notified to Sydney Water by the customer from time to time.

Breach means any contravention of or non-compliance with a term, condition or provision of this consent or the Act.

Chargeable trade waste mass means the mass of a pollutant subject to quality or critical substance charges.

Composite sample means a sample of trade wastewater obtained by combining equal volumes at either equal time or flow intervals.

Critical mass charge means the charge applied to some critical and over capacity substances as calculated in accordance with the provisions set out in schedule 3.

Critical substance means a substance determined to be critical and notified from time to time by Sydney Water.

Customer means the party or parties (except Sydney Water) who executes or execute this consent.

Daily mass means the mass of a substance discharged during a 24-hour period.

Default notice means a notice issued in accordance with clause 8.1.

Domestic concentration means the concentration of a pollutant deemed by Sydney Water to be equivalent to that found in domestic wastewater.

Domestic wastewater means water which has in it human faecal matter, urine or refuse of any type produced in, and which is permitted to be discharged to a Sydney Water sewer from, any premises used exclusively for residential purposes.

Environment Protection Authority means the statutory authority established under section 15 of the Protection of the Environment Administration Act 1991

Equivalent domestic mass means the mass of a substance that would be expected in the trade wastewater if it were at domestic concentration.

Flow weighted charge means the portion of a substance's charge for a billing period that is attributed to any sample collected in accordance with schedule 2 or, if such sample is required but is not collected, then fixed by Sydney Water in accordance with schedule 2.

Flow weighting factor means a factor used to determine charges as described in schedule 3.

Long term average daily mass means, for each pollutant, the figure listed in schedule 1 and used to determine critical mass charges as described in schedule 3.

Lower explosive limit means the minimum concentration of flammable and/or explosive substances that would result in a fire or explosion.

Mass discharged means the mass of a pollutant discharged on a sample day and is measured by

GENERAL CONDITIONS

multiplying the composite sample concentration by the trade wastewater discharge for that sample day.

Maximum daily mass means the greatest mass of a substance permitted for discharge within a 24-hour period.

Over capacity means the status of a substance as determined in accordance with Sydney Water's Trade Waste Policy, 2007.

Over capacity substance means a substance determined to be over capacity and notified from time to time by Sydney Water.

Premises means the land, plant and buildings described and specified in paragraph 1 of schedule 7, on or in which the customer carries on industrial or other commercial activities specified in paragraph 2 of schedule 7.

Quality charge means a pollutant charge applied to trade waste discharges based on the mass of each pollutant discharged to sewer.

Regulator means any statutory authority, which may grant permission, authority or licence to Sydney Water to operate the sewer or treat or dispose of sewage treatment by-products.

Residual products means biosolids, re-use water or such other product intended for re-use as may be developed by Sydney Water from time to time.

Risk index means a ranking applied to the consent by Sydney Water to describe the relative risk of accepting the trade wastewater. Determination of the risk index will be based on the methodology determined from time to time by Sydney Water, or as may be necessary in the opinion of Sydney Water to take into account particular circumstances. The risk index is used to determine, among other things, the amount of self-monitoring required, the number of inspections to be performed by Sydney Water, the annual consent fee and the term of the consent.

Sewer means the sewerage service of Sydney Water, including the sewage treatment plant, discharge to which is facilitated by a discharge point situated on the premises and specified in item 3 of schedule 7.

Significant breach means any breach of a nature outlined at clause 15.2. Such breaches may result in immediate suspension or termination of the consent.

Standard mass charging rate means the charge per kilogram for substances as defined in schedule 3.

Sydney Water means Sydney Water Corporation.

Responsibilities of connected customers policy means Sydney Water's policy detailing the conditions under which Sydney Water will agree to accept trade wastewater to sewer.

Trade wastewater means any liquid and any substance in it that is produced in an industrial or commercial activity at the premises and discharged into the sewer, but does not include domestic wastewater.

Trade waste residue means any substance separated and retained, from trade wastewater being discharged into the sewer.

1.2 In this consent, unless the contrary intention appears:

- (a) A reference to an Act or any delegated legislation or instrument made under an Act includes any other Act delegated legislation or instrument as may amend or replace any of them.
- (b) A reference to a word or expression
 - (i) in the singular form includes a reference to the word or expression in the plural form; and
 - (ii) in the plural form includes a reference to the word or expression in the singular form.
- (c) A reference to a party or a natural person includes a reference to a corporation.
- (d) A word or expression that indicates one or more particular genders is taken to indicate every other gender.
- (e) Headings to clauses and paragraphs are included in this consent to assist understanding of its terms and conditions but are not intended to affect the meaning or application of any term or condition.
- (f) A reference to a clause, schedule or appendix is a reference to a clause of or schedule or appendix to this consent and any such schedule or appendix is a part of this consent.

1.3 Remedies available to the parties under this consent;

- (a) are cumulative; and
- (b) do not prejudice or affect any other remedy available to the parties.

1.4 No rule of construction applies to the disadvantage of a party because that party was responsible for the preparation of this consent or any part of it.

2. Application of certain statutes and laws

2.1 This consent is made under and is subject to the provisions of the Act.

2.2 This consent is governed by and will be performed according to the law applicable in the State of New South Wales.

2.3 Subject to the terms and conditions of this consent the customer has lawful authority to dispose of trade wastewater for purposes of;

- (i) Section 115 of the Protection of the Environment Operations Act 1997; and
- (ii) Section 49 of the Act; and

3. Commencement and term of consent

3.1 This consent commences on the date specified in paragraph 4 of schedule 7.

3.2 This consent will, unless terminated or renewed in accordance with this consent, continue for the period specified in item 5 of schedule 7.

GENERAL CONDITIONS

4. Discharge of trade wastewater into sewer

- 4.1 The customer may discharge trade wastewater from the premises into the sewer in accordance with the provisions of schedule 1 and schedule 4.
- 4.2 The customer must not discharge trade wastewater from the premises into the sewer contrary to the provisions of schedule 1 and schedule 4.
- 4.3 The customer indemnifies Sydney Water against all damages, losses, costs or expenses suffered or incurred by Sydney Water, caused by any unauthorised discharge from the premises in respect of:
- (a) injury (including death) or harm to any person; or
 - (b) damage to property vested in Sydney Water; or
 - (c) contamination of residual products; or
 - (d) material harm to any sewage treatment process
- provided that the said damages, losses, costs or expenses suffered or incurred by Sydney Water are caused by any unauthorised discharge of trade wastewater or other matter into the sewer by the customer which is in breach of this consent or by any other person from the customer's premises, except to the extent to which the damages, losses, costs or expenses (as the case may be) were caused by either the negligent or wilful act or omission of Sydney Water or a breach of this consent by Sydney Water.
- 4.4 The customer must take all precautions reasonably practicable to ensure that no person, other than a person acting for or on behalf of or with the consent of the customer, discharges any matter from the premises into the sewer.
- 4.5 For purposes of this consent, every discharge of matter from the premises into the sewer will be taken to have been a discharge by a person acting for or on behalf of, or with the consent of, the customer.

5. Charges

- 5.1 The customer must pay Sydney Water charges with respect to trade wastewater discharged to the sewer, the administration of this consent and, when applicable, the processing of grease trap waste determined in accordance with, and within the time and in the manner specified in schedule 3.
- 5.2 Sydney Water may vary the basis of charges or the charging rates in schedule 3;
- (a) as and when determined by the Independent Pricing and Regulatory Tribunal of New South Wales (IPART); or
 - (b) by written consent with the customer.

6. Inspections

- 6.1 A Business Customer Representative may enter the premises at any time;
- (a) for purposes of inspecting whether the activities of the customer are being conducted in accordance with this consent; or

- (b) for the purposes described in Section 38 of the Act or exercising any right or function conferred on Sydney Water under this consent.

This clause does not limit Sydney Water's statutory powers of entry.

- 6.2 When exercising rights under clause 6.1;

- (a) a Business Customer Representative must not cause any delay or inconvenience to the efficient conduct of business activities by the customer which could be reasonably avoided; and
- (b) except for any relevant safety precautions, a Business Customer Representative must not be impeded or delayed by any person on the premises.

- 6.3 If, in the opinion of Sydney Water, it is necessary for a Business Customer Representative to exercise rights under clause 6.1, the customer will make payment in accordance with the provisions of schedule 3.

7. Inquiries

- 7.1 Sydney Water may convene and determine the terms of reference of a joint inquiry about the circumstances relating to an incident that may have caused a breach.
- 7.2 An inquiry under clause 7.1 is to be conducted informally and without legal representation for purposes of gathering information about an incident directly from any person who may be expected to know, from his or her own observations, about the circumstances relating to the incident.
- 7.3 An inquiry under clause 7.1 may be conducted irrespective of whether the incident, the subject of the inquiry, is also the subject of a default notice.
- 7.4 Before conducting an inquiry under clause 7.1, the customer and Sydney Water may agree about what action, if any (except any action pursuant to a statutory obligation), may be taken with respect to any information that may be gathered during the inquiry.

8. Default procedures

- 8.1 If, in the opinion of Sydney Water, the customer commits, causes or allows a breach to occur, Sydney Water may issue to the customer a default notice.
- 8.2 A default notice must;
- (a) provide any relevant particular of the breach alleged by Sydney Water, including any particular known to Sydney Water that may assist the customer to ascertain the alleged breach; and
 - (b) specify that the customer must provide a response in writing to Sydney Water within seven days of receipt of the notice.
- 8.3 A default notice is not invalid merely because it does not provide a particular that may assist the customer to ascertain the alleged breach.
- 8.4 Any supply to the customer by Sydney Water of particulars under clause 8.7(a) is taken, for purposes of clause 8.5, to be a default notice under clause 8.1.

GENERAL CONDITIONS

- 8.5 The customer must supply to Sydney Water a written response to a default notice within seven days of receipt of the default notice which must;
- (a) request further particulars of the alleged breach; or
 - (b) describe or explain the circumstances causing;
 - (i) the event which appeared to Sydney Water to be a breach; or
 - (ii) the breach to occur; and
 - (c) describe any action taken with respect to the alleged breach; and
 - (d) provide a plan of action to be taken by the customer to avoid the occurrence of any incident similar to the alleged breach; or
 - (e) explain the reasons of the customer for disputing the alleged breach.

8.6 The customer may make one request only for particulars under clause 8.5(a) with respect to a default notice.

8.7 When the customer responds in writing to Sydney Water in accordance with clause 8.5, Sydney Water must within seven days of receipt of that response either;

- (a) with respect to clause 8.5(a), provide in writing to the customer any further particulars that it may be able to provide in which case the customer shall be allowed a further seven days from receipt of those particulars to respond as required by clause 8.5(b)
- (b) specify to what extent it accepts, rejects or disagrees with the response under 8.5(b) and provide details of any action it proposes to take (including any special requirements it may impose) to deal with the breach.

8.8 The issue by Sydney Water of a default notice is without prejudice to any right or power Sydney Water may have pursuant to this consent or conferred on it by statute or statutory rule.

9. Improvement program

9.1 The customer must, at its own expense, establish and carry out the improvement program specified in, and in accordance with the provisions of, schedule 4.

9.2 If, prior to any failure to comply, the customer notifies Sydney Water that it may not be able to comply with any obligation under clause 9.1, Sydney Water will consider any reasonable proposal of the customer to vary a term or condition of the improvement program.

10. Diligence program

10.1 Within six months of the making of this consent, the customer must give a notice to Sydney Water specifying a current diligence program.

10.2 For purposes of clause 10.1, a diligence program includes a plan, whereby the customer demonstrates that the management of the customer is exercising reasonable care in planning and taking appropriate action, to prevent or minimise the effects of any incident that may constitute a breach.

11. Suspension or termination of consent to discharge trade wastewater

11.1 Sydney Water may suspend the consent granted in clause 4.1 if;

- (a) the customer does not comply with clause 8.5, 9.1, 12.1, 12.2 or notice of the suspension is given to the customer; or
- (b) Sydney Water is for any reason specified in clause 11.2 unable to accept for treatment trade wastewater that may be discharged by the customer.

11.2 Sydney Water may, by a notice given to the customer, suspend the consent granted in clause 4.1 if, in the reasonable opinion of Sydney Water;

- (a) an emergency prevents the sewer from accepting any or certain specified categories of trade wastewater that may be discharged by the customer; or
- (b) an event has occurred, which could have an adverse effect on any employee or agent of or contractor to Sydney Water or the sewer, including any biological process.

whether the emergency or event is caused by fire, storm, tempest, flood, malicious damage, act of war, civil disobedience, explosion, earthquake or an act or omission of an employee, or agent of, or contractor to Sydney Water, or an unlawful discharge of matter into the sewer, or some other cause.

11.3 The period of any notice of suspension given under clause 11.2 will be no shorter than any period, which in the opinion of Sydney Water the circumstances dictate.

11.4 The customer must comply with any notice under clause 11.1 or 11.2 subject only to any delay that may be required to safeguard the health or life of any person.

11.5 Any suspension under clause 11.1 or 11.2 must not be for a period longer than, in the opinion of Sydney Water, the circumstances dictate.

11.6 If the customer does not cease discharging trade wastewater in accordance with a notice given under clause 11.1 or 11.2 and Sydney Water is of the opinion that the customer is not taking appropriate measures to stop the discharge, a Business Customer Representative may, with such other persons as he or she may think necessary, enter the premises and take such measures as he or she may think necessary to stop the discharge.

11.7 A suspension under clause 11.1 or 11.2 or any action that may be taken in accordance with clause 11.6 does not give rise to any remedy to the customer against Sydney Water for, or in respect of, the suspension or action.

11.8 Any costs incurred by Sydney Water with regard to taking action under clause 11.6 is a debt payable to

GENERAL CONDITIONS

Sydney Water by the customer on demand made by Sydney Water.

- 11.9 Sydney Water may suspend the consent granted in clause 4.1 if; the discharge of trade wastewater by the customer in accordance with the consent granted under clause 4.1, by itself or in conjunction with the discharges of other persons is likely, in the opinion of Sydney Water, to cause Sydney Water to contravene any legislation, permission, authority or licence granted by a regulator, or any other regulatory authority.
- 11.10 Any suspension under clause 11.9 must be terminated as soon as Sydney Water is reasonably satisfied that the conditions giving rise to the suspension no longer exist.
- 11.11 If the customer and Sydney Water cannot agree in accordance with clause 11.10, they will initiate and attend discussions with the regulator to resolve any relevant matter.
- 11.12 If, after discussions under clause 11.11 the customer and Sydney Water fail to agree in accordance with clause 11.10, the consent granted in clause 4.1 may be terminated by Sydney Water.
- 11.13 Without limitation of the effect of any other clause in this consent, Sydney Water may terminate or suspend the customer's permission to discharge trade wastewater immediately by written notice to the customer, if in the opinion of Sydney Water the customer's discharge of trade wastewater is in breach of this consent and is likely to cause;
- (a) Sydney Water's contravention of the condition of any licence issued to it by the EPA; or
 - (b) the failure to meet a product specification of any of Sydney Water's residual products.
 - (c) Sydney Water to breach or fail to comply with any legislation.
- 11.14 A suspension under clause 11.9 or 11.13 in accordance with the terms of this consent or a termination under clause 11.12 or 11.13 in accordance with the terms of this consent does not give rise to any remedy to the customer against Sydney Water for or in respect of the suspension or termination.
- 11.15 Without limitation of the effect on any other clause in this consent, Sydney Water may terminate or suspend the customer's consent to discharge trade wastewater immediately by written notice served on the customer in accordance with Section 100 of the Act, on the occurrence of any one of the following events;
- (a) The customer fails to pay to Sydney Water any amount due and payable under this consent within twenty-one days of the due date for payment and such payment is not made within fourteen days of a written request from Sydney Water to do so.

- (b) The customer is in breach of the consent and is unable or unwilling to remedy the breach of consent as required by Sydney Water.

The customer acknowledges and agrees that if, following the termination of the consent, it continues to discharge trade wastewater into the sewer, a Business Customer Representative may enter the customer's premises and take all reasonable necessary steps to stop the customer's continued discharge of trade wastewater to the sewer. The right of entry conferred by this clause is in addition to, and not in substitution for, any power of entry conferred on Sydney Water by the Act.

12. Supply of information

- 12.1 Any information supplied by the customer to Sydney Water for purposes of making this consent or for any purpose of this consent must as far as reasonably possible be a true and complete disclosure by the customer for purposes of enabling Sydney Water to;
- (a) determine whether to grant the consent in clause 4.1; and
 - (b) determine whether there has been any breach of this consent.
- 12.2 The customer must not, in or in connection with a document supplied to Sydney Water for purposes of making this consent or for any purpose of this consent, furnish information, which is false or misleading in a material particular with regard to the trade wastewater to be discharged to the sewer.
- 12.3 Sydney Water must not disclose any confidential information obtained in connection with the administration or execution of this consent, unless that disclosure is made;
- (a) with the consent in writing of the customer
 - (b) with other lawful excuse.

13. Sampling

- 13.1 For purposes of this consent, schedule 2 specifies sampling and analysis criteria, flow rates and volume determinations of trade wastewater to be discharged or discharged under clause 4.1.
- 13.2 A Business Customer Representative may take as many samples of trade wastewater at any point in any production process or storage facility, or at any other point on the premises, as he or she thinks fit.
- 13.3 The customer must comply with the provisions of schedule 2.

14. Apparatus, plant and equipment for recording or treating trade wastewater

- 14.1 The customer must, at its own cost, provide, operate and maintain in an effective and efficient working order, the apparatus, plant and equipment described in schedule 5 for purposes of regulating, treating, determining and measuring the quality, quantity and

GENERAL CONDITIONS

rate of discharge of trade wastewater under clause 4.1.

- 14.2 Sydney Water may require the customer to use its discretion to formulate and take such additional actions as may be appropriate to achieve the objects which, in the opinion of Sydney Water, are necessary for the customer to regulate, treat, determine or measure trade wastewater for purposes of discharge under clause 4.1.
- 14.3 The customer must, at its own costs, maintain records in such manner as may be required by Sydney Water, of all measurements, sampling and results obtained in the course of treatment and discharge of trade wastewater under clause 4.1.
- 14.4 The customer must submit to Sydney Water documents containing records of results specified in schedule 2.
- 14.5 The customer must maintain records of particulars and dates of cleaning and maintaining all apparatus, plant and equipment described in schedule 5 and particulars, dates and method of disposal of trade waste residue from such apparatus, plant and equipment.
- 14.6 The customer acknowledges that Sydney Water does not approve or warrant that any apparatus, plant or equipment used by the customer is sufficient for purposes of processing or treating trade wastewater for discharge under clause 4.1.

15. Variation and renewal of consent

- 15.1 Before varying, substituting or adding any process conducted or to be conducted on the premises that may cause the volume, rate or quality of wastewater discharged to change from that agreed under schedule 1 and schedule 4, the customer shall give Sydney Water not less than 14 days written notice of its intention. Any variation, substitution or addition shall only be conducted after receipt of written approval to same and subject to any conditions (including any requirement to vary the terms of this consent) that Sydney Water may impose.
- 15.2 Sydney Water may vary the terms of this consent where:
- (a) Sydney Water alleges a single significant breach or three breaches of the same nature, to have occurred in a six month period; or
 - (b) in the opinion of Sydney Water, a substantial or material part of any plan of action under clause 8.5(d) may not be completed for a period exceeding 90 days; or
 - (c) the customer gives Sydney Water notice under clause 15.1.

For the purposes of this clause and without limitation, the following circumstances shall be regarded as being a single significant breach:

- (i) an activity or event that could adversely affect; the health and safety of any employee, agent or

contractor to Sydney Water, the integrity of Sydney Water assets or the viability of any of Sydney Water's treatment processes or products; or

- (ii) failure to achieve effluent improvement program milestone; or
 - (iii) failure to install pre-treatment; or
 - (iv) by-pass pre-treatment and/or installation of equipment that facilitates by-pass of pre-treatment; or
 - (v) flow-meter turned off or bypassed.
- 15.3 A renewal of this consent may be initiated by the customer:
- (a) not less than two months before the date of expiration of this consent, and
 - (b) not more than six months before the date of expiration of this consent.
- 15.4 If this consent remains current immediately prior to the expiration of the term detailed in 3.2, or any subsequent terms renewed in accordance with this clause, and:
- (a) the customer has not given notice in accordance with clause 20.1 of this consent and;
 - (b) Sydney Water has not given to the customer at least 30 days' notice prior to the expiration of this consent, of its intention to permit the consent to expire in accordance with clause 3.2

Then this consent shall be deemed to be renewed immediately following its expiration, for a further period of six months.

- 15.5 Any amended schedules that Sydney Water prepares in response to a variation or renewal will be taken to be incorporated into this consent;
- (a) on execution by the customer; or
 - (b) after 14 days of receipt by the customer of the notice of the variation or renewal.
- 15.6 The notification of alterations to the critical status of any pollutants does not constitute a variation.

16. Disposal of trade waste residue

The customer must not dispose of any trade waste residue, except in accordance with the requirements of the EPA.

17. Disposal of grease trap wastes

The customer must not dispose of grease trap wastes other than in accordance with Sydney Water's 'Wastesafe' Management System.

18. This consent comprises all applicable terms and conditions

- 18.1 The provisions of this consent comprise all of the applicable terms and conditions between the parties.
- 18.2 It is declared by the parties that no further or other promises or provisions are, or will be claimed to be implied, or to arise between the parties by way of collateral or other agreement by reason of any promise, representation, warranty or undertaking given or made by any party (or its agent) to another, on or prior to the

GENERAL CONDITIONS

execution of this deed, and the existence of any such implication or collateral or other agreement, is hereby negated by the parties.

- 18.3 Clauses 18.1 and 18.2 do not prejudice the ability of the parties to vary or amend this consent in accordance with the provisions of this consent or by a further consent in writing.

19. No transfer or assignment

The customer cannot transfer or assign the consent granted in clause 4.1 nor any other right or obligation the customer has or may have under this consent, without the prior consent in writing of Sydney Water.

20. Termination of consent by customer

- 20.1 Termination of this consent may be effected by the customer upon the giving of at least 30 days' notice in writing to Sydney Water. The notice must state the date on which this consent terminates.
- 20.2 The customer is bound by the provisions of this consent with regard to any discharge of trade wastewater into the sewer from the premises, including the payment of charges under clause 5.1, from the commencement of this consent until its termination.
- 20.3 Notwithstanding provisions contained elsewhere in this consent the parties may terminate this consent in writing by mutual agreement provided the parties enter into a further trade waste consent immediately following termination of this consent.

21. Notices and communications

- 21.1 A notice or communication under this consent must be in writing.
- 21.2 For purposes of clause 21.1, a notice or communication may;
- (a) be left at the address of the addressee; or
 - (b) be sent by prepaid ordinary post to the address of the addressee; or
 - (c) sent by facsimile transmission to the facsimile number of the addressee
 - (d) sent by email to the email address of the addressee as specified in schedule 8 or such other address as may be notified by the addressee to the other party.
- 21.3 Unless a later time is specified in it, a notice or communication takes effect from the time it is received.
- 21.4 Unless the contrary is shown, for purposes of clause 21.3, if a notice or communication is;
- (a) a letter sent by pre-paid post, it will be taken to have been received on the third day after posting; or
 - (b) a facsimile, it will be taken to have been received on receipt by the sender, of the written or oral advice of the addressee that the whole of the facsimile transmission has been received by the addressee in a form that is legible.

22. Miscellaneous

Each party must act in good faith in the implementation of this consent and, without limiting the scope of this obligation, must also seek to resolve any difference or dispute between them as to the consent in good faith.

23. Entire consent

This consent constitutes the entire agreement between the parties in relation to its subject matter. No understanding, arrangement or provision not expressly set out in this consent will bind the parties. Accordingly all correspondence, negotiations and other communications between the parties in relation to the subject matter of this consent that precede this consent are superseded by and merged in it.

Note: This consent has no effect until it is executed for and on behalf of Sydney Water Corporation.

Contact Us

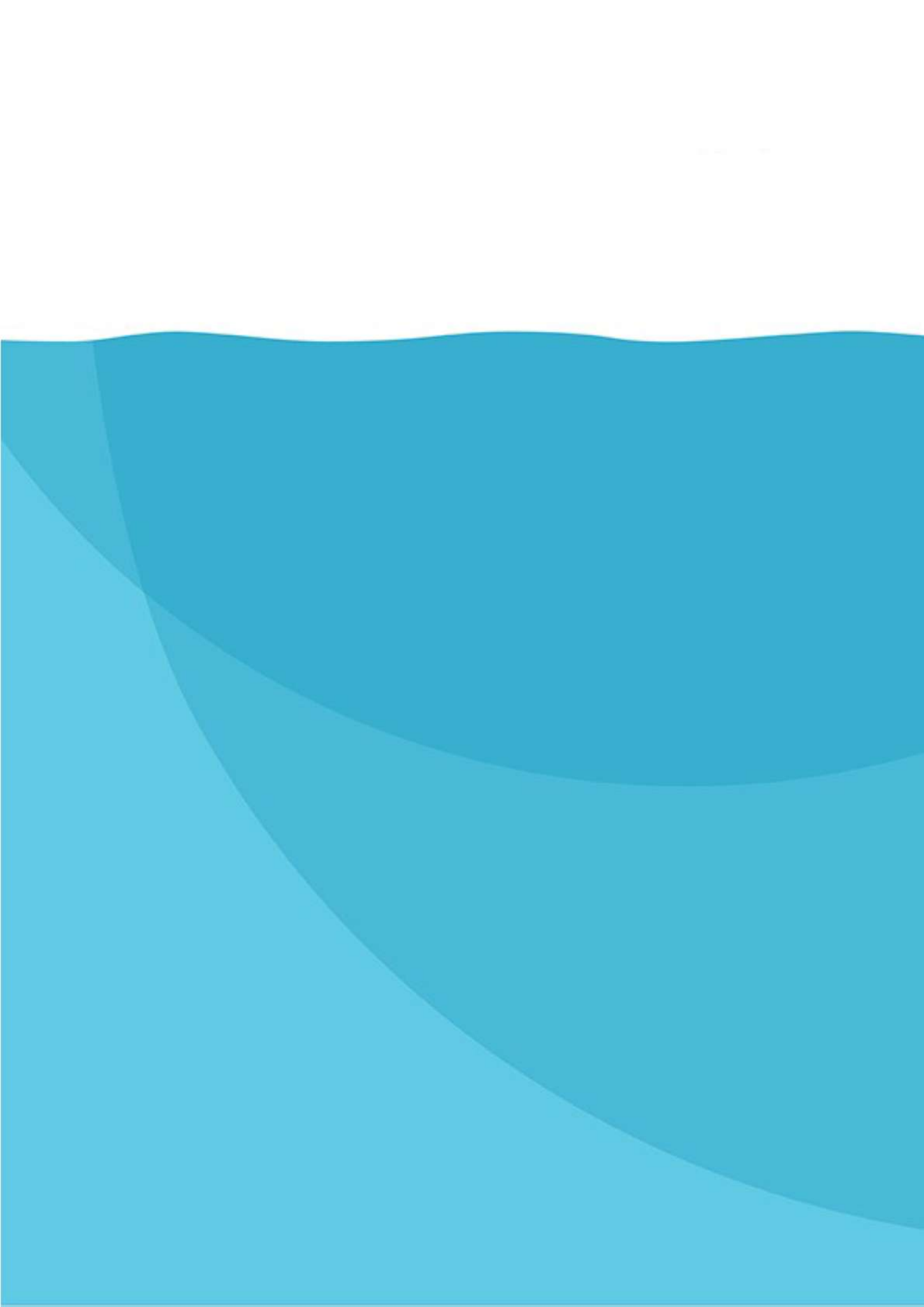
To find out more visit
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Postal address

Sydney Water
PO Box 399
Parramatta NSW 2124

Sydney Water

ABN 49 776 225 038
BCS034





Health, Safety, Community & Environment Policy

AB-0002

Why is it important?

ANSTO is committed to our core values of Safe, Secure and Sustainable. It is essential that we protect, promote, and enhance the physical and psychological health and wellbeing of our people, as well as our community and the environment. We acknowledge that we all have a role to play in protecting our people, community, and the environment - when we see something, we say something.

Managing our health and safety risks: safety is everyone's responsibility

Safety is not compromised by other priorities. We manage our health and safety risks by embedding our values as core behaviours in all aspects of our organisation centred on being safe. We fulfil our duties to consult and seek the participation of our staff in identifying hazards, risk assessment, selecting and implementing controls, and developing safe work systems and environments. Our staff are empowered to stop work if they feel unsafe. We seek opportunities for continual improvement. In consultation with, and with the participation of, our workers and key stakeholders we aim to fulfil our legal and other requirements and identify safety hazards and risks, then assess their impact (actual and potential). We aim to eliminate risks where it is reasonably practicable and otherwise implement safety controls to minimise risks using the hierarchy of controls.

Working with our communities: building enduring beneficial relationships

We seek to contribute to the health, wellbeing, economic and social development of our communities by building and maintaining mutually beneficial relationships with our communities that are based on trust and care. We consult with our community stakeholders in good faith on matters that directly affect them. We maintain effective complaints handling processes and ensure community members are made aware of them. We continue to develop and deliver cultural awareness and competency training with input from appropriate Indigenous groups and other relevant agencies. We recognise and support diversity, inclusion, and equity as fundamental to our organisation and values. We are committed to ending forced labour, modern slavery, human trafficking, and child labour.

Managing our environmental risks

We are committed to protecting the environment from our operations and preventing or minimising pollution to the satisfaction of 'as low as reasonably practicable.' We assess all environmental impacts methodically by identifying and managing environmental aspects through appropriate and effective controls. We ensure that we fulfil our environmental compliance obligations and embed the principles of ecologically sustainable development in all activities that have a potential impact on the environment. We maintain awareness of and accountability for any adverse impacts of our work and promoting environmental guardianship. We continually improve our environmental management system and environmental performance through setting clear targets and objectives. We use sustainable procurement practices to reduce the adverse impacts of purchased products and services on the environment throughout their life cycle and beyond.

What else is important for you to know about ANSTO health, safety, community and environmental management?

Health and Safety at Work

ANSTO understands its obligations and responsibilities under the Work Health and Safety Act 2011 (WHS Act) and all other relevant Australian Government legislation, regulation, and policies. It is essential that we fulfil our duties to ensure our workers are provided with a safe and healthy workplace and that risks to health and safety are eliminated so far as is reasonably practicable.

- We have embedded and continue to improve the health and safety management system and performance, consistent with the international standard ISO 45001. Applying a systematic quality management approach consistent with the international standard ISO 9001 in support of organisational excellence.
- We comply with legal and regulatory requirements at a minimum.
- We maintain systems to inform our people and other stakeholders about potential health and wellbeing hazards and controls.
- We monitor and enhance the effectiveness of health and wellbeing risk and exposure controls.
- We use the hierarchy of controls (elimination, substitution, separation, engineering, administrative, personal protective equipment).

Modern Slavery

ANSTO has published a Modern Slavery Statement in accordance with the Modern Slavery Act 2018 (Cth).

- We manage the risks of modern slavery in our operations and supply chains and act to address those risks through our procurement practices.
- Through our three core values, Safe, Secure and Sustainable, we recognise the importance of the same ethical conduct and protection of human rights as is critical to upholding our commitment to eradication of modern slavery. We do this through compliant, responsible, and ethical business practices.

Environmental protection

ANSTO is committed to improving our environmental performance in accordance with Australian Government legislation and policy. We manage environmental impacts using the hierarchy of controls and use a range of communication methods, including all staff messages and intranet content, to support staff to mitigate environmental impacts.

- We ensure compliance with relevant Australian Government environment legislation, regulation and policies and other relevant requirements to prevent or minimise adverse impacts.
- We preserve cultural heritage and manage it in consultation with relevant stakeholders as part of our contribution to the preservation of the physical and intangible cultural artefacts and living stories inherited from past generations.
- Where it aligns with ANSTO's long-term strategic planning objectives, ANSTO aims to conserve and improve the ecological value of our campuses and buffer zone.
- We embed environmental considerations into all decision-making processes and implement an environmental management system consistent with the ISO 14001 standard.

Purpose

The purpose of this procedure, Project Environmental Protection Requirements (PEPR - hereafter referred to as the Requirements) is to provide direction for the protection of the environment in relation to construction or other projects that are proposed on ANSTO property or on behalf of ANSTO that will or may have an impact on the environment.

These Requirements form the basis for how the project team shall identify, manage and document any environmental impacts that will or may result within [AF-5947 Project / Construction Environmental Management Plan](#) (P/CEMP). All P/CEMP's must be approved by Environmental Management Systems Manager.

These Requirements form part of the These Requirements form part of the [AG-2067 Environmental Management System Manual](#), [AG-3219 ANSTO Building Code](#) and the [AG-8155 Project Management Lifecycle Framework](#).

These Requirements extend to contractors, sub-contractors and procurement practices.

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1. Application of these requirements to all projects

All projects and maintenance works must consider any environmental impacts and mitigate these impacts as low as reasonably practicable. To ensure appropriate resources to mitigate environmental harm, the project team or maintenance works planner/supervisor should identify these impacts as early as possible. The project governance steps in relation to the management of environmental impacts for all projects is shown in **Image 1**. To assist projects with the early identification of requirements to meet ANSTO's project environmental governance framework, [AF-1376 Project Environmental Planning Checklist](#) shall be completed at the commencement of all projects.

The level of environmental protection and sustainable design assurance to be afforded to any project is determined by the scope, scale and risk of a project. The larger the project's footprint, the higher likelihood for environmental harm, and therefore the greater effort is required to mitigate this harm. The preparation of a Project / Construction Environmental Management Plan (P/CEMP - [AF-5947](#)), is a primary tool for larger projects to identify their potential environmental impacts and the mitigating actions to be implemented to reduce the potential for harm to the environment. For smaller projects, the preparation of a Safe Work Method and Environmental Statement (SWMES – [AF-2315](#)) may be sufficient, provided the environmental risks are appropriately identified and mitigated – refer to **Image 1** to whether a project requires a P/CEMP or SWMES.

For any facilities maintenance works where a possible or likely environmental impact has been identified in the SWMES, the Responsible Officer shall have the SWMES reviewed by the Environmental Management Systems Manager prior to the commencement of works.

Examples of facilities maintenance works that would require a review by the Environmental Management Systems Manager include, but not limited to:

Maintenance activity	Potential/actual environmental impact
Digging a trench to inspect a suspected faulty cable	Silt displacement to stormwater as a result of soil being piled and re-deposited
Removal of undergrowth vegetation to minimise the risk of snake incursion to buildings	Loss of faunal habitat, silt displacement and noxious weed seed displacement as a result of exposed soil
Replacement of damaged electrical transformer	Loss of containment of oil or SF ₆

The Project Team may request the preparation of a P/CEMP by a third-party (such as the Principal Contractor) with specific experience in developing such plans. The Project Team would be expected to seek specialist input (internal or external to ANSTO) to address provisions beyond their scope of expertise.

If a third party is preparing the P/CEMP, Appendix A and B of [AF-5947](#) **do not** need to be completed, however, a copy of the third party P/CEMP must be provided within the [AF-5947](#). This is to be reviewed by the ANSTO Environmental Management Systems Manager to ensure aspects of the P/CEMP requirements are covered.

If ANSTO is preparing the P/CEMP, Appendix A and B of [AF-5947](#) **do** need to be completed.

The P/CEMP shall provide sufficient detail on how the Project Team plans to comply with all provisions within these Requirements, ANSTO Environmental Management System (EMS), the ANSTO Building Code (ABC) and ANSTO's environmental legislative requirements.

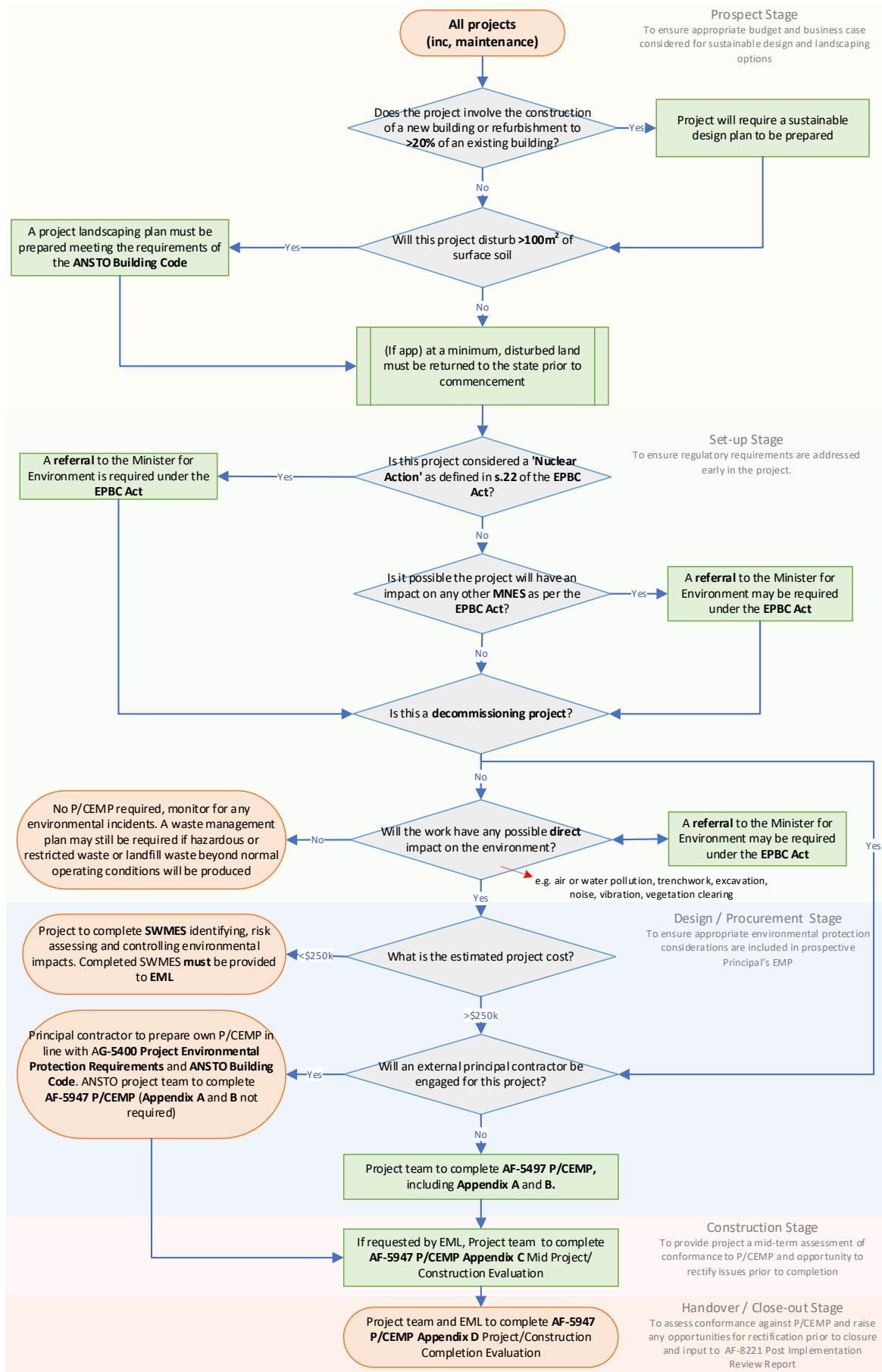


Image 1: Project Environmental Governance Framework

2. Environmental Compliance Obligations

The Project Team shall determine the applicable environmental compliance obligations relating to all aspects of construction/decommissioning/closure of a site under their control (refer to [AP-2069 Environmental Compliance Obligations](#)). Environmental compliance obligations may include relevant Commonwealth environmental legislation and guidance or other best-practice material that ANSTO deems relevant. In addition, all other obligations such as local agreements, community expectations or other contractual agreements of an environmental nature shall be included. Identified compliance obligations must be noted in the P/CEMP along with the controls to ensure compliance is achieved (these should be either detailed in the Principal's P/CEMP or in Appendix A of [AF-5947](#)).

3. Air Quality

The Project Team must identify all potential air borne pollution sources including but not limited to dust, odours, vapours, and fumes from fossil fuel machinery or other activities that may arise during the course of project activities. Due to the abundance of legacy dump-sites throughout the ANSTO site and Buffer Zone, a thorough assessment of any potential legacy risks must be determined and reported. Legacy risks may include but not limited to, radioactive soil contamination, asbestos contamination and beryllium contamination. The ANSTO Hazards Register should be consulted to assist in this determination.

The Project Team shall ensure that the mitigation and management principles for controlling potential airborne pollution within the [NSW EPA Air Quality Guidance Note: Construction Sites](#) is adhered to. All reasonable attempts to plan to mitigate against airborne pollution shall be performed, the controls implemented, assessed and evaluated, and the overall environmental performance reported.

The Project Team shall ensure all mitigation measures are appropriately planned, applied, and performance measured throughout the project as per the guideline listed in this section. Any breaches or complaints are to be recorded in the relevant ANSTO incident management system.

In consultation with the Project Team, the Environmental Management Systems Manager may impose construction emissions KPI's and targets that will be required to be met and reported to the Environmental Management Systems Manager.

4. Minimisation of energy and water consumption

Energy and water consumption must be kept to a minimum within the scope of the project to achieve its objectives.

In consultation with the Project Team, the Environmental Management Systems Manager may impose construction energy and water consumption KPI's and targets that will be required to be met and reported to the Environmental Management Systems Manager.

5. Land and Surface / Groundwater Contamination Minimisation

The control of surface and ground water quality and quantity is a critical aspect for the minimisation of the project's environmental footprint. This will be achieved through the following measures.

5.1. Stormwater and drainage

The Project Team shall determine all potential direct and indirect impacts to ANSTO's stormwater system as a result of project activities. The Project Team shall ensure that all impacts to ANSTO's stormwater system are in-line with the provisions stated within [AG-3219 ANSTO Building Code](#). These impacts include but are not limited to:

- Proposed connections to the established stormwater system;

- Alteration of stormwater flows and the potential impacts on the stormwater load capacity for the ANSTO-site;
- Sediment displacement from construction activities or otherwise;
- Surface water contamination from construction vehicles, ie. oil and grease;
- Other sources of potential contamination.

The Project Team shall assess any potential direct or indirect impacts and develop and implement management plans for the mitigation of any identified potential impacts. The Project Team is responsible for routinely inspecting any controls implemented for suitability and ongoing performance

As guidance material, the Project Team should consider the mitigation principles outlined within [NSW Government – Managing urban stormwater: soils and construction – Volume 1 \(2004\)](#) when applying the appropriate controls.

The Project Team shall ensure all mitigation measures are appropriately planned, applied, and performance measured throughout the project as per the guideline listed in this section. Any breaches or complaints are to be recorded in the relevant ANSTO incident management system.

5.2. Temporary access roads

ANSTO accepts that the current ANSTO road network may not be suitable to access a proposed project site, resulting in the requirement for the construction of temporary access roads to enable access. The Project Team shall ensure that all proposed temporary access roads are in accordance with the provisions stated within [AG-3219 ANSTO Building Code](#). As further guidance material, the Project Team should consider the principles outlined within [Managing urban stormwater: soils and construction – Volume 2C - Unsealed roads 2008 \(NSW Government\)](#). The Project Team shall perform a pre-construction environmental condition assessment of the site of the proposed temporary access road including soil compaction properties to assist in the assurance of remediating the site to prior-construction condition.

The Project Team shall ensure the construction and ongoing use of a temporary access road will not result in:

- The removal or damage to native vegetation;
- Contamination of surface/groundwater (eg. sediment displacement);
- Damage or disruption to existing services.

The Project Team shall ensure that all appropriate remediation attempts are performed for the entire length of the temporary access road site ensuring that the pre-construction condition is restored. Works to ensure this may include restoring the natural soil compaction, revegetation, and installation of ongoing sediment displacement controls.

The Project Team shall consult with the ANSTO Landlord to determine the most appropriate routes for the temporary access roads in relation to current and proposed site service conduits and other proposed actions for the site.

The Project Team shall ensure all mitigation measures are appropriately planned, applied, and performance measured throughout the project as per the guideline listed in this section. Any breaches or complaints are to be recorded in the relevant ANSTO incident management system.

5.3. Excavation

All excavation activities that have the potential to increase erosional potential shall be managed in accordance with [AG-3219 ANSTO Building Code](#).

- Avoid excavation and trenching during periods of heavy rainfall.
- Divert surface water away from excavated areas and trenches using sandbags or other means.
- Limit the length of time trenches are open.

Stockpiling is not to remain longer than 12 months unless approved by the ANSTO Landlord as part of a long-term project or has been identified for use in an upcoming project.

5.4. Virgin Excavated Natural Material (VENM)

Virgin Excavated Natural Material (VENM) is generated through the excavation of previously undisturbed areas that have not been subject to contamination of any nature. VENM shall be strictly managed to ensure that contamination of VENM is prevented and can be subsequently utilised for other works.

The Project Team shall define the following:

- Quantity
- Proposed temporary storage location
- Length of time the VENM will be stored
- Actions to prevent erosion or movement of sediments from the contained storage area
- Final disposition of the VENM
- Dust management measures
- Disturbed areas identified for weed proliferation countermeasures
- Excavation area rehabilitation plan

The Project Team shall consult with the ANSTO Landlord to determine the appropriate storage, final disposition and rehabilitation management requirements and ensure ongoing management and rehabilitation of VENM fill will be performed in-line with ANSTO guides.

5.5. Other Excavated Material (OEM)

Other Excavated Materials (OEM) are generated where prior site activities have been undertaken and the resulting excavated materials are contaminated with non-native materials. OEM shall be strictly managed to ensure that potential contamination of stormwater, existing soil or VENM is mitigated.

The Project Team shall define the following parameters:

- Quantity
- Characteristics, including an assessment of potential contamination
- Proposed temporary storage location
- Length of time the OEM will be stored
- Action taken to prevent erosion or movement of sediments from the contained area
- Final disposition of the OEM
- Dust management measures
- Disturbed areas identified for weed proliferation countermeasures
- Excavation area rehabilitation plan

The Project Team shall consult with the ANSTO Landlord to determine the appropriate storage, final disposition and rehabilitation management requirements and ensure ongoing management and rehabilitation of OEM fill will be performed in-line with ANSTO guides.

5.6. Saw cutting and concrete slurries

Slurry from saw cutting and concreting operations must be contained as it has a high pH that is not reduced by filtering through geotextile.

- contain slurry using a wet-vac
- if not using a wet-vac, use sandbags to contain and recover slurry
- where geotextile/sandbags will be utilised, it is recommended that the filter aid particle size distribution should be no smaller than 5 x the D₁₅ and no greater than 5 x the D₈₅ of the particle size distribution of the target pollutant, see **Table 1** for further guidance.
- use minimal water during cutting to create a thick slurry which is more readily contained
- sweep slurry into a contained area before it dries
- allow the slurry to dry sufficiently so it can be collected and removed from the site

- in consultation with Waste Operations, dispose of the 'spadeable' slurry as General Solid waste and liquid slurry to a liquid waste treatment facility.

Table 1: Filter Material Characteristic Calculation

Sediment Characteristics			Filter aid characteristics		
Material	D ₁₅ Sediment (mm)	D ₈₅ Sediment (mm)	D ₁₅ (mm) No Smaller Than to Maintain Hydraulic Flow (5xD ₁₅ Sediment)	D ₁₅ (mm) No Larger Than to Prevent Piping (5xD ₈₅ Sediment)	Potential Classification of Filter Material
Pavement grindings	0.0016	0.017	0.008	0.085	Silty sand
Saw cut slurry	0.0018	0.018	0.009	0.09	Silty sand
Portland cement	0.0024	0.012	0.012	0.06	Silty sand

Source: Minnesota Department of Transportation – Concrete Slurry, Wash and Loss Water Mitigation, <https://www.lrrb.org/pdf/201221.pdf>

5.7. Sediment Controls

- Locate sediment fences parallel to the site contours, as close as possible to your site on the downhill side, with small returns to limit the catchment area of any one section.

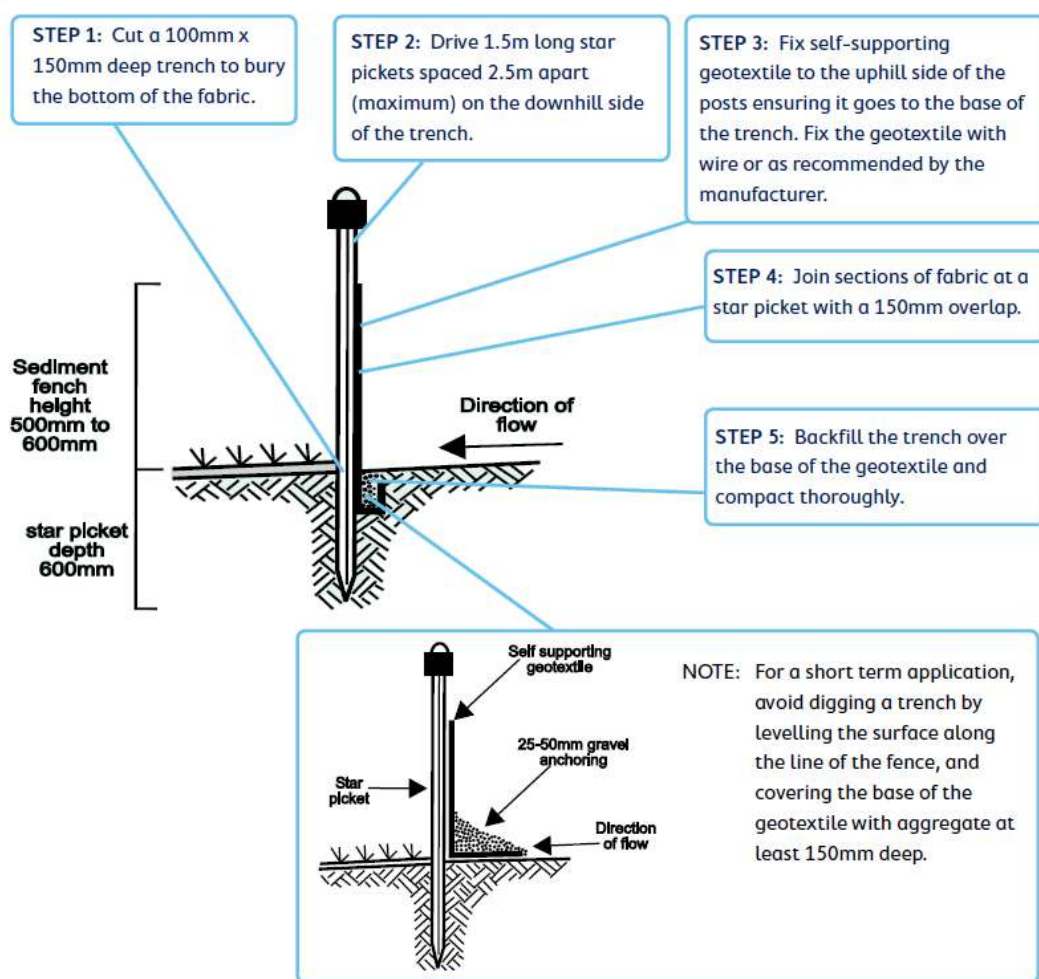


Image 2: Sediment Fence

When protecting a gutter:

- geotextile filter bags should be filled to 2/3 capacity with 25 to 50 mm aggregate
- form a seal with the kerb to prevent sediment bypassing the filter bag.

When protecting a drain inlet:

- make the geotextile filter bag longer than the length of the inlet pit, ie. using a silt sock
- use spacer blocks between the filter bag and the kerb inlet.

NOTE: Traditional hessian sandbags do not allow water to filter through. Only woven geotextile filter bags should be used to protect gutters and inlets.

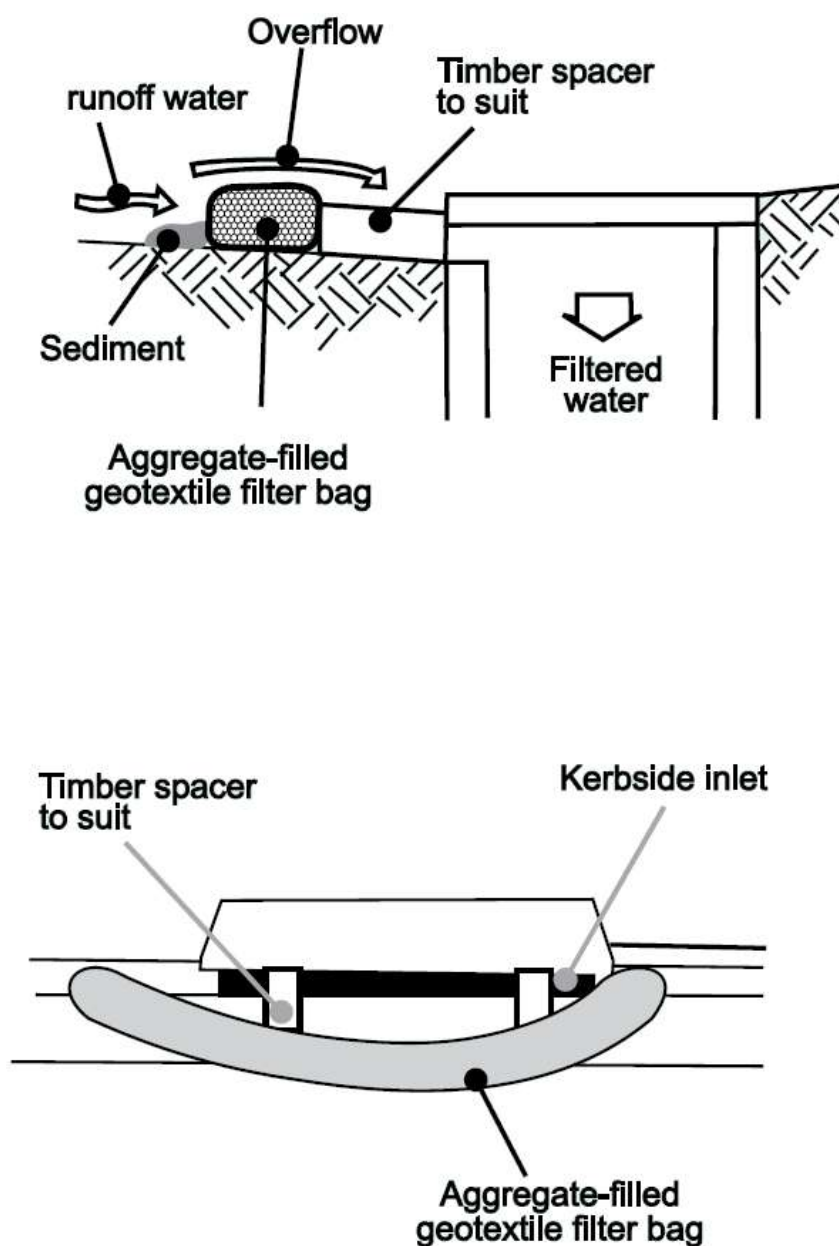


Image 3: Installing Geotextile Filter Bags

5.8. Construction equipment

Construction equipment is a potential source of contamination through the leakage of fuels and lubricants. The Project Team shall ensure and provide evidence that all equipment is maintained in accordance with the specification provided by the respective manufacturer. The Project Team shall ensure that all active equipment is inspected routinely and any equipment found to be potentially contaminating the environment through fuel or lubricant leakage is taken out of service immediately, any actual contamination managed appropriately, and any further contamination risks mitigated and/or contained.

The Project Team shall ensure any breaches or complaints are to be recorded in the relevant ANSTO incident management system.

5.9. Introduced materials

Prior to entry on to the project site, the Project Team shall identify, plan and implement the required control measures for any introduced material. Throughout the project works, the Project Team shall maintain an inventory of all introduced materials that enter the project site.

Introduced materials include:

- top soils
- plants
- waste
- fuels
- flammable materials
- corrosives
- oil/greases/lubricants
- construction materials
- environmentally hazardous chemicals
- other chemicals
- any other materials deemed to be a potential threat to the environment

The Project Team shall ensure the adequacy of all control measure and ensure that any control failure or breach of containment of any introduced material shall be recorded in the relevant ANSTO incident management system.

5.10. Requirements to discharge to waters

Construction water must be free from pollutants prior to discharge to drains, surface waters or the ground. Before waters can be discharged, the following parameters must be met:

Table 2: Criteria to be met to discharge construction water

Parameter	Criteria	Method
Oil and grease	No visible sheen or odour	Visual
pH	6.5-8.5	pH probe
Salinity	<500 µSm/cm	Conductivity probe
Total suspended solids	< 50mg/L	Meter

NOTE: Before waters are permitted to be discharged, approval to discharge must be granted by the Environmental Management Systems Manager.

5.11. Groundwater Monitoring

The Project Team shall determine any potential impacts on groundwater flows or quality resulting from any project related activities. Any potential impacts shall be managed and mitigated in consultation with the [ANSTO Environmental Monitoring Group](#) (EMG). The ANSTO EMG has an established surface and groundwater monitoring program which may be utilised by the Project Team to assess performance.

Any identified hazardous materials utilised by the Project Team shall be stored and managed appropriately to ensure groundwater contamination is prevented. The storage of hazardous materials must be performed in accordance with the appropriate Australian Standard relevant to the hazardous material, regardless of the time that the hazardous material is in a state of storage.

The Project Team shall ensure all mitigation measures are appropriately planned, applied, and performance measured throughout the project as per the guideline listed in this section. Any breaches or complaints are to be recorded in the relevant ANSTO incident management system.

6. Waste

The Project Team is responsible for the management of all waste (including loose litter, construction waste, and hazardous waste) generated throughout the life of the project and shall arrange for all aspects of waste to be removed from the site at the completion of project or is found to be present within their area of influence. The Project Team is responsible for the appropriate characterisation of all waste. Non-radiological waste shall be characterised in accordance with [AG-2985 Non-Radioactive Waste Guidelines](#) which directly references the [NSW EPA Waste Classification Guidelines](#) as the compliance obligation. All waste generated shall be disposed of in the appropriate manner for that type of waste. Throughout the life of the project, the Project Team shall ensure that any waste that is consolidated within their site does not have an adverse impact on the surrounding environment.

The Project Team shall ensure that the waste management planning is in-line with ANSTO guidelines, the [AE-5362 ANSTO Environmental Sustainability Strategy](#) and that waste-to-landfill is minimised wherever practicable throughout the life of project. All waste is required to be tracked and records of any waste maintained. Any identified deviations from ANSTO waste management guidelines shall be recorded in the relevant ANSTO incident management system.

The Environmental Management Systems Manager may request a waste management plan to be developed including a requirement to achieve a minimum landfill diversion rate.

The Project Team shall maintain a log of all waste receipts and records.

7. Flora, Fauna and Heritage Values

The Lucas Heights site contains areas where the protection of native flora and fauna must be considered and the appropriate management planning arrangements implemented. The site also contains Aboriginal and European Heritage sites that also require similar planning arrangements. The Project Team shall ensure that all appropriate actions are performed to preserve these areas and any other area with floral, faunal or heritage values influenced by the project.

The Project Team shall perform the following:

- Identification of areas of remnant native vegetation or sites of heritage value that will or may be impacted by any project activities;
- Where the proposed works will or may have an impact on remnant native vegetation or sites of heritage value, the Project Team shall engage an appropriately qualified consultant to perform a detailed flora and fauna and/or heritage study of the area of influence;
- List all threatened or protected species and ecological communities or migratory species protected under international agreements (hereafter protected species and communities) currently identified by the relevant Commonwealth or State Department that are or may be found within the appropriate distance from the project site. When conducting a Protected Matters Search through the Commonwealth Department of Environment, a default 5 km radius should be considered;

- List all sites of Aboriginal or European Heritage value within the area of influence observed or identified through searches of the relevant Commonwealth or State heritage databases including the 'Aboriginal Heritage Information Management System' and the 'Commonwealth Heritage list';
- Impact assessment on all aspects of project related activities and post-construction installations on the habitats of the observed or potential protected species and communities or sites of heritage value identified;
- Detail the proposed mitigation measures to ensure that any observed or potential protected species and communities or sites of heritage value are protected as far as reasonably practicable to the objectives of the project;
- Considering all of the above, the Project Team shall perform a '[Self-assessment](#)' under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth). A statement of assessment shall be submitted to the Environmental Management Systems Manager for acceptance outlining:
 - o whether the project will be referred to the Minister of Environment; and
 - o what criteria were used to determine if a referral is necessary.

Note: The Environmental Management Systems Manager may request re-assessment if the project was not correctly assessed against the criteria stated in the Act.

Where a project related activity has been identified through the 'Self-assessment' process as having or is likely to have a significant impact on observed or potential protected species and communities or sites of heritage value, a [referral](#) to the Commonwealth Minister for the Environment under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* (Cth) shall be submitted.

- Where a referral to the Minister has been submitted, all conditions shall be adopted by the Project Team.

The Project Team shall ensure all mitigation measures are appropriately applied and performance measured throughout the project as per the impact risk assessment and resultant recommendations. Any breaches or complaints are to be recorded in the relevant ANSTO incident management system which may also require reporting to the Commonwealth Department of Environment where the breach or complaint is in connection to a condition stated within a referral approval granted under the *EPBC Act* (if applicable).

8. Noise and Vibration

In order to meet both WHS and EMS objectives, an assessment of potential noise and vibration generating activities and associated mitigation measures is required. All works must adhere to Australian Standard AS 2436 – 2010 Guide to noise and vibration control on construction, demolition and maintenance sites, and guidance within [AG-3219 ANSTO Building Code](#). The principles included within the [Draft Construction Noise Guideline \(nsw.gov.au\)](#) should also be considered.

The Project Team shall develop a list of potentially affected stakeholders as a result of noise and vibration caused by project works, communicate and agree upon a noise and vibration mitigation and management project plan, maintain documented evidence of consultation, and report upon performance throughout the project. [AG-3219 ANSTO Building Code](#) identifies the sensitive land areas across site where specific measures must be agreed upon with the affected personnel. The impact on potentially affected ecological communities shall also be assessed and mitigated where appropriate.

The Project Team shall ensure all mitigation measures are appropriately planned, applied, and performance measured throughout the project as per the guidelines listed in this section. Any breaches or complaints are to be recorded in the relevant ANSTO incident management system.

8.1. Noise control

The Project Team shall identify all nearby work areas and other sensitive land uses that may be affected by any works on the project. Other sensitive land uses may include sensitive scientific experimental instruments, public places (ie. child care centre, cafeteria) and native bushland. The Project Team shall determine the extent of noise effects on nearby work areas and other sensitive land uses and determine what measures will be enforced to minimise noise to the relevant requirements. The Project Team should avoid wherever possible planning works at night and other times deemed to be controlled in consultation with the affected stakeholder group.

8.2. Ground vibration

Heavy impact / vibration emitting construction equipment can significantly impact high sensitivity scientific equipment, building foundations/structures, infrastructure services, heritage sites, faunal species and unconsolidated earth. The Project Team shall identify all potentially impacted buildings, services and other sensitive areas that may be affected by high impact/vibration emitting construction activities. All practicable mitigation measures shall be considered and implemented. The Project Team shall develop a schedule of heavy impact / vibration activities in consultation with the affected stakeholder group.

9. Visual Impact and Lighting

9.1. Visual impact assessment and considerations

The Project Team shall ensure that all work sheds and construction structures are kept clean and laid out in an orderly manner free from unapproved advertising slogans or any offensive or inappropriate images or writing. The Project Team shall provide details of the area of influence for the project including the controlled site area.

The principal contractor may label equipment including cranes and motor vehicles; however a full statement of this extent of labelling must be provided.

The ANSTO Landlord must be consulted regarding advertising prior to commencing work.

9.2. Signposting

All areas of a designated site must be clearly fenced and/or signposted to exclude non-authorised personnel and identify the risks and hazards posed by the activities. The provisions provided in the [AG-3219 ANSTO Building Code](#) relating to signposting of spoil and excavations shall be adhered.

9.3. Lighting

The Project Team shall take all reasonably practicable measures to ensure that the effects of light spill (artificial light that substantially projects beyond buildings under their control) or sky glow (illumination from artificial light affecting the appearance of the night sky) are controlled and minimised throughout the life of the project. The guidance provided within Section 8.3 of AS/NZS 1680.5: 2012 Interior and workplace lighting – Outdoor workplace lighting, should be followed to ensure the environmental effects of artificial light are minimised.

The Project Team shall ensure all mitigation measures are appropriately planned, applied, and performance measured throughout the project as per the guideline listed in this section. Any breaches or complaints are to be recorded in the relevant ANSTO incident management system.

10. Traffic and parking

10.1. Contractor worker parking

The number of car parking spaces will be limited to the vehicle entry passes. Parking in unauthorised locations will incur penalties as imposed by ANSTO Security. The location of temporary car parking areas is subject to all other requirements detailed within these Requirements.

All temporary carpark shall be managed similarly to temporary access roads detailed in **Section 5.2** of these Requirements with the provisions within the [AG-3219 ANSTO Building Code](#) adhered.

10.2. Heavy vehicle access

The Project Team shall detail:

- All heavy vehicle access requirements
- Access routes
- Relevant impacted stakeholders
- Existing condition of proposed access routes;
- Potential environmental impact on the access routes; and,
- Mitigation measures and controls.

The Project Team shall ensure all relevant impacted stakeholders are consulted with respect to all heavy vehicle movements and that ANSTO Security are informed at all times. Any identified deviations from the details provided or incidents resulting from heavy vehicle movements shall be recorded in the relevant ANSTO incident management system.

11. Site rehabilitation on completion

The Project Team shall ensure that all disturbed areas within their area of influence will be rehabilitated at the completion of the building works to at least the condition that existed prior to the commencement of project activities. The Project Team should endeavour to landscape any disturbed area with endemic plant species. The Project Team shall ensure that sufficient photographic evidence of the pre-disturbed project area is collected and stored appropriately.

11.1. Landscaping

Landscaping of the areas surrounding ANSTO buildings and infrastructure can significantly mitigate against soil erosion and noxious weed propagation, provide sanctuary for endemic fauna and reduce energy costs for adjacent building through passive cooling effects. Successful landscaping in accordance with recognised ecological principles may significantly reduce the ongoing maintenance requirements for a given area, ie. grass cutting, and therefore a forecasted cost-benefit analysis should be considered. Endemic species to this region should be highly considered with non-endemic species considered only where no practicable endemic variety is available for the specified purpose.

All projects where more than 100m² of land is disturbed, must have a landscaping plan prepared and approved by the ANSTO Landlord and Environmental Management Systems Manager.

All projects where less than 100m² of land is disturbed, the disturbed must be remediated at a minimum to the state prior to being disturbed.

The Project Team shall consult with the ANSTO Landlord to ensure that all landscaping plans adhere with [AG-3219 ANSTO Building Code](#) and any other requirements as stipulated by ANSTO.

12. Education and Training

The Project Team shall ensure that all site contractors have the required site-specific training and awareness on environmental issues specific to the project and its surrounding environment, including aspects of this document. Training and awareness tools may include induction and toolbox talks, environmental observations (similar to safety observations), environmental performance updates, and review of environmental incidents.

The Project Team shall detail the frequency of toolbox talks, and training topics related to environment.

The Project Team shall ensure that all contractors are made aware of all relevant impacts identified and the control measures implemented to mitigate harm. All contractors shall also be made aware of the importance of incident reporting and any agreements with ANSTO services with respect to emergency plans.

13. Environmental Emergency Planning

The Project Team shall determine all environmental impacts that require an environmental emergency plan to be prepared. Any environmental impact with an inherent risk score of moderate or above where establishing an emergency plan practicably reduces the risk of ongoing environmental harm, shall have an environmental emergency plan established.

The Project Team shall consult with the Emergency Operations Manager to review and establish a testing schedule for any environmental emergency plans.

The Project Team shall periodically test and review all environmental emergency plans based upon their degree of risk.

The Project Team shall review any environmental emergency plan relating to an aspect where an incident has occurred.

14. Environmental Incident Reporting

The Environmental Management Systems Manager shall be alerted to any environmental incidents within 24 hours of an environmental incident occurring.

The Project Team shall record all relevant environmental incidents through the ANSTO incident management system that occur either within the project area of influence or resulting from activities related to the project in transit to and from the project area of influence. If the incident investigation is agreed to be performed outside of ANSTO's incident management system (for example through the Principal Contractor's system for smaller, more trivial incidents), the incident investigation may be closed at triage with the investigation attached.

At the completion of the project, the PM shall ensure a consolidated list of incidents is archived and records maintained beyond the life of the project to ensure any legacy issues are traceable.

Any legacy environmental issues that will knowingly persist beyond the life of the project shall be recorded in the ANSTO environmental aspect register.

If an environmental incident occurs that was in relation to an impact not identified within the P/CEMP, the P/CEMP must be updated and the relevant controls implemented to avoid re-occurrence.

15. Audits and Inspections

The Environmental Management Systems Manager may request to undertake an inspection or audit of the Project with respect to the management of environmental risks at any stage throughout the project.

16. Project/Construction Evaluation

Upon approval of the P/CEMP, the Environmental Management Systems Manager shall determine the requirement for a mid-project/construction evaluation. If deemed required, the Environmental Management Systems Manager shall complete **Appendix C** of the [AF-5947 P/CEMP](#) at an agreed time during the project. Any findings from this evaluation shall be implemented within the agreed timeframe and recorded in the relevant action tracking system.

Prior to the completion of a project that has an approved P/CEMP, the Environmental Management Systems Manager shall evaluate conformance of the project and document the evaluation, subsequent findings and agreed actions for the Project Team in **Appendix D** of the [AF-5947 P/CEMP](#). Based upon the environmental outcomes of the project, the Environmental Management Systems Manager shall liaise with the Project Team to whether approval for handover can proceed. The results of this evaluation should be considered by the Project Team when completing the [AF-8221 Post Implementation Review \(PIR\) Template](#) and [AF-1681 Contractor Performance Review Form](#) as part of the EPMO process.

17. Records

The following records are to be maintained for [AF-5947 ANSTO Project Construction Environmental Management Plan](#).

File Number	Title	Type	Storage Location	Retention
AF-5947	ANSTO Project / Construction Environmental Management Plan	Form	Project folder in network P drive	Refer to AR-1477 ANSTO Records Management Process and National Archives Authority for record maintenance, retention and disposal.

18. Abbreviations

PEPR	<i>Project Environmental Protection Requirements (The Requirements)</i>
P/CEMP	<i>Project / Construction Environmental Management Plan</i>
EMG	<i>Environmental Monitoring Group</i>
EMS	<i>Environmental Management System</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation (EPBC) Act 1999 (Cth)</i>
EPMO	<i>Enterprise Project Management Office</i>
OEM	<i>Other Excavated Material</i>
VENM	<i>Virgin Excavated Natural Material</i>
WHS	<i>Work Health and Safety</i>

19. References

ANSTO overarching processes, procedures, strategy;

- [AP-2069 Environmental Compliance Obligations](#)
- [AR-1477 ANSTO Records Management Process](#)
- [AE-5362 ANSTO Environmental Sustainability Strategy](#)

ANSTO guides, instructions and forms;

- [AG-2067 Environmental Management System Manual](#),
- [AG-3219 ANSTO Building Code](#)
- [AG-8155 Project Management Lifecycle Framework](#)
- [AG-2985 Non-Radioactive Waste Guidelines](#)
- [AF-5947 Project / Construction Environmental Management Plan](#)
- [AF-1376 Project Environmental Planning Checklist](#)

- [AF-2315 Safe Work Method and Environmental Statement \(SWMES\)](#)
- [AF-8221 Post Implementation Review \(PIR\) Template](#)
- [AF-1681 Contractor Performance Review Form](#)

External References;

- [NSW EPA Air Quality Guidance Note: Construction Sites](#)
- [NSW Government – Managing urban stormwater: soils and construction – Volume 1 \(2004\)](#)
- [Managing urban stormwater: soils and construction – Volume 2C - Unsealed roads 2008 \(NSW Government\)](#)
- [NSW EPA Waste Classification Guidelines](#)
- [Draft Construction Noise Guideline \(nsw.gov.au\)](#)

End of Document

Guidance to the Project Manager or Responsible Officer

- **ALL PROJECTS MUST COMPLETE THIS FORM.**
- This form forms the initial screening of environmental protection and environmental sustainability requirements for all projects at ANSTO.
- Don't consider impacts resulting from normal operations following the project.
- For all new buildings and refurbishments to >20% of an existing building, a sustainable design plan must be developed, budgeted and implemented.
- For all projects where >100 m² of soil is likely to be disturbed, a landscaping remediation plan must be developed, budgeted and implemented. Disturbance <100m² must be returned to its prior state at a minimum.
- For all projects involving the decommissioning / demolition of a building or part thereof, regardless of size or budget, [AF-5947 Project/Construction Environmental Management Plan](#) **must** be completed prior to on-ground activities commencing.
- For all other projects with a budget >\$250k, where environmental impacts may occur, [AF-5947 Project/Construction Environmental Management Plan](#) **must** be completed.
- For some specific cases, a separate plan may be required, e.g. an asbestos management plan or a waste management plan.
- Forward the completed form to the Environmental Management Leader at: environmentalmanagement@ansto.gov.au

Section A: Project Details

Project Manager or Responsible Officer Name	
Date	
Project Title	
Project Number	
Customer Name	
Customer Contact Details	

Section B: Screening Questions			
Question		Response	
1a	Will the project involve the construction of a new building or refurbishment to >20% of an existing building?	☐ Yes A sustainable design plan must be developed, budgeted and implemented. Proceed to Question 2	☐ No Proceed to Question 2
2	Will the project likely disturb any surface soil? (consideration must be given to potential legacy issue, i.e. asbestos removal)	☐ Yes, >100 m ² A site landscaping and remediation plan must be prepared, budgeted and implemented in accordance with the ANSTO Building Code. If you answered yes to this question you will have to answer yes to Question 5b Proceed to Question 3a	☐ Yes, <100 m ² All disturbed ground must be returned to its prior-project state in accordance with the ANSTO Building Code. If you answered yes to this question you will have to answer yes to Question 5b Proceed to Question 3a
3a	Is this project considered a 'Nuclear Action' as defined in s.22 of the Environment Protection and Biodiversity Conservation Act 1999 ?	If you checked any one of the check boxes in Section E1 (page 6), you must select Yes here. ☐ Yes An EPBC Referral must be prepared and submitted to the Minister for the Environment. Proceed to Question 3c	
3b	Is it possible the project will have an impact on any other Matter of National Environmental Significance ?	If you checked any one of the check boxes in Section E2 (page 6), you must select Yes here. ☐ Yes An EPBC Referral may be required, consult the Environmental Management Leader for further advice. Proceed to Question 3c	
3c	Will the project have a direct impact on land not owned or tenanted by ANSTO?	☐ Yes Further approvals may be required. Consult the Environmental Management Leader for further advice. Proceed to Question 4	☐ No Proceed to Question 4

Section B: Screening Questions			
Question		Response	
4	Will this project involve decommissioning / demolishing part or all of a building?	☐ Yes Proceed to Question 7 – you must select yes to questions 5a and 5b.	☐ No Proceed to Question 5a
5a	Will the project produce hazardous or restricted waste, or landfill waste beyond normal operating conditions (ie. construction waste)?	☐ Yes A waste management plan meeting the minimum standards of the ANSTO Building Code must be prepared. Characterisation of this waste will be required prior to disposal. Proceed to Question 5b	☐ No Manage waste in accordance with ANSTO's existing waste management system. Proceed to Question 5b
5b	Will the project have <u>any</u> possible direct impact on the environment?	If you checked any one of the check boxes in Section D (page 4-5), you must select Yes here.	
		☐ Yes An EPBC Referral may still be required, consult the Environmental Management Leader for further advice. Proceed to Question 6	☐ No No further environmental assessment is required, monitor project for any environmental incidents. END SCREENING QUESTIONS HERE
6	Will the project likely have a project spend >\$250,000?	☐ Yes Proceed to Question 7	☐ No Complete a SWMES identifying all possible impacts identified in Section C (page 4) of this form. A copy of the SWMES must be provided to the Environmental Management Leader. No further environmental assessment is required. END SCREENING QUESTIONS HERE
7	Will the project likely engage an external Principal Contractor?	☐ Yes AF-5947 P/CEMP must be completed, however Appendices A and B of AF-5947 are not required to be completed if these will be completed in the Principal's P/CEMP. END SCREENING QUESTIONS HERE	☐ No AF-5947 P/CEMP must be completed, including Appendix A and B. END SCREENING QUESTIONS HERE

Forward the completed form to the Environmental Management Leader at: environmentalmanagement@ansto.gov.au

Section C: Waste Production	
Will any hazardous or restricted waste be produced?	☐ Asbestos or tyres ☐ Hazardous or restricted waste (refer to NSW EPA Waste Classification Guidelines , NSW EPA Waste Tracking Requirements or Victorian EPA Waste Classification guidance)
Will any other waste be produced that will require disposal offsite?	☐ > 50 kg non-recycled material / day or >1,000 kg non-recycled material in total over the life of the project ☐ Excavated material

Section D: Environmental Impact Criteria	
Is there a possibility of harm to flora, fauna, endangered ecological communities or heritage?	☐ Flora ☐ Fauna ☐ Endangered ecological communities ☐ Aquatic environments (including erosion) ☐ Significant heritage items (onsite or within the Buffer Zone)
Is there a possibility of discharge or spill to stormwater, groundwater or onto lands of any of these substances?	☐ Chemicals, including fuels ☐ Sediment or spoil - if any excavation is occurring, this must be selected. ☐ Concrete wash-down ☐ Sewerage / Tradewaste ☐ Radiological liquid ☐ Other non-specified pollutants
Is there a possibility of emissions to air of any of these substances?	☐ Asbestos- (you may require an asbestos management plan – refer to AP-2522 Risk Management of Asbestos) ☐ Synthetic greenhouse gases with an H420 hazard category or are regulated under the Ozone Protection and Synthetic Greenhouse Gas Management Act 1989 , including: Hydrofluorocarbons (HFCs) Perfluorocarbons (PFCs)

Section D: Environmental Impact Criteria	
	Sulphur hexafluoride (SF6) ☐ Radiological gases - ensure you consult the Regulatory Affairs Manager ☐ Heavy metals, such as mercury, lead or cadmium. ☐ Odours ☐ Dusts ☐ Equipment, vehicle or plant emissions beyond normal ANSTO operational activity ☐ Other non-specified pollutants
Will the project consume excessive amounts of energy or natural resources? (These thresholds correspond to an impact rating of 'low' as defined in AG-5719 Consumptive Environmental Aspects - Impact Determination)	☐ Electricity consumption > 2,000 kWh / day ☐ Water consumption > 15,000 L / day ☐ Hydrocarbon fuel consumption > 8 GJ-e / day ☐ Excavated material ☐ Other significant consumption of resources
Will there be any other potential impacts on the local environment?	☐ Excessive noise ☐ Vibration ☐ Traffic congestion ☐ Lighting at night ☐ Unpleasing aesthetics ☐ Excessive water discharge to stormwater ☐ Excessive water discharge to sewer (>10,000 L / day) ☐ Other non-specified

Section E1: Nuclear Actions as defined under s.22 of the <i>Environment Protection and Biodiversity Conservation Act 1999</i>	
Will the project involve:	☐ Establishing or significantly modifying a nuclear installation ☐ Transporting spent nuclear fuel or radioactive waste products arising from reprocessing ☐ Establishing or significantly modifying a facility for storing radioactive waste products arising from reprocessing ☐ Mining or milling uranium ores ☐ Establishing or significantly modifying a large-scale disposal facility for radioactive waste ☐ Decommissioning or rehabilitating any facility or area in which one of the above has been undertaken ☐ Any other type of action set out in the EPBC Regulations. For the avoidance of doubt, proposed projects involving the recovery of sands or rare earths may constitute a 'nuclear action' if the proposed project falls within the above definition. A decision about whether a disposal facility is large scale will depend on factors including the activity of the radioactive materials to be disposed of (see regulation 2.02 of the Environment Protection and Biodiversity Regulations 2000).
Section E2: Significant impact on other matters of national environmental significance as defined under Part 3 of the <i>Environment Protection and Biodiversity Conservation Act 1999</i>	
Is there a possibility the project will have an impact on any of these features?	☐ World heritage property ☐ National heritage places ☐ Wetlands of international importance (Ramsar wetlands) ☐ Listed threatened species and ecological communities ☐ Listed migratory species ☐ Commonwealth marine environment , including Commonwealth managed fisheries ☐ Great Barrier Reef Marine Park

Forward the completed form to the Environmental Management Leader at: environmentalmanagement@ansto.gov.au

1. Purpose

The purpose of this Project / Construction Environmental Management Plan (P/CEMP) is to provide assurance for the protection of the environment from construction activities or other projects that are proposed on ANSTO property or on behalf of ANSTO that may have a direct impact on the environment.

The project team must meet the minimum environmental protection standards stated in [AP-5400 Project Environmental Protection Requirements](#) (hereafter referred to as The Requirements) and the ANSTO Building Code.

This P/CEMP extends to contractors, sub-contractors and procurement practices.

2. When do I need a P/CEMP?

All decommissioning projects and other projects that may have a possible direct impact on the environment and have a project budget >\$250,000 shall require a P/CEMP to be developed.

Where an external Principal Contractor is being engaged and they will prepare their own P/CEMP, **Appendix A** and **B** of this P/CEMP do not need to be completed, however they will be required to prepare a detailed P/CEMP that meets the minimum standard of [The Requirements](#) and the ANSTO Building Code, and insert an approved copy into **Section 3** of this P/CEMP.

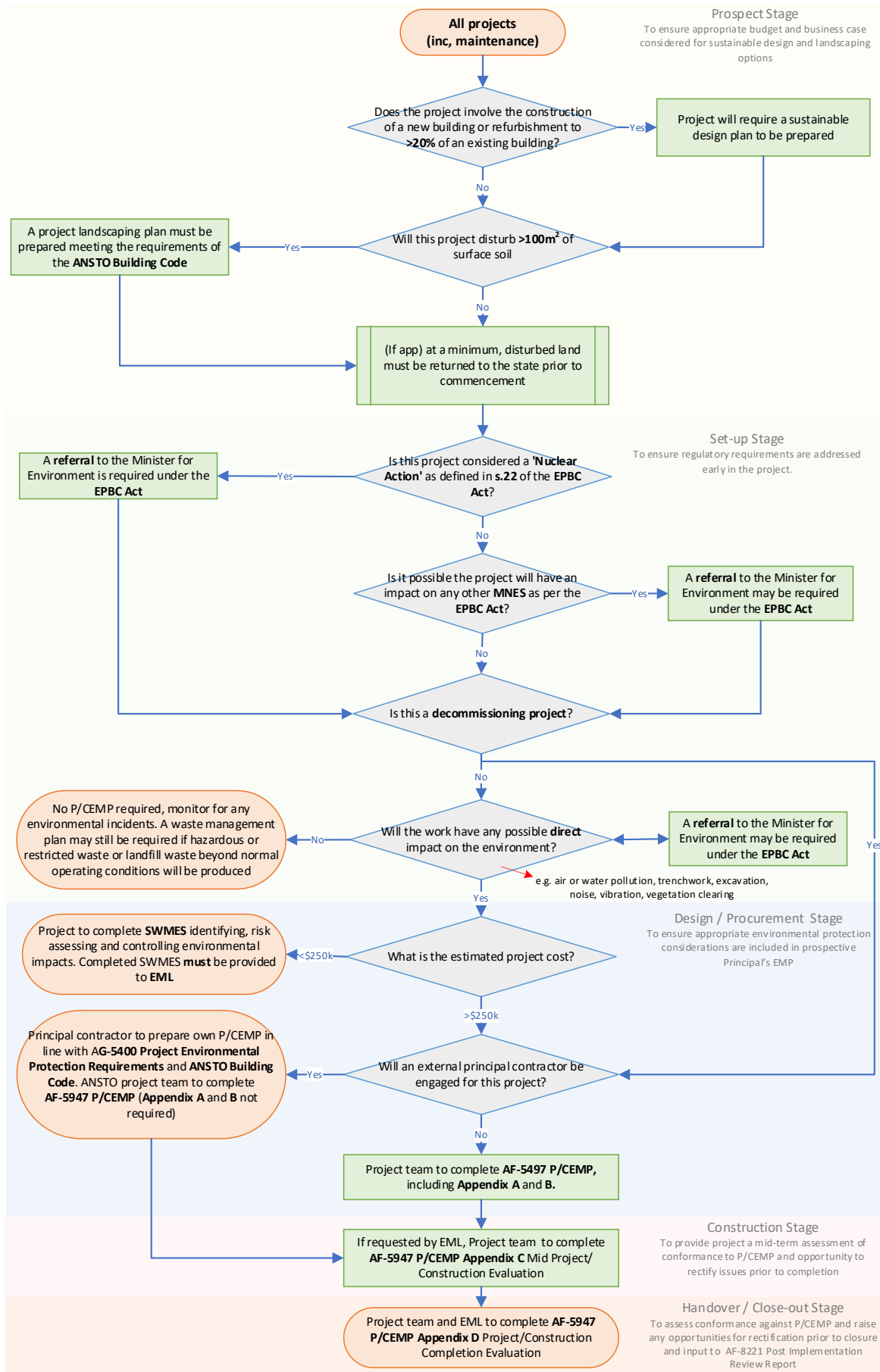
Where ANSTO is the Principal, **Appendix A** and **B** of this P/CEMP must be completed.

Appendix C and **D** are assurance checks to ensure the Project is conforming with the [The Requirements](#), the ANSTO Building Code and other commitments stated in the P/CEMP. Results from these assurance checks should be used by the Project Team to inform the project evaluation required using [AF-1681 Contractor Performance Review Form](#). **Appendix C** should be completed by the Project Team (if requested by the Environmental Management Leader). Completion of **Appendix D** is mandatory for all projects and must be completed in consultation with the Environmental Management Leader prior to the handover of the site from the Principal Contractor.

Refer to flowchart on next page for further guidance.

REQUIRED RESPONSE – Indicate the project cost and Principal for the project.

- | | | |
|--|---|--|
| ☐ Decommissioning project & external Principal engaged |  | Please provide the Principal's draft P/CEMP in section 3 .
DO NOT complete Appendix A or B . |
| ☐ Non-decommissioning project & external Principal engaged | | |
| ☐ Decommissioning project & ANSTO Principal |  | Complete both Appendix A and B of this P/CEMP |
| ☐ Non-decommissioning project, ANSTO Principal & project cost >\$250k | | |
| ☐ Non-decommissioning project, ANSTO Principal & project cost <\$250k |  | Complete a SWMES and send to Environmental Management Leader .
The Requirements shall be referenced for implementation of environmental protection controls |



3. External Principal Contractor's P/CEMP

If a P/CEMP is being prepared by the external Principal Contractor, please insert the draft version of the P/CEMP into the box below. The draft P/CEMP must be approved by the Environmental Management Leader prior to commencement of works.

Any change in scope to the Principal's P/CEMP must be approved by the Environmental Management Leader.

(Select a space in the box below -> go to the 'Insert' tab on the ribbon -> select 'Object' under the 'text' category -> From the dialog box opened, click the 'Display as icon' checkbox -> select the 'Create from file' tab -> browse to find the Principal's P/CEMP, press 'OK')

4. Project Roles

The following personnel are assigned the following roles in this project (in-line with the Project Management Plan):

Project Client:

Program Manager (if app):

Project Manager:

Project Steering Committee (if app):

Local Environmental Coordinator:

Environmental Consultant (if app):

Contractor:

Subcontractors (if app):

Landlord (if relevant):

5. Approval and oversight

Environmental Management Leader	
Name	
Is a mid-project/construction evaluation required?	☐ (If ticked, please complete Appendix C – Mid project/construction evaluation of this P/CEMP) Date evaluation to be completed by project team:
P/CEMP File Number	P/CEMP # (To be provided by Environmental Management Leader)
Remarks	
Signature	

Project/Construction Completion Audit	
Has the project satisfactorily complied with the environmental obligations of this P/CEMP (Appendix D of this P/CEMP to be completed)?	☐ Yes ☐ Yes, with further actions / conditions to be fulfilled – refer to GRC # ☐ No, corrective action required - refer to GRC #

Appendix A Environmental Impact Assessment (EIA) and Control Implementation

For all decommission projects where ANSTO is the Principal and other projects >\$250,000 where ANSTO is the Principal, the Project Team shall identify any environmental impacts that will or may occur during the undertaking of the project, the proposed mitigation controls and perform a risk assessment on the inherent (pre-control implementation) and residual (post-control implementation) risks in the table below.

Refer to [The Requirements](#) for the relevant section details. Add additional lines if necessary (*select entire row, right-click and select 'insert rows below'*).

Please also include any compliance obligations (ie. laws, standards, internal ANSTO procedures) relevant to each impact identified. A non-exhaustive list of relevant compliance obligations is provided in **Appendix E**.

Section within AP-5400	Criteria	EIA Ref #	Identified Impacts (sub-categorise by impact under each section of The Requirements, eg. 8.1- Noise from earth movers)	Inherent Risk Assessment (use AG-2395 Risk Analysis Matrix)	Mitigation Controls (inc. minimum requirements to address compliance obligations)	Residual Risk Assessment (use AG-2395 Risk Analysis Matrix)
3	Air Quality	3.1				
		3.2				
4	Energy and Water Consumption (if applicable)	4.1				
		4.2				
5	Land and Surface/ Groundwater Contamination	5.1				
		5.2				

Section within AP-5400	Criteria	EIA Ref #	Identified Impacts (sub-categorise by impact under each section of The Requirements, eg. 8.1- Noise from earth movers)	Inherent Risk Assessment (use AG-2395 Risk Analysis Matrix)	Mitigation Controls (inc. minimum requirements to address compliance obligations)	Residual Risk Assessment (use AG-2395 Risk Analysis Matrix)
6	Waste	6.1				
		6.2				
7	Flora, fauna and heritage	7.1				
		7.2				
8	Noise and Vibration	8.1				
		8.2				
9	Visual Impact and Lighting	9.1				
		9.2				
10	Traffic and parking	10.1				
		10.2				

Appendix B Additional Environmental Planning Statements/Plans

For all decommission projects where ANSTO is the Principal and other projects >\$250,000 where ANSTO is the Principal, the Project Team shall provide a statement against each of the requirements in the table below.

Refer to [The Requirements](#) for the relevant section details.

Section	Criteria	Project Statement / Plan <i>(Insert document into space provided if required)</i>
11	Site Rehabilitation on Completion including Landscaping	
12	Education, Awareness and Training of Project Staff	
13	Environmental Emergency Planning (if applicable)	
	<i>Other plans as required (e.g. asbestos management plan)</i>	

Appendix C Mid Project / Construction Evaluation

Ref #	Relevant section in the Requirements	Question / Statement	Evaluation A = Acceptable O = OFI M = Minor NC C = Major NC	Comments
1	3	Have air pollution controls being effectively implemented and periodically evaluated?		
2	3	(If relevant) Are construction emissions targets being achieved, if not are actions being put in place to achieved?		
3	4	(If relevant) Are construction energy and water consumption targets being achieved, if not are actions being put in place to achieved?		
4	5.1	If there have been any alterations to stormwater/drainage, have impacts resulting from any alterations been effectively controlled?		
5	5.1	If aspects of the site stormwater/drainage system have been altered as a result of the project, have these alterations been appropriately controlled and ongoing plans developed in consultation with the ANSTO Landlord and ANSTO Hydraulics Engineer for the management of stormwater within the site's area of influence?		
6	5.7	Are sediment displacement controls implemented effectively for the types of sediment disturbed/created?		
7	5.2 / 10	If temporary roads and/or carparks have been installed, have the environmental impacts been considered and controlled effectively?		

Ref #	Relevant section in the Requirements	Question / Statement	Evaluation A = Acceptable O = OFI M = Minor NC C = Major NC	Comments
8	5.3	Are all excavations appropriately controlled for sediment displacement and stormwater/groundwater contamination?		
9	5.4 / 5.5	Are spoil/stockpiles being effectively managed and signposted as to their origin (VENM or OEM)?		
10	5.8	Is there any evidence of ground contamination from leakage from construction equipment?		
11	5.9	Is there any evidence of ground contamination from other introduced materials (ie. top soil, fuels and chemicals)?		
12	6	Is waste being effectively managed, segregated, sign-posted, disposal receipts stored and minimum landfill diversion targets met?		
13	7	Has any native vegetation that was not identified in the P/CEMP as potentially impacted, been impacted?		
14	7	Is there any evidence of native fauna being impacted by the project?		
16	7	Is there any evidence of heritage items not identified in the P/CEMP being impacted by the project?		

Ref #	Relevant section in the Requirements	Question / Statement	Evaluation A = Acceptable O = OFI M = Minor NC C = Major NC	Comments
17	8	Is noise and vibration as a result of the project being effectively managed and communicated to interested parties appropriately? Have there been any noise or vibration complaints raised?		
18	9.3	Is light spill or sky glow at night being managed effectively?		
19	11	Are areas where no further planned works will be conducted being rehabilitated promptly, effectively and to the state approved in the project Landscaping Plan or ABC (where a landscaping plan was not required, ie. <100 m ² of soil disturbance)?		
21	12	Is environmental training and awareness being communicated to the relevant staff on a regular basis?		
22	14	Are environmental incidents being lodged and the information conveyed through to the ANSTO Incident Management System?		
23	15	If an environmental incident occurs in relation to an impact that was not identified in the P/CEMP, has the impact being reviewed and subsequently included in the P/CEMP?		
24	All	Is the P/CEMP being reviewed upon changes to the project scope which may have an impact on the environment?		
25		Is the sustainable design plan for this project being implemented as approved, without deviation and is deemed effective against the sustainable design objectives for this project? (If relevant)		

Appendix D Project/Construction Completion Evaluation

Ref #	Relevant section in the Requirements	Question/Statement	Evaluation A = Acceptable O = OFI M = Minor NC C = Major NC	Comments
1	3	(If relevant) Were construction emissions targets being achieved?		
2	4	(If relevant) Were construction energy and water consumption targets achieved?		
3	5.1	If aspects of the site stormwater/drainage system have been altered as a result of the project, have these alterations been appropriately engineered to ensure the site-stormwater system is not negatively impacted?		
4	5.2 / 10	If temporary roads and/or carparks were installed, have the impacted areas been rehabilitated to their pre-project condition?		
5	5	Is there any evidence of un-remediated sediment displacement or erosion as a result of the project?		
6	5.8	Is there any evidence of ground contamination from leakage from construction equipment?		
7	5.9	Is there any evidence of ground contamination from other introduced materials (ie. top soil, fuels and chemicals)?		
8	6	Has all waste been cleared from the site and appropriately disposed of with receipts filed for all waste disposals?		

Ref #	Relevant section in the Requirements	Question / Statement	Evaluation A = Acceptable O = OFI M = Minor NC C = Major NC	Comments
9	6	Was the landfill waste diversion target met for the project?		
10	7	Has there been any evidence of native vegetation that was not identified in the P/CEMP as potentially impacted, been impacted?		
11	8	Has there been evidence of native fauna being impacted by the project?		
12	9	Has there been any evidence of heritage items not identified in the P/CEMP being impacted by the project?		
13	11.1	Has landscaping been completed in accordance with the originally approved project Landscaping Plan or the ANSTO Building Code?		
14	14	Have all environmental incidents being lodged and the information conveyed through to the ANSTO Incident Management System?		
15	15	Have any legacy environmental impacts/aspects been identified as a result of the project and subsequently been updated in the ANSTO Environmental Aspects Register?		
16		Was the sustainable design plan for this project implemented as approved, without deviation, deemed effective against the sustainable design objectives for this project and where applicable, been assessed against the relevant efficiency rating scheme (i.e. Greenstar or NABERS)		

Appendix E Relevant Environmental Compliance Obligations (non-exhaustive)

Section	Compliance Obligation
	Specific ARPANSA licence conditions
	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)
	Specific EPBC Act Referral conditions
	Relevant existing OPAL construction/operating conditions
	AG-3219 ANSTO Building Code
3	NSW EPA Air Quality Guidance Note: Construction Sites
6	NSW EPA Waste Characterisation Guidelines
8	AS 2436:2010 Guide to noise and vibration control on construction, demolition and maintenance sites
9	AS/NZS 1680.5:2012 Interior and workplace lighting – Outdoor workplace lighting

Safe Work Method and Environmental Statement AF-2315



Refer to [AG-2397 Explanatory Notes to Safe Work Method & Environmental Statement \(SWMES\)](#) before proceeding.

SWMES file No.:		WO No:		Is this High Risk Construction Work?	☐ Yes ☐ No
SWMES Revision No:		Date:	Select	Jobsite specific induction required?	☐ Yes ☐ No
Location/ Building/ Area:				SRA Reference for Project or Work Area:	☐ Yes ☐ No
Planned Start Date:	Select				SRA Ref:
Activity Description:				Potential ionising radiation exposure:	☐ Yes ☐ No
ANSTO Responsible Worker:				Radiation survey performed:	☐ Yes ☐ No ☐ N/A
ANSTO Personnel:				Radiation dose review level specified:	☐ Yes ☐ No ☐ N/A
Company Performing work:				Recommended dosimetry:	☐ EPD ☐ TLD ☐ Extremity
				Contractors Personnel:	

Licences/ Qualification/ Tickets/ Training: (National/ state legislated operational licence)	Chemicals/ Substances/ Materials: (SDS, storage, spill control, transport)
Permits required: (SWP, isolation, excavation/penetration, confined space etc)	Plant/ Equipment: (Service certificates, registers, maintenance logs, pre-operational checks)
Legacy Issues: (Asbestos, Beryllium, Cadmium, Uranium, Electrical)	Legal & other Requirements/ References: (ANSTO WHS MS, legislation, codes, standards)
Hazards Register	
Planning: (notifying all affected staff, planning committee, risk assessment, rescue, emergency, subject matter experts, health & safety, radiation protection, Authorised Isolator etc)	Consultation: (Toolbox talks, review by subject matter experts, health & safety, radiation protection, review by workers, HSR, etc)

Notes:

Additional Information <i>(photos, diagrams and formatted text may be entered below)</i>

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Identification of Safety Hazards If the process identified in this SWMES has potential safety hazards, check the appropriate box and complete the risk assessment in the space below. This is not a comprehensive list and ALL hazards must be noted on your SWMES.

☐ Asbestos disturbance or removal	☐ Electrical Arc Flash	☐ Isolations & LOTO	☐ Pressure/ Vacuum Equipment
☐ Biological Hazards	☐ Excavations & Penetrations	☐ Lifting Loads	☐ Psychosocial hazards
☐ Chemical Hazards	☐ Explosives	☐ Load bearing structural changes	☐ Radiation Contamination
☐ Confined Spaces	☐ Fall From Height	☐ Legacy chemical contamination	☐ Radiation Dose
☐ Construction Work	☐ Falling Objects	☐ Needlestick/ Sharps	☐ Radiation Skin Dose
☐ Demolition Hazards	☐ Fatigue	☐ Noise & Vibration	☐ Vehicles or Mobile Plant
☐ Diving	☐ Fissile Materials/Criticality	☐ Non Ionising Radiation	☐ Working Alone or Out of Normal Hours
☐ Electrical Hazards	☐ Heat Stress or Cold Environments	☐ Plant & Equipment	☐ Worker behaviours

Identification of Human and Organisational Factors If the process identified in this SWMES has human factors hazards, check the appropriate box and complete the risk assessment in the space below. Refer to [AG-8491 Human Factors Identification Risk Assessment and Control](#) for further information. Risks of medium and above or impacts of moderate and above require, further analysis using [AF-8492 Human Factors Hazards Identification and Analysis](#).

☐ Task undefined	☐ Illumination	☐ Maintainability	☐ Temperament
☐ Task load	☐ Acoustics	☐ Personal Protective Equipment	☐ Staffing
☐ Significant error risk	☐ Workspace and layout	☐ Unintended Design Features	☐ Knowledge
☐ Task error tolerance	☐ Access and Egress	☐ Physiological	☐ Timing
☐ Task complexity	☐ Usability	☐ Anthropometric	☐ Supervision
☐ Hazardous Manual Tasks	☐ Information	☐ Perceptual	☐ Communication
☐ Temperature & air quality	☐ Operability	☐ Cognitive	☐ Safety culture
			☐ Funding

Identification of Environmental Hazards If any of the boxes below are ticked due to potential environmental hazards, complete the risk assessment in the space below. Whenever a tick box below has been ticked, the [Local Environmental Coordinator \(LEC\)](#) MUST be consulted. The LEC must then submit an [AF-2092 Environmental Aspects Identification Form](#) if required. If the work is for a project, then you MUST use [AF-1376 Project Environmental Planning Checklist](#).

☐ Pollutant entering drains	☐ Cryogenics - particularly helium and specialties	☐ Abnormal potable water use
☐ Potential for groundwater contamination	☐ Use of ozone depleting substances/synthetic GHG	☐ Excessive paper/package use
☐ Abnormal excessive noise or vibration	☐ Use of chemicals with hazard code H400 - H420	☐ Risk of sediment displacement
☐ Dust generation - crushing, grinding	☐ Abnormal electricity use	☐ Risk to flora/fauna
☐ Airborne emissions - radiological or non-radiological	☐ Excessive lighting requirement at night	☐ Significant alteration to stormwater flows

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Activity Detailed steps of the job/ task being undertaken	Hazard What hazards are present from work and location at each step of the process?	Risk Rating Use AG-2395	Controls Implemented safety controls to reduce the risk associated with each hazard. Use AG-2407	Risk Rating With control	Responsible Person(s) responsible for implementing control measure(s)
Activities and changes to activities which have a potential inherent impact of 'moderate' or greater, or inherent safety risk of 'medium' or greater to workers, the public or environment must be screened/ evaluated as per AP-1094 Safety & Reliability Assurance process prior to implementation. This will ensure appropriate controls to either eliminate the hazard or reduce the risk to as low as reasonably practicable have been implemented.					
Preparation					
Implementation					
Conclusion					

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Emergency / Rescue Scenarios (consider advice in [AG-5535 Chemical Emergency Response & Spill Management](#), [AG-5236 Radioactive Spill Contamination Response & Recovery](#) and other emergency scenarios that may arise from these works. Consultation with the ANSTO Emergency Response Team or your WHS Advisor may be of assistance in emergency and rescue response planning).

Potential Emergency Scenarios	Preventive and Mitigating Controls	Responsible Person(s) responsible for implementing control measure(s)

[Double-click here to add more rows]

The SWMES is to be signed by all participants in the work. Signing acknowledges that the work methods proposed will be followed.

[Double-click here to lock / unlock all the fields in this form]



Locking the form enables the electronic signatures and prevents modification of the form above this point.

Unlocking the form for revision allows the above sections to be edited again but will remove all signatures below this point.

The prepared SWMES has been approved by the Responsible Officer who will ensure that it is signed by all participants involved in the work.

Name	Position	Signature & Date Locked
	/ANSTO Responsible Worker	

Prepared by

Name	Position	Signature & Date

Reviewed by

Name	Position	Signature & Date

For guidance on risk scoring and risk rating refer to [AG-2395 Risk Analysis Matrix](#).

Debrief or Follow Up
Lessons learned and opportunities for improvement
Actions may be raised in GRC for oversight and tracking.

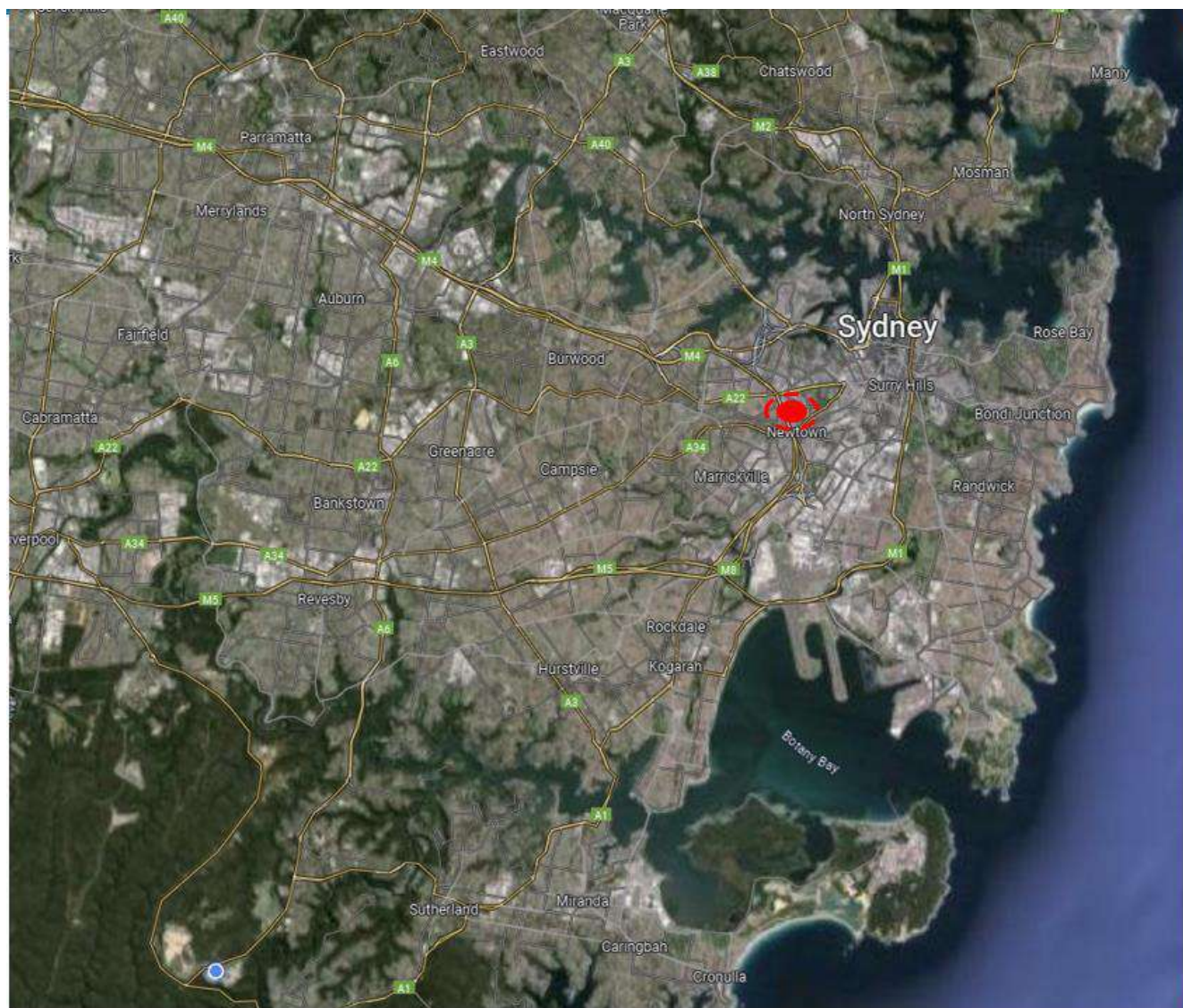


Figure 1 Location (zoomed out Sydney)



Figure 3 Location (zoomed Camperdown area)



Figure 4 Location (building)

HISTORICAL SITE ASSESSMENT (HSA) FOR CAMPERDOWN FACILITY

FOR

CAMPERDOWN DECOMMISSIONING

Document No: NRCF-1200-RT-0001

ERIS Document Number: PP 137221

Revision: Start at 0	Effective Date: dd/mm/yyyy20
Approved by: Approved	Custodian: Custodian
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Revision Details

Rev	Description of Revision	Author(s)	Reviewed	Approved
1	Original	 IMISIDES, Warren (wiz) 2/12/2022  KIMBER, Alec (aki) 12/12/2022	 POLEWSKI, Michael (mxp) 19/01/2023	 Chair - WMTSAG Sign

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Revision: Start at 0	Effective Date: dd/mm/yyyy20
Approved by: Approved	Custodian: Custodian
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Purpose

This document provides a historical site assessment of the Camperdown Facility (B81) and surrounding area. The purpose of this document is:

1. to provide an information resource to support the completion of a Preliminary Site Investigation, and
2. guide the characterisation methodology and the selection of remediation options.

Scope

This document is a compilation of readily available information, sufficient to provide initial classification of the Camperdown Facility and its surroundings. It is not intended to provide a comprehensive list of legacy activities on the site.

Revision: Start at 0	Effective Date: dd/mm/yyyy20
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1. Background

The Australian Nuclear Science and Technology Organisation (ANSTO) operated a cyclotron facility at Camperdown from 1991 until 2021 and is currently developing a strategy for transition of ownership of the facility from ANSTO back to the owner, Sydney Local Health District (SLHD).

To fulfill its lease obligations, ANSTO will need to identify any required remediation actions and apply for a decommissioning licence through the Australian Radiation Protection & Nuclear Safety Agency (ARPANSA) to undertake those actions, prior to handing back the facility to the owner.

2. Introduction

In the context of the characterisation of the facility, conformance to international best practice will be maintained by following the guidelines such as the National Environmental Protection Measure (NEPM) for the assessment of site contamination [2] and the USA's Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) [3].

The Historical Site Assessment (HSA) is typically one of the first steps in conducting Radiation Survey and Site Investigation (RSSI) and may also be utilised in whole during completion of the Preliminary Site Investigation [4].

The historical site assessment report will:

- Describe the Building 81 Camperdown Facility and surrounding area
- Identify known radioactive contamination and other sources of hazardous material contamination
- Document both confirmed and unconfirmed historical activities with the potential to cause contamination
- Inform and guide subsequent scoping and characterisation surveys by collating historical information in a single document

3. Facility Description

The ANSTO Research Cyclotron Facility is located on leased land at 81 Missenden Rd, Camperdown NSW, approximately 5 km southwest of the centre of Sydney (Figure 2 and Figure 3). The facility consists of a 2-story building with a basement, and an underground transfer system to the Royal Prince Alfred Hospital that leaves the lease to the east along Grose Street.

The floor plans of the building are provided as:

- Figure 7: Drawing A1E 059081 – Building 81 National Medical Cyclotron – Ground Floor Plan
- Figure 8: Drawing A1E 059081 – Building 81 National Medical Cyclotron – Basement Floor Plan
- Figure 9: Drawing A1E 059081 – Building 81 National Medical Cyclotron – First Floor Plan.

The facility:

- Commenced operations in 1991 as the National Medical Cyclotron, operating a 30MeV cyclotron, beam lines and isotope hot cells to produce radioisotopes principally for medical purposes.
- Was refurbished from 2010 to 2012, with the original cyclotron replaced with a modern 18MeV cyclotron, all beam lines had been removed and the facility was producing radioisotopes for research purposes.
- Shut down in 2021 and is currently being prepared to be handed back to SLHD at the end of the lease once the required remediation has been identified and completed.

4. Site History and Current Usage

4.1. Site Timeline

The Camperdown Facility was constructed on land that was previously used by light industry. A complete history of the site's use prior to this was not explored.

The production of radioisotopes at the facility evolved during operations as well as the original cyclotron being replaced and expansions to the facility building. This information is available from licence documentation, records from operations and project deliverables.

Historical aerial photos provide a source of information about the facility and surrounding area. Observations made from aerial photos have been collected and compiled with other documented and undocumented reports to form a Site Activity Timeline (Table 1). A short summary of observations and other details of significant items are provided in Section 4.2.

To complement the timeline, historical aerial photos of the Camperdown Facility are available from the Six Maps [6] website and images from 1944 to 2020 are provided in Appendix D.

Table 1. Building 18 External Storage Compound Site Timeline

Year	Usage or Event	Source	Section
Pre 1997	Light Industrial Area	Historical Aerial Photos	4.2.1
1987-1991	National Medical Cyclotron Facility Construction	Documented	4.2.2
1991	Radioisotope Production	Documented	4.2.3
1993	Radioisotope Product Expansion	Documented	4.2.4
~1995	Building Expansion	Documented	4.2.5
Late 1990s	Cooling Tower Replacement	Documented	4.2.6
2010 - 2012	Cyclotron Facility Refurbishment	Documented	4.2.7
~2014	Vertical Section of Transfer System Removed	Anecdotal	4.2.8
2021	Final Shutdown	Documented	4.2.9
2021	Decommissioning Project	Documented	4.2.10
2025	End of Lease	Documented	4.2.11

4.2. Site Timeline - Event Details

The events listed in Timeline (Table 1) are discussed in this section.

4.2.1. Light Industrial Area (pre1987)

The site of the facility was previously occupied by a section of Grose Street and light industrial buildings, with "Building 22" being the largest. Several of the buildings appear to have asbestos roofs.

Grose Street and the light industrial buildings are apparent in historical aerial images (Figure 30, Figure 31, Figure 32, Figure 33) and their associated lots are sketched on the demolition plan for the cyclotron building (Figure 20).

4.2.2. National Medical Cyclotron Construction (1987-1991)

The facility was constructed as the National Medical Cyclotron in a joint venture between the NSW government and ANSTO, on leased land owned by, what is currently called, the Sydney Local Health District (SLHD). The original lease plan defines the boundaries of the lease and identifies the affected existing lot boundaries (Figure 21). Site preparation and building construction took place between 1987 and 1991 and a timeline of the building construction, fit out and preparations for operation is provided as Figure 22.

The following original plans are provided as figures in the Appendix:

- Figure 23: Drawing AIE101180 NMC Civil Works Layout
- Figure 24: Drawing AIE62426 Original Ground Floor Plan
- Figure 25: Drawing AIE62425 Original Basement Plan and Sections

4.2.3. Radioisotope Production (1991)

Initial production concentrated on ^{13}N , ^{15}O and ^{18}F with the latter being used to produce ^{18}F -Fludeoxyglucose.

Some of the principal systems and equipment used for radioisotope production and supply where:

- The IBA Cyclone 30, 30Mev Cyclotron in room 0053
- PET target rack in PET Beam room 0059
- The PET Suite
- Pneumatic transfer System
- Monitored active extract ventilation and radioactive waste liquid systems

4.2.4. Radioisotope Product Expansion (1993)

In 1993, production of the longer half-life radioisotope ^{67}Ga , ^{201}Tl and ^{123}I commenced. In addition, experimental quantities of ^{111}In and ^{64}Cu were produced. Additional principal systems and equipment added included:

- Solid target station in SPECT Beam room 0051
- Solid target station in SPECT Beam room 0061
- SPECT hot cells in room 0048 (Figure 27)

4.2.5. Building Expansion (~1995)

In the years around 1995 the building was expanded to provided required capabilities, with the main additions being:

- Basement expansion (Figure 28)
- Beam vaults addition (Figure 29, hashed section, left hand bottom)
- Welding bay addition (Figure 29, centre bottom)

The basement was expanded by excavation to provide room for additional waste handling facilities and storage of activated components. Items stored included:

- Activated copper target plates
- Activated cyclotron and beamline components
- Solutions containing ^{203}Tl and ^{67}Zn .
- Cyanide containing liquors (from the target electroplating processes)
- Mercury containing waste (from the QC analysis by polarography)

The additional beam vaults were constructed to provide shielding for irradiations for Positron Emission Tomography (PET) production in room 0059 and the irradiation for Single Photon Emission Computed Tomography (SPECT) production in room 0061. The new vaults had beam access tubes cored through the wall to the cyclotron vault and removable sections, one to allow possible external access from the western side of the building and the other to remove the division between the two rooms. These features were never used.

4.2.6. Cooling Tower Replacement (Late 1990s)

In the late 1990's the cooling tower was removed and replaced with an air-cooled chiller unit.

4.2.7. Camperdown Facility Refurbishment (2010 - 2012)

Radioisotope production at the NMC was successfully performed for nearly 20 years before operations were ceased in 2010. ANSTO applied and received a decommissioning licence in December 2010 for the removal of all beam equipment, hot cells and cyclotron and other operationally redundant equipment.

A project was undertaken to perform the decommissioning and to refurbish the facility, ending in 2012. This project undertook the following work:

- Removal of the beam lines and target stations
- Removal of the Cyclone 30, 30 MeV Cyclotron and its relocation to Lucas Heights for storage
- Removal of the original SPECT hot cells and PET Suite
- Cleanout of basement and other redundant equipment
- Installation of a IBA Cyclone 18, 18 MeV cyclotron
- Installation of 9 hot cells
- Refurbishment of lab areas including installation of fume cupboards and upgrade to standards
- Upgraded active extraction for hot cells and fume cupboards
- Upgraded safety systems
- Set up a storage area for beamline components and targets in the basement

After the refurbishment the facility was renamed as the ANSTO National Research Cyclotron Facility (NRCF) but known colloquially as the Camperdown Facility. It produced PET radioisotopes Fluorine-18 and Carbon-11 which were used for research purposes.

A safety system relevant to characterisation of the facility was the careful management of air pressures around the production hot cells and adjoining rooms, which was designed to confine any contamination events. A plan of the air pressures maintained is provided as Figure 17.

At the commencement of the refurbishment project, the basement was found to be in general disorder and during the project it flooded. This was resolved by the removal of materials from the basement and solving the rainwater ingress. At the end of the refurbishment redundant beam lines and cyclotron components were stored in the basement for future use or disposal.

4.2.8. Vertical Section of Transfer System Removed (~2014)

In approximately 2014 the pneumatic transfer system and its shielding on the exterior of the Royal Prince Alfred hospital building was removed and the tunnel closed off at that end.

4.2.9. Final Shutdown (2021)

The Camperdown Facility and the production of radioisotopes was shut down in 2021, with some valuable scientific equipment being removed from the facility for re-use at the Lucas Heights campus. The facility remained secure.

4.2.10. Decommissioning Project (2021)

The Camperdown Decommissioning Project (ANSTO Project D00063) commenced in 2021 to decommission all redundant Structures Systems and Components (SSCs) located at the Camperdown facility and remediate any residual radiological impacts resulting from the production of radioisotopes.

The primary objectives of the project are to:

- Characterise the facility
- Obtain a decommissioning licence
- Remove redundant SSCs from the facility
- Remediate any remaining radiologically impacted SSCs
- Remediate the site
- Clear the site from conditions enforced by state and federal regulatory bodies
- Handover the site to SLHD

4.2.11. End of Lease (2025)

The current lease of the facility ends in January 2025.

4.3. Current Usage

4.3.1. Remaining Structures, Systems, and Components (SSCs)

Of the remaining SSCs, some have been radiologically impacted, such as the vaults, and access to these areas are actively managed. These SSCs are:

- The 18MeV Cyclotron
- Vault Room 0051
- Vault Room 0053
- Vault Room 0059
- Vault Room 0061

4.3.2. Decommissioning Project Office

The ground floor sections outside of the radiation barrier room are being used as project offices for the facility decommissioning project, for reception / security and for access to the first floor.

5. Potential Sources of Contamination

The irradiation of targets from proton beams produced by the cyclotrons resulted in proton and neutron activation of the vault room concrete and equipment within. The expected radionuclides from these activation events are Co-60, Eu-152, Eu-154 that are detectable from their gamma emissions.

Radioisotopes were produced in the production area during operations and had half-lives that do not present a current source of contamination.

All calibration sources used in the facility were sealed sources and were removed at end of operations.

6. Available Data on Contaminants

This section contains available information on:

- Routine Health Physics Surveys conducted within the facility
- Events Reported in Quarterly Reports
- Stack Emissions Records
- Trade waste records
- ANSTO Hazard Register entries for B81

6.1. Radiological Surveys

6.1.1. Routine Health Physics Surveys (2012 to 2022)

The facility was routinely surveyed by Health Physics Surveyors to allow radiological hazards to be identified, monitored, and managed to minimise risk during operations. Records from the last period of production from 2011 to 2022 are available, documenting 2501 routine surveys [5].

These surveys were concentrated around the vaults, labs, packaging, basement, and barrier areas but also included surveys of other areas such as the foyer and first floor offices. The number of surveys per year was consistent and contain suggested remedial actions that were actioned.

The surveys provide an excellent resource to identify and classify impacted areas.

A summary of the areas surveyed, and the number of surveys undertaken in those areas are provided in Table 2.

The surveys include post shutdown surveys, with routine health physics surveying ongoing.

Table 2. Health Physics Survey Comments [8]

Survey Area	Room	Number of Surveys
Barrier	0024	339
Basement	L1001, L1002	40
Chemistry Labs	0025, 0026	69
Control Room	0043	67
Cyclotron Utility	0059	21
Cyclotron Vault	0053	104
First Floor Offices	Entire Floor	22
Main Foyer	0001	18
Packaging and Corridors	0035	262
Packing and Loading Bay	0017	98
QC I Lab	0033	370
QC II Lab	0046	384
Radiochemistry I	0037	381
Radiochemistry II	0048	303
Side 1 Beam Room Area	0061	11
Side 2 Beam Room Area	0051	12
Total:		2501

6.2. Events Reported in Quarterly reports

During operations from 2010 till present, 48 quarterly reports were provided to the regulator [6]. These quarterly reports have been reviewed and the reported contamination events listed in Table 3 were considered in this assessment to evaluate the potential impact on the remediation of the facility. All events were local and resolved without the need for remediation.

Table 3. Contamination Events from Quarterly Reports

Reporting Period	Incident
01-Oct-2020	GRC 10023/10025/10036: Air Radiation Alarm located in Rm0037 (GMP) triggered during synthesis activity in adjacent location Rm0037a (C-11). Peak rate recorded at ~10cps for up to 17 seconds. Investigation demonstrated no airborne contamination. Strong correlation with ACS (Air Compression System) trigger, and verified shine path between ACS line and monitor probe. More shielding applied.
01-Oct-2019	GRC #7915 (Actual Impact Rating: Low Significance) RADMON notification concerning high (above 10cps) airborne radiation level in GMP laboratory. Operator questioned and reported no audible alert at the time of notification. RADMON data analysed, and demonstrated raised (~5-10cps) levels of apparent airborne radiation, with a short spike to 13cps, during the period in question. GMP Batch Record analysed, with time correlation between dose calibrator performance check using a Cs-137 source, and the notification becoming apparent. Conclusion; Cs-137 source needs to enter the GMP Dispensing cell, through a pass through box located adjacent to the radiation detector. Short nature of the pass, combined with error between analogue Radiation Detector and digital conversion to RADMON, meant the radiation detector did not sound an audible signal, whilst the RADMON detected the breach of limit and distributed alarm notifications. Radiation detector was performance checked for audible signal triggering at 10cps, and functionality verified.
01-Oct-2018	GRC 5699 - Malfunctioning HPLC pump connection. Loose union fitting resulting in a ~120cps contamination.
01-Oct-2017	Event 3507: Transport pot contamination (267cps) captured at Dispatch, pot replaced. Impact rating - Low Significance. Event 3952: Skin contamination (7 cps), detected at barrier. 100% removal on first wash with cold water. Impact Rating - Minor.
01-Jun-2017	Event 3069: Low level contamination to left hand. 5-10cps removable after brief cold water wash. Suspected fragment of target body (possibly foil) material after target refurbishment activity. Event 3435: Low level airborne in C-11 lab. HPLC samples (5) removed individually from cell. On return from QC lab monitor was in alarm. Analysis of RadMon system and carbon filter demonstrated ~20cps decaying at rate expected for C-11. Suspected 'burp' from HPLC waste vial. Event 3246: Contaminated PPE & equipment (overshoes, lab coat & fume cupboard). 2000cps lab coat, 700cps overshoe & 2000cps fume cupboard. Pipette located in fume cupboard behind shield was dropped during HPS contamination check.
01-Apr-2017	Event #2791: Overshoe contamination detected at barrier on 5/5/17. ~200cps detected after tour performed. Two other tour participants were thoroughly checked for contamination, and none found. Retracement of entire tour pathway was performed with survey equipment and no contamination found. Possible original source of contamination was presumed to be basement however this area was also thoroughly checked and no contamination found. Event #2722: Shoe and Overshoe contamination detected at barrier on 4/7/2017. ~40-50cps detected on overshoe and ~20cps detected on right shoe. Transfer from overshoe to shoe, or glove to both, is presumed to be during readjustment of overshoe (which had come loose) as reported by user. Overshoe was discarded and segregated for decay and shoe was treated with Decon 90 and EtOH, which reduced contamination to below 20cps. Suspected original source is a droplet of liquid F18 material from hot cell during transfer. Floor area and other work flow areas surveyed for contamination and none found.
01-Jan-2017	1. Air sampler detector in alarm when cell door lowered (but no airborne contamination). GRC 2183
01-Jul-2015	Routine contamination surveys unavailable as described in Performance Deficiency #2 (Inspection Report F0251 ANSTO Camperdown 29 March - 4 April 2016) are now reviewed by RPA and available to the Operations manager for review on a routine basis.

Reporting Period	Incident
01-Jul-2015	Event 15/569: Activated metal plate found in office area Event 15/612: Radiological air sampler went into alarm, staff evacuated from the area Event 15/658: Health Physic Surveyor found minor contamination in QC2 lab fume cupboard Event 15/659: Worker had minor contamination on right sleeve at gowning area
01-Oct-2013	1) On 30 October 2013, a contamination event had happened (which has been notified to ARPANSA). A laboratory worker was contaminated (fixed onto the worker's skin) with a significant quantity of [18F]Succinimide-4-Fluorobenzoate ([18F]SFB). This resulted of a skin dose to the worker which was estimated to be 355 mSv. The event is considered to be a near miss for a higher potential dose of up to 7.1 Sv (Skin). The root cause for the event is considered to be the failure to correctly and sufficiently identify the hazard (both prior to and post implementation). Therefore, failing to identify and implement effective controls for the relevant work process. Recommendations have been made for the improvement of systems at ANSTO Camperdown (ANSTO Life Sciences), as well as within the organisation as a whole. Consequently, F18 production was put on hold until all corrective controls and relevant instructions are in place.
01-Jan-2013	On 27th February 2013, a tour was conducted at ANSTO Camperdown. Radiation surveys for the facility were conducted for all the blue area prior the commencement of the tour. No contamination was detected in any of the blue area. At the end of the tour, all visitors were checked for traces of contamination at the de-gowning area. There were two members found to have contamination on their hands (and shoes). It has been suggested that these two contaminated visitors (Nuclear medicine professionals from hospitals) have been dealing with radioactive activity at their own workplace prior to the tour (See event report: 13/113)- To prevent the reoccurrence of this type of scenario, all visitors and contractors are required to be checked for any radioactive contamination prior of entering into the blue area of the facility. Any personnel is found be contaminated will be excluded of any activity to the blue area facility.
01-Jan-2010	On 18 February 2010 the basement was found with 50 – 75 mm of water covering the floor (event report no. 10/048). The water was rainwater that entered under a fire exit door. The sump-pump did not operate to remove the water. There were no injuries, no contamination and no environmental impact. The sump-pump was repaired, the seal under the door replaced and a high-level alarm connected to the security desk.

6.3. Stack Emissions

During operations from 2010, the active stack was only monitored for Fluorine-18, which has a half-life of 109.8 minutes.

Stack emission records of Fluorine-18 from the facility are available from 2011 onward [7]. The last emission was recorded on 22/06/2021. The annual emissions from this record are charted in Figure 1.

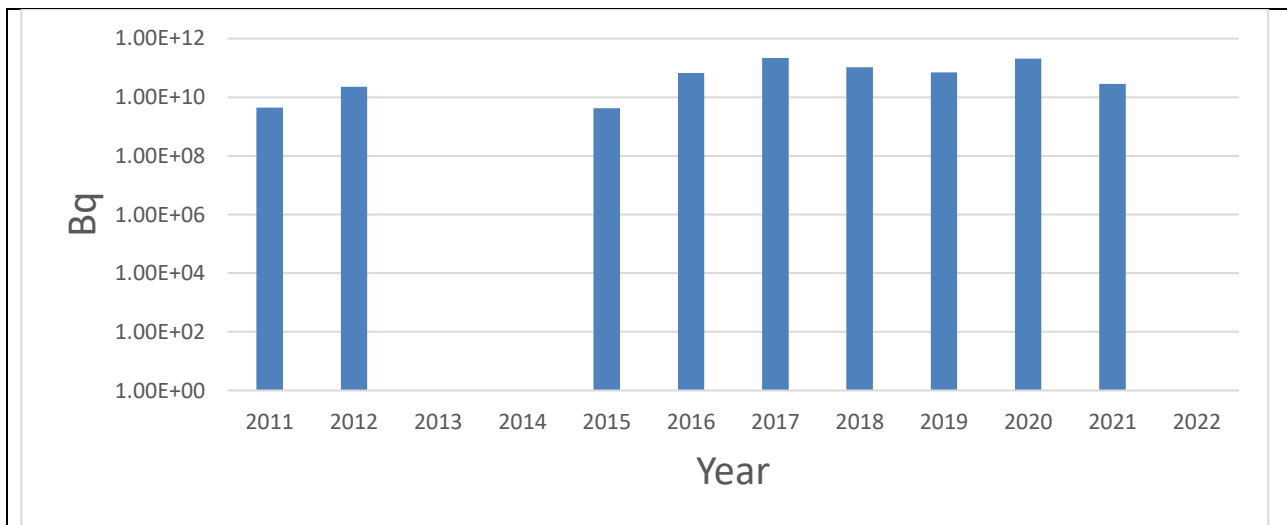


Figure 1: Fluorine-18 Emissions

6.4. Trade waste records

During operations and post-operations, the trade waste tanks were sampled prior to their discharge to Sydney Water. The records for 2020 to 2022 are available in ANSTO's SAP system, equating to a total of 52 records.

The samples were analysed to determine pH value and to detect gamma radiation. Where gamma radiation was detected, the samples were further analysed to determine the activity of the radionuclides and evaluate those results against release limits prior to discharge.

No discharges above limits were recorded.

6.5. ANSTO Hazard Register entries for B81

Several hazards related to contaminants exist within the ANSTO Hazards Register [1] that are specific to the B81 Camperdown Facility. These are summarised in Table 4, including references to any associated reports. Additional details are available by accessing the register via the Risk ID hyperlink.

Table 4. Summary of relevant hazards captured in ANSTO Hazards Register [1]

Risk ID	Hazard	Location	Risk Priority	Date Identified	Report
10893	Asbestos	Room 1042 - Boiler - Seal inside the boiler	Low	14/10/2013	
11497	Metal Contaminants	Refer to report: BLD81-SAR2601	Medium	02/06/2015	BLD81-SAR2601
14805	Chemical Hazard	North Basement - Delay Water Tanks	High	03/06/2016	
16945	Various	Facility	Medium	11/08/2021	Building Overview

Risk [14805](#) has a high Risk Priority, with the Advice Comment of:

"Hydrogen Sulphide may be produced by the decay of organic material in the water delay tanks. Workers must not enter this area in the event of an alarm. Evacuate the area immediately in the case of an alarm."

7. Impacted Areas

Based on a review of the available health physics surveys (section 6.1.1), it was determined that the radiologically impacted areas of the facility are:

- Vault Rooms
- Cyclotron
- Basement
- Production area
- Dispatch area

Based on conversations with production and maintenance staff and subject matter experts (RPA, HPS), the following areas are also considered impacted:

- Site (below the vault rooms)
- Trade waste tanks
- Hot cells and trenches
- Pneumatic transfer system
- Active ventilation system

The remainder of the facility has no reasonable potential for residual contamination and is non-impacted.

8. Classification of Areas

Based on the information provided by the measurements recorded in the routine health physics surveys (section 6.1.1), the impacted areas have been assigned a classification. This allows for a graded characterisation process and the class will be confirmed during scoping. Impacted systems have been incorporated into the most appropriate area, that have been assigned a Survey Unit number.

According to MARSSIM (section 2.5.2) the initial assumption for affected areas is that none of the necessary information is available. This results in a default Class 1 classification. As there are no radiological measurements available from the beneath the concrete slab of the facility this, has resulted in the Site receiving the default classification.

The survey unit, area description, the radiological impact type, and preliminary classification is provided in Table 5.

Table 5. Survey Unit, Area Description and Classification

Survey Unit	Area Description	Impact	Classification
01	Vault Rooms, including: Cyclotron	Activation	Class 1
02	Basement, including: - Trade Waste Tanks - Basement Hot Cell	Contamination	Class 3
03	Production area, including: - Hot Cells and Trenches - Pneumatic Transfer System - Active Ventilation System	Contamination	Class 3
04	Dispatch area	Contamination	Class 3
05	Site	Unknown	Class 1

9. Conclusions

The facility building will be demolished leaving a site that may require remediation prior to the final status survey.

The demolition of the vault room section of the facility building presents a contamination risk to the site. If this risk is realised, the complexity of the scoping, characterisation, remediation, and final status survey of the site will be increased.

The information collected and collated in this HSA is sufficient to complete a preliminary site investigation and the formulation of a conceptual site model to guide future detailed site characterisation work.

10. References

1. ANSTO Hazards Register [Internet]. 2020. Available from: <http://hazardsregister.ansto.gov.au/home>.
2. National Environment Protection (Assessment of Site Contamination) Measure (1999).
3. NRC U, EPA D. MARSSIM, Multiagency Radiation Survey and Site Investigation Manual, NUREG-1575, Rev1: EPA 402-R-97-016, Rev. 1, DOE/EH-0624, Rev. 1; 2000. Available from: <https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1575/r1/>.
4. Wales NS. Guidelines for Consultants Reporting on Contaminated Sites 1997. Available from: <https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/clm/20110650consultantsreportglines.pdf>.
5. Camperdown Decommissioning HP Surveys Compilation from 2011 to 2022. Available from ACS <https://cdn.ansto.gov.au/acs/ACS277651>
6. Camperdown Decommissioning Quarterly Reports Compilation from 2010 to 2022. Available from ACS <https://cdn.ansto.gov.au/acs/ACS277663>
7. Camperdown Decommissioning Stack Emissions from 2011 to 2022. Available from ACS <https://cdn.ansto.gov.au/acs/ACS277664>

Appendix A: Camperdown Facility Site Description

This section contains:

- Figure 2: Aerial Image of Camperdown Facility
- Figure 3: Aerial Image of Camperdown Facility Location
- Figure 4: Map of Camperdown Facility Location
- Figure 5: Area Topography
- Figure 6: Aerial Photograph Depicting Facility Within DP 1179349 / lot 101
- Figure 7: Drawing A1E 059081 – Building 81 National Medical Cyclotron
- Figure 8: Drawing A1E 059081 – Building 81 National Medical Cyclotron – Basement Floor Plan
- Figure 9: Drawing A1E 059081 – Building 81 National Medical Cyclotron – First Floor Plan
- Figure 10: ANSTO Camperdown Lease Location Plan
- Figure 11: Drawing A1E62432 Site Plan
- Figure 12: Utilities Investigation, Drawing PR142110-UTIL-001-B, Sheet 2
- Figure 13: Utilities Investigation, Drawing PR142110-UTIL-001-B, Sheet 3
- Figure 14: Utilities Investigation, Drawing PR142110-UTIL-001-B, Sheet 4
- Figure 15: Transfer System Key Plan
- Figure 16: Drawing A1E112396 – Exhaust Stack Room “SIAM” Filter Fan GA
- Figure 17: Drawing A3E127286
- Figure 18: Drawing A3E127312 Room Layout Room 53 Cyclotron (Sheet 1)
- Figure 19: Drawing A1E140608 – MS Ground Floor Exhaust Layout Plan

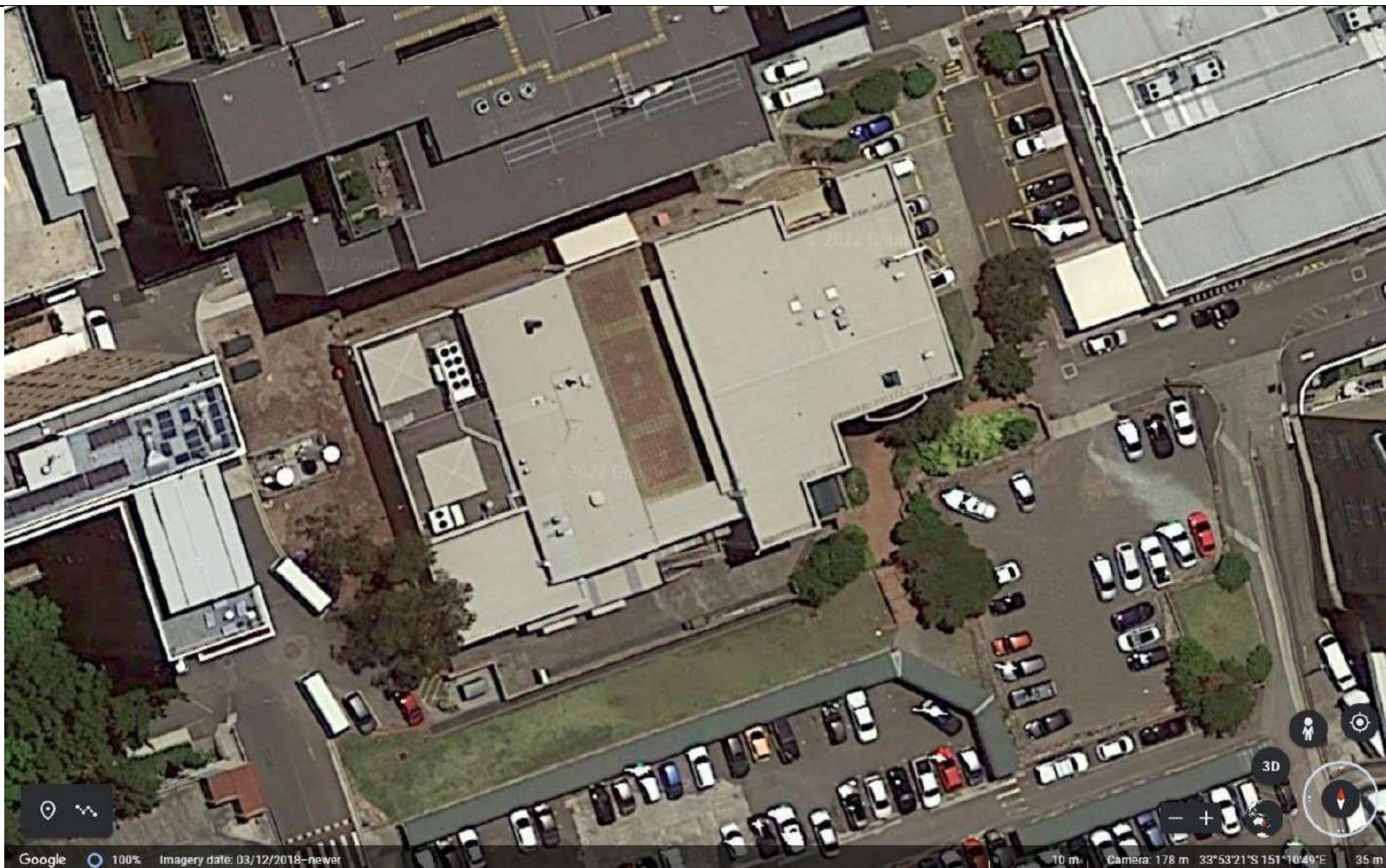


Figure 2: Aerial Image of Camperdown Facility (Centre of Image)

Source: Google Earth

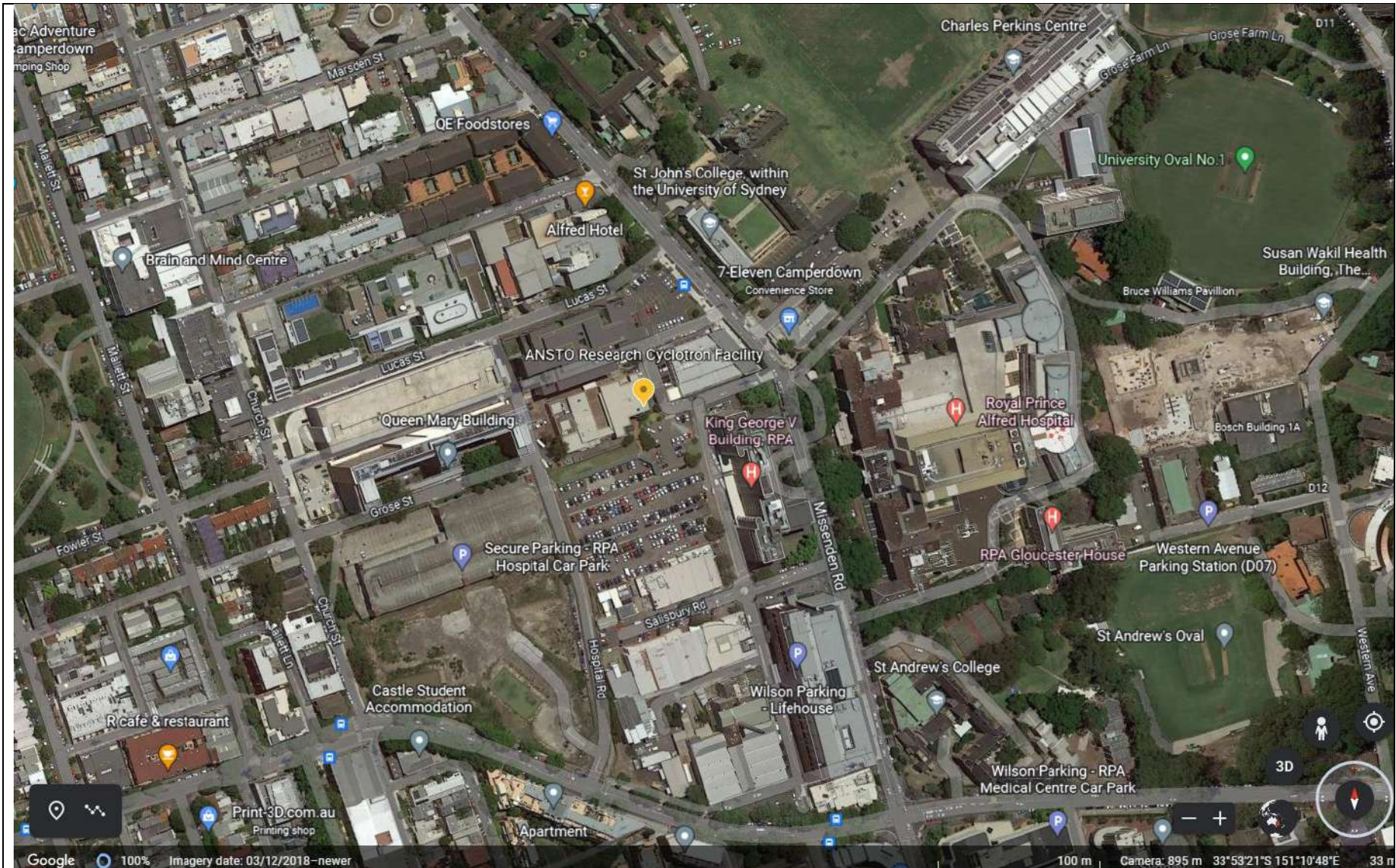


Figure 3: Aerial Image of Camperdown Facility Location

Source: Google Earth

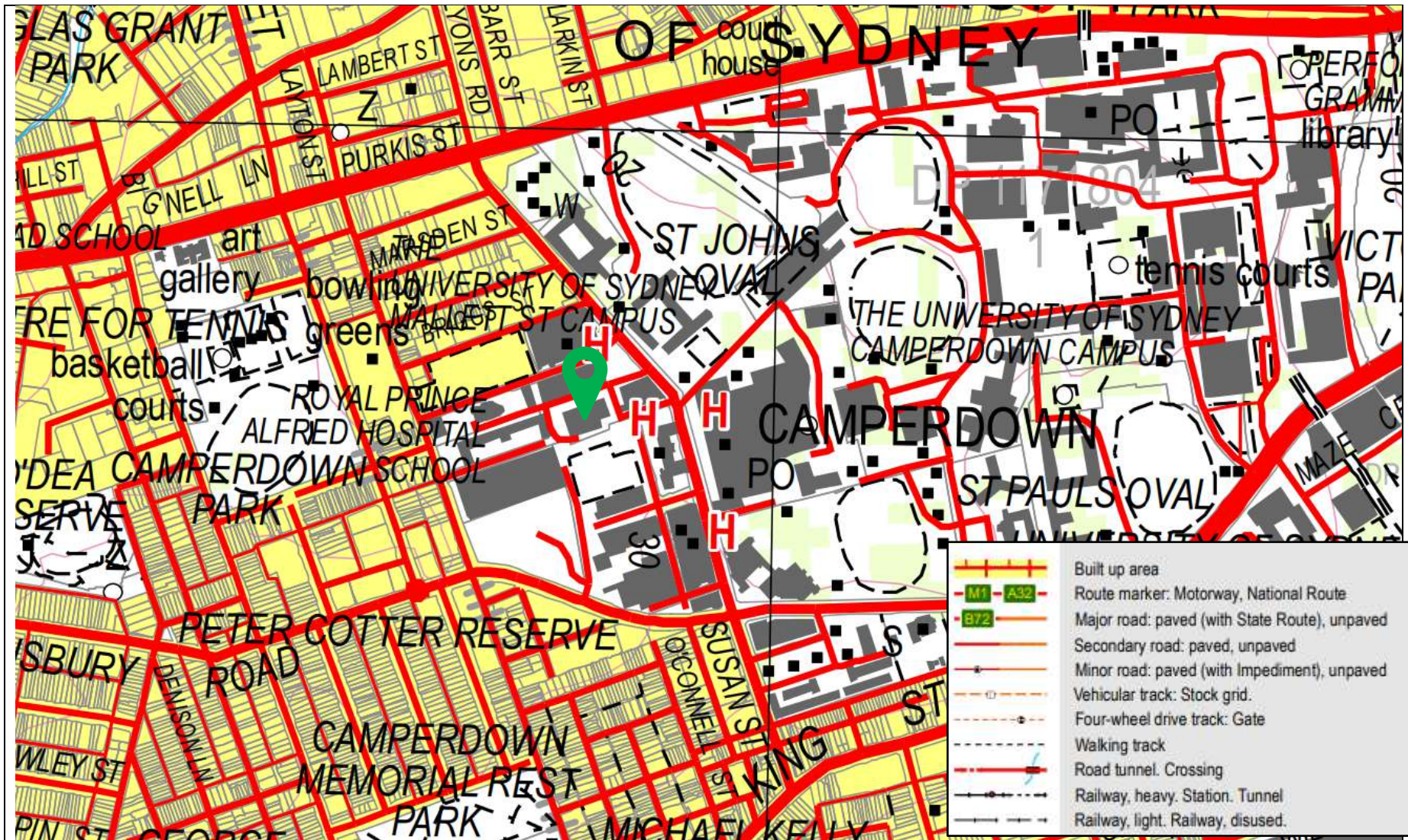


Figure 5: Area Topography

Source: Six Maps, 9130-3S BOTANY BAY Topographic Map



Site Location

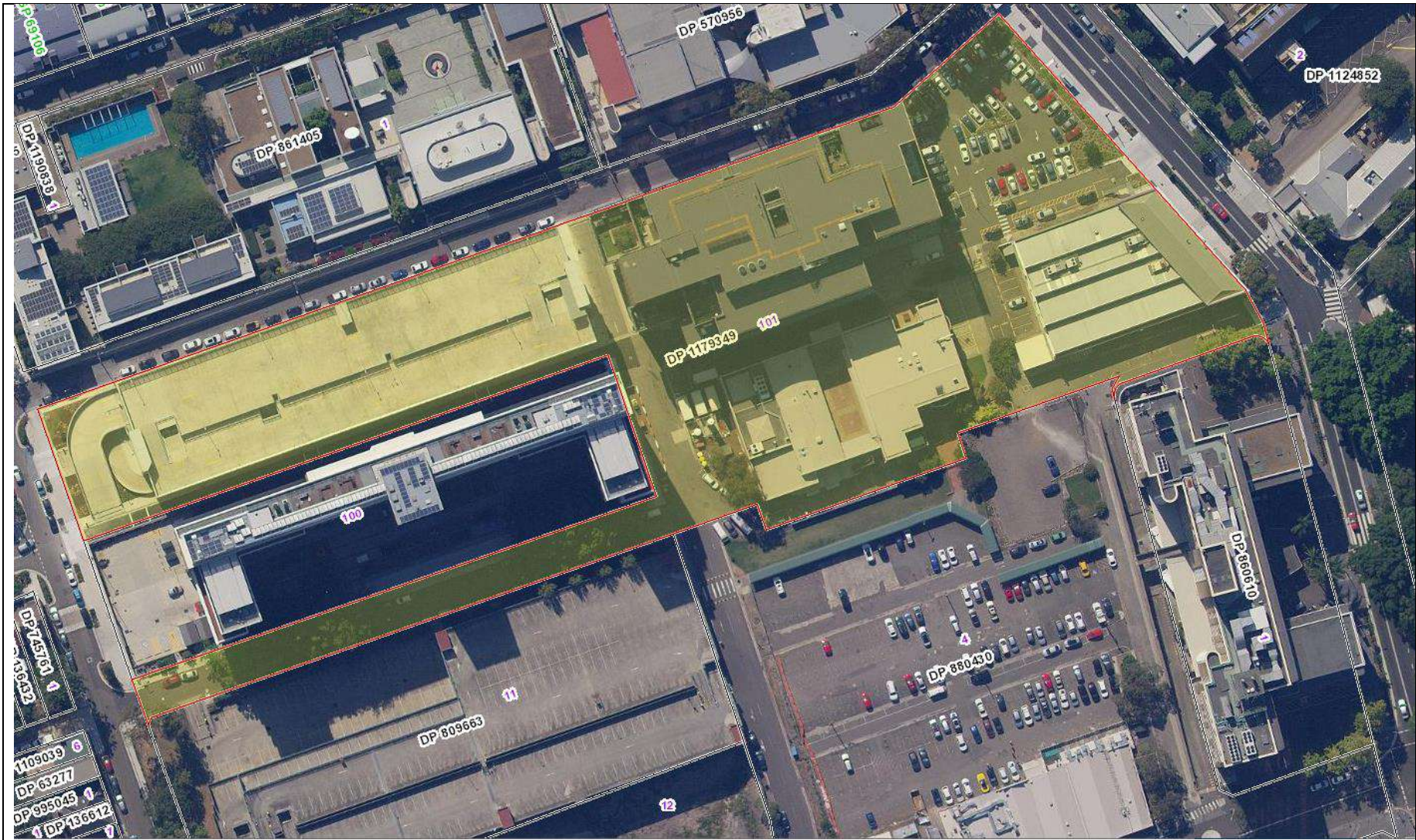
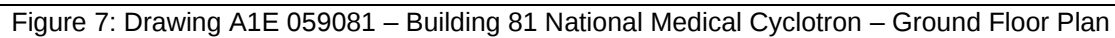


Figure 6: Aerial Photograph Depicting Facility Within DP 1179349 / lot 101

Source: Six Maps, NSW Imagery [6]

North Up



Source: ANSTO ERIS [21]

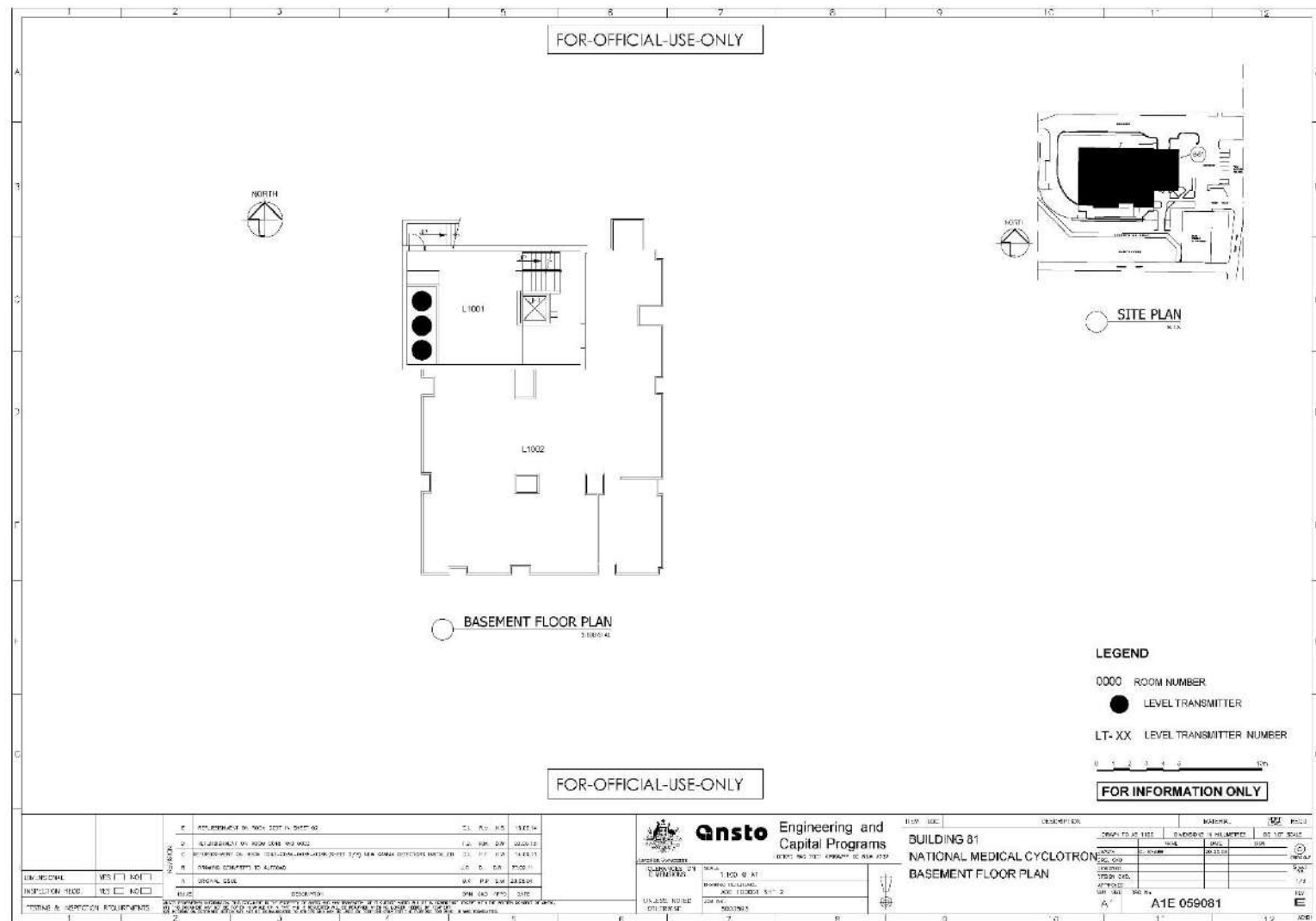


Figure 8: Drawing A1E 059081 – Building 81 National Medical Cyclotron – Basement Floor Plan

Source: ANSTO ERIS [21]

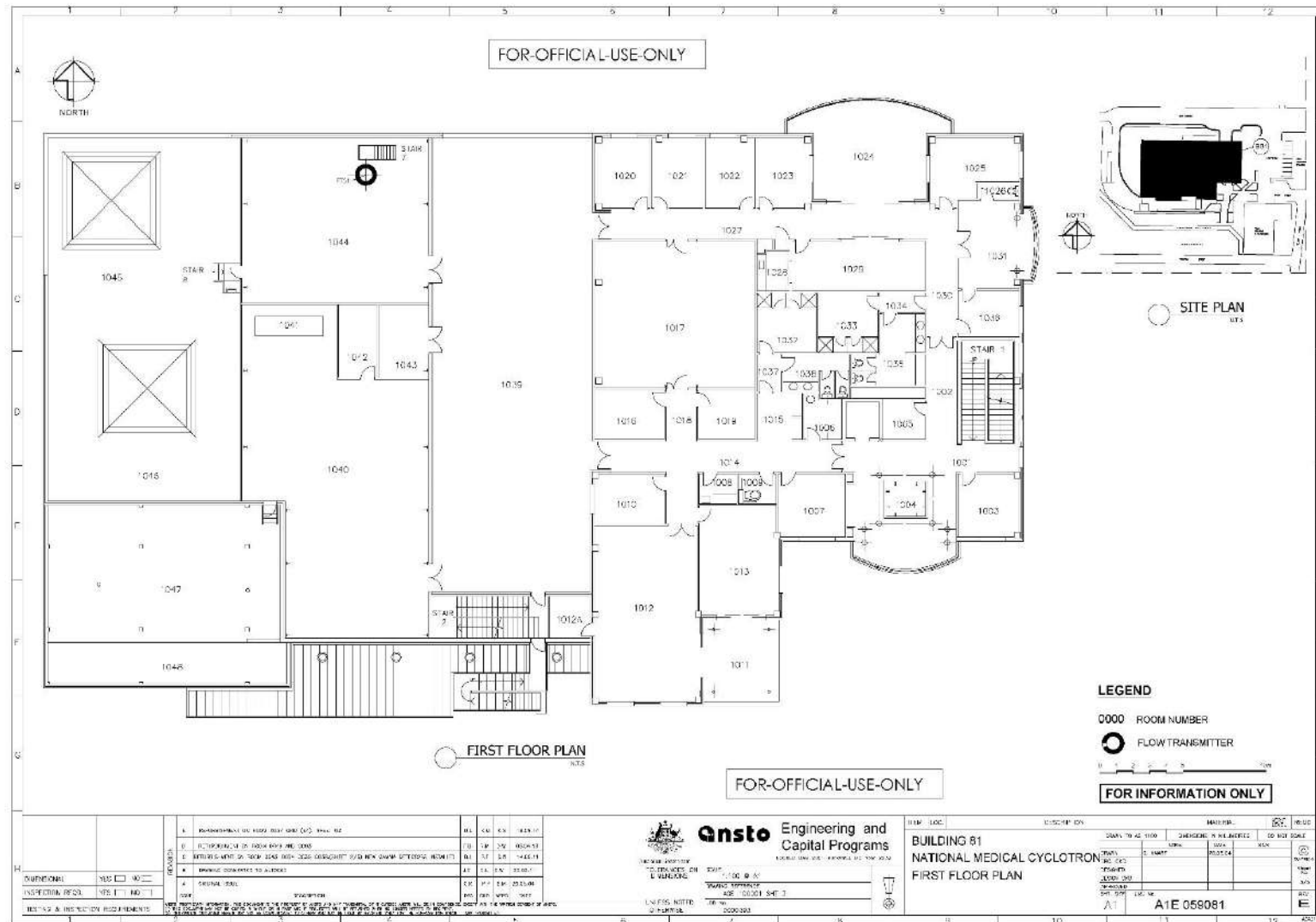
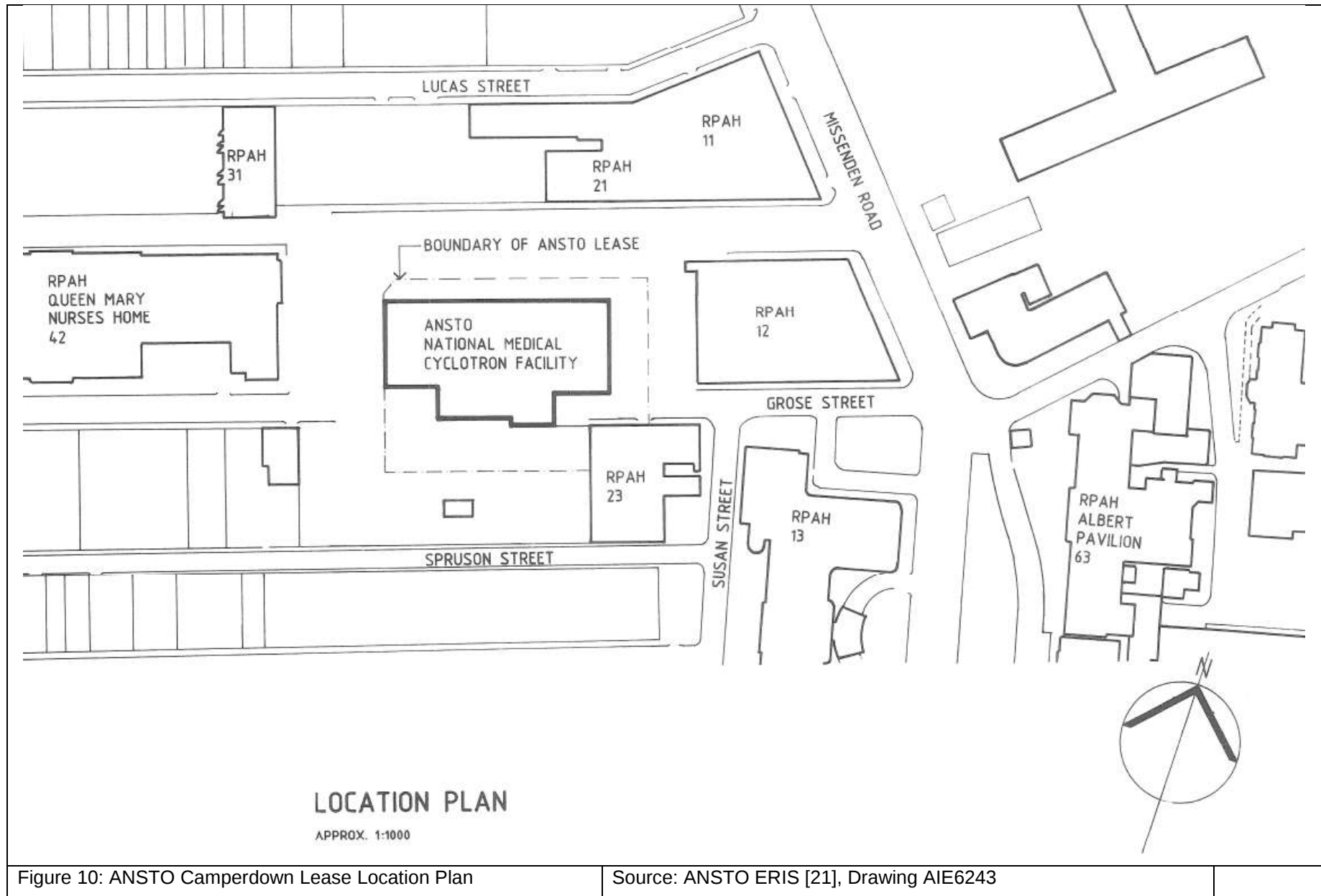
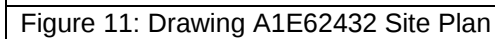


Figure 9: Drawing A1E 059081 – Building 81 National Medical Cyclotron – First Floor Plan

Source: ANSTO ERIS [21]





Source: ANSTO ERIS [21]

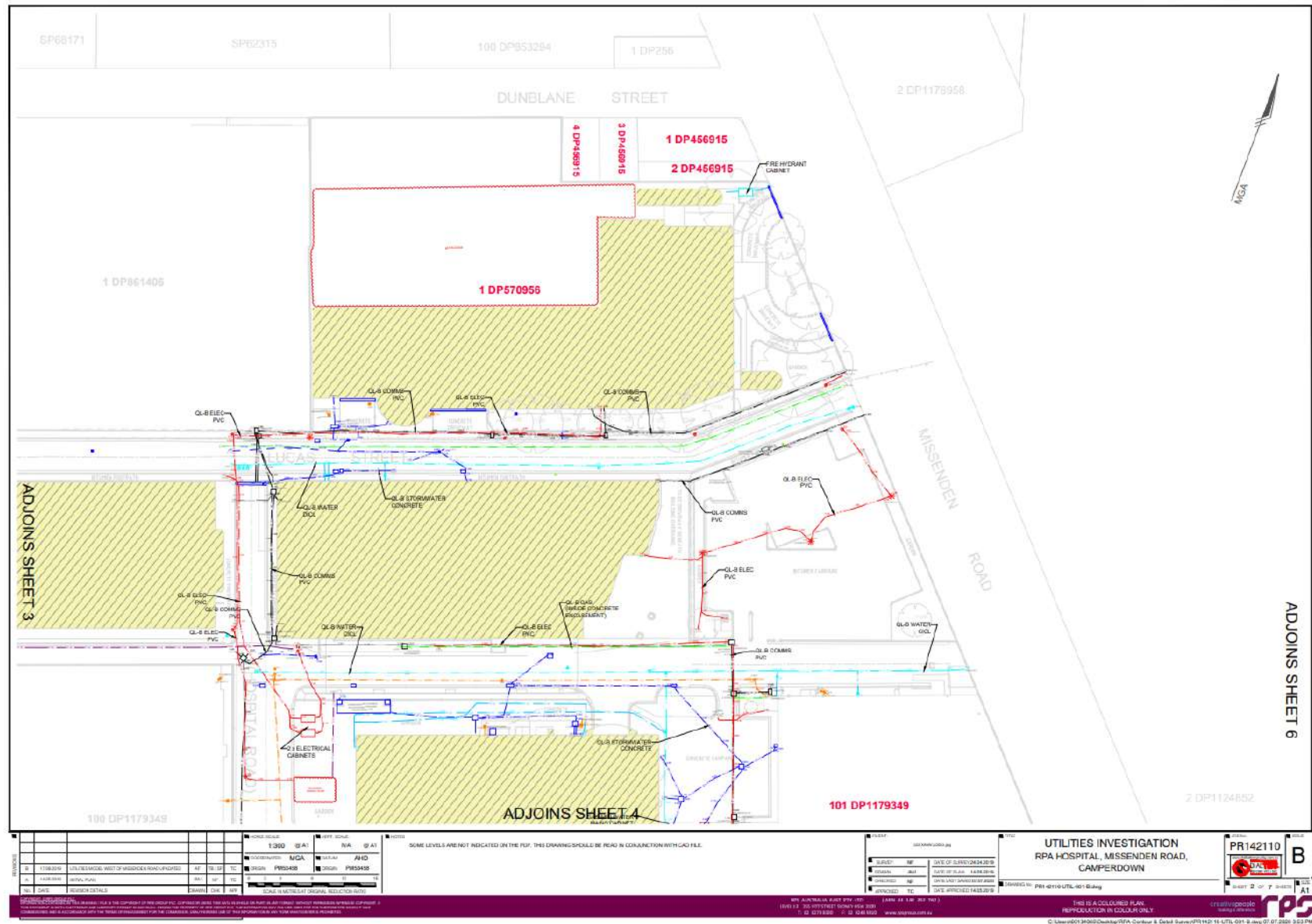
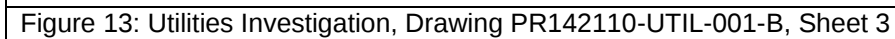


Figure 12: Utilities Investigation, Drawing PR142110-UTIL-001-B, Sheet 2

Source: Project Directory



Source: Project Directory

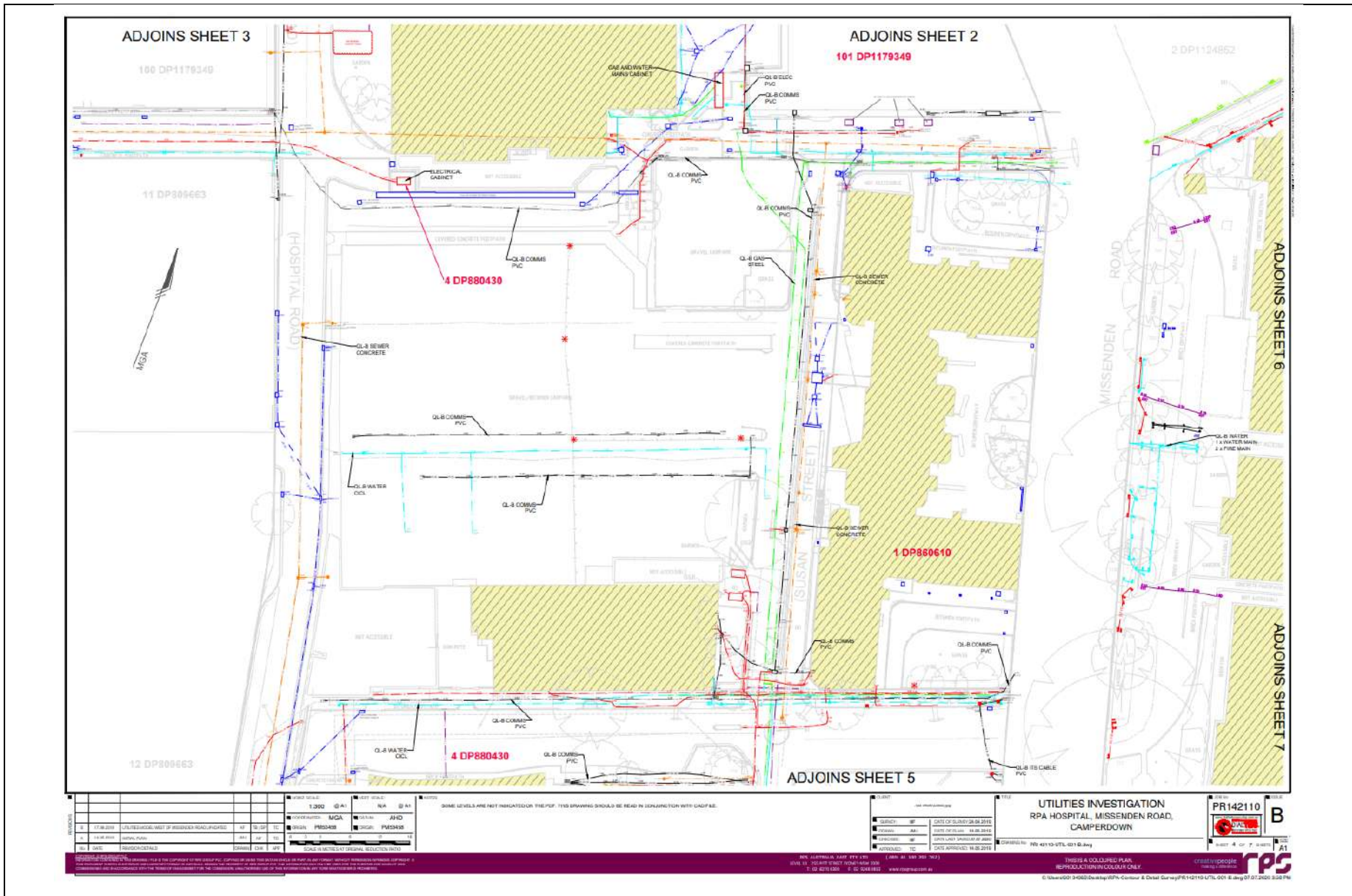


Figure 14: Utilities Investigation, Drawing PR142110-UTIL-001-B, Sheet 4

Source: Project Directory

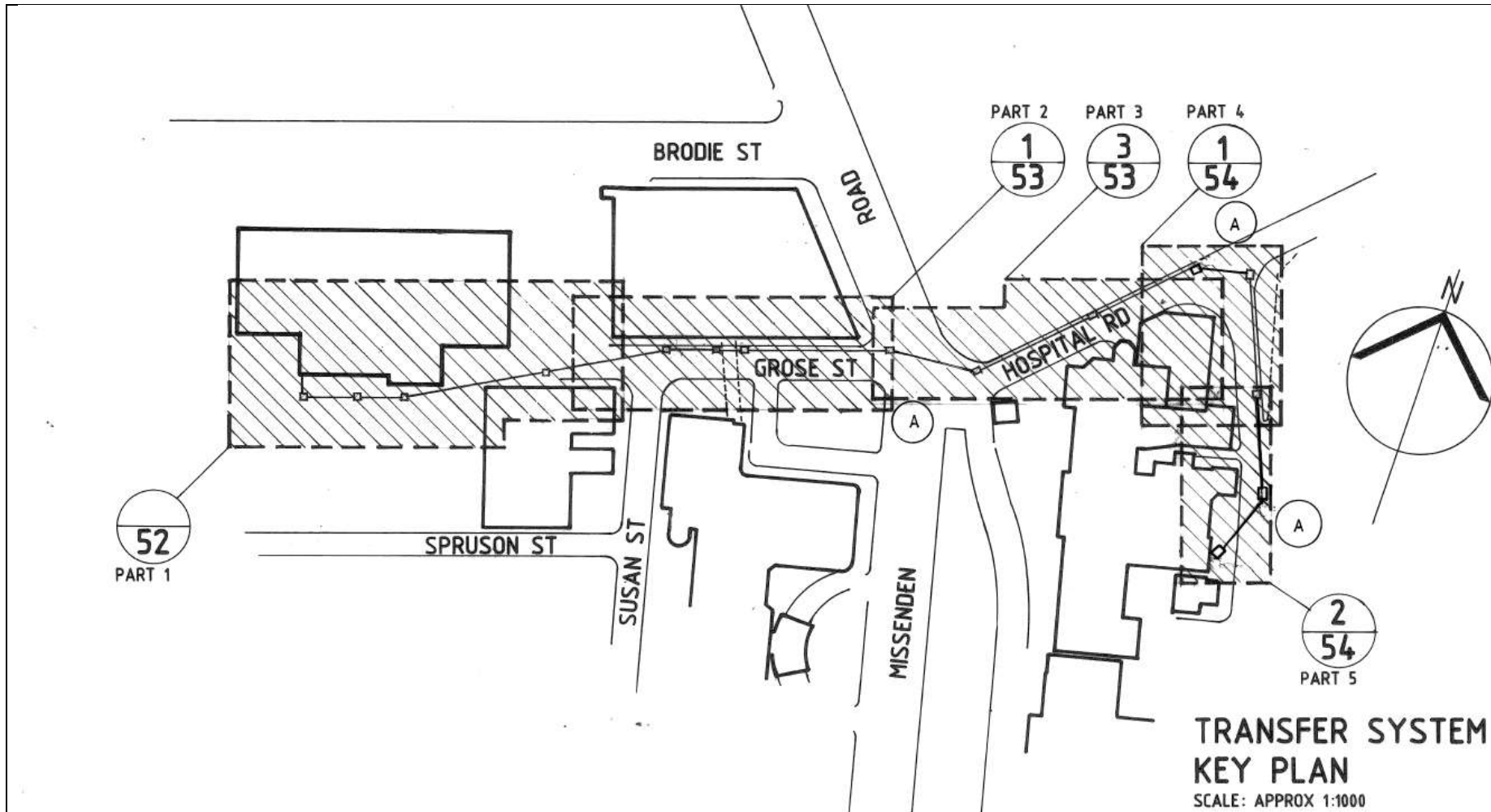


Figure 15: Transfer System Key Plan

Source: ANSTO ERIS [21], Drawing AIE101185

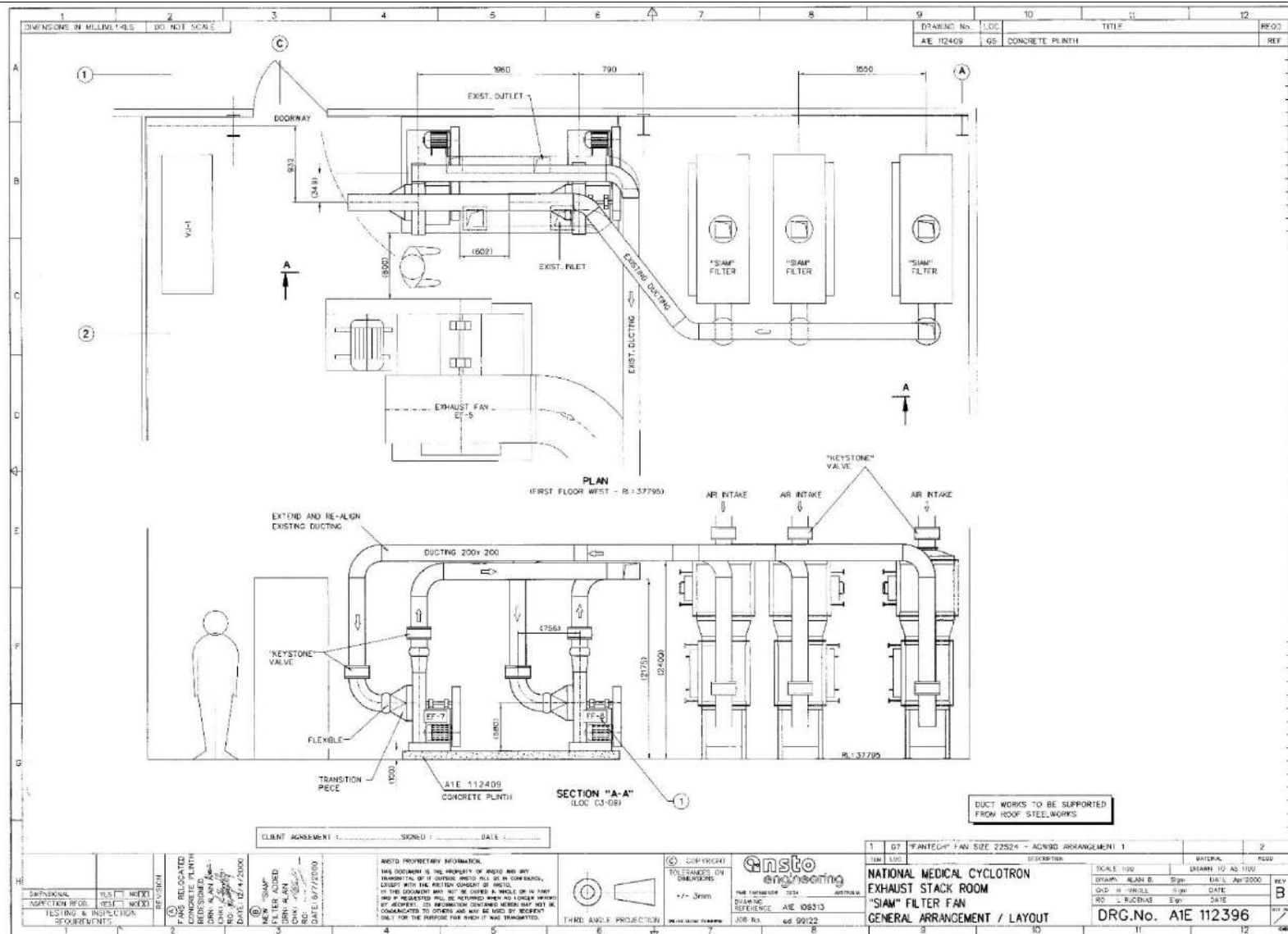


Figure 16: Drawing A1E112396 – Exhaust Stack Room “SIAM” Filter Fan GA

Source: ANSTO ERIS [21]

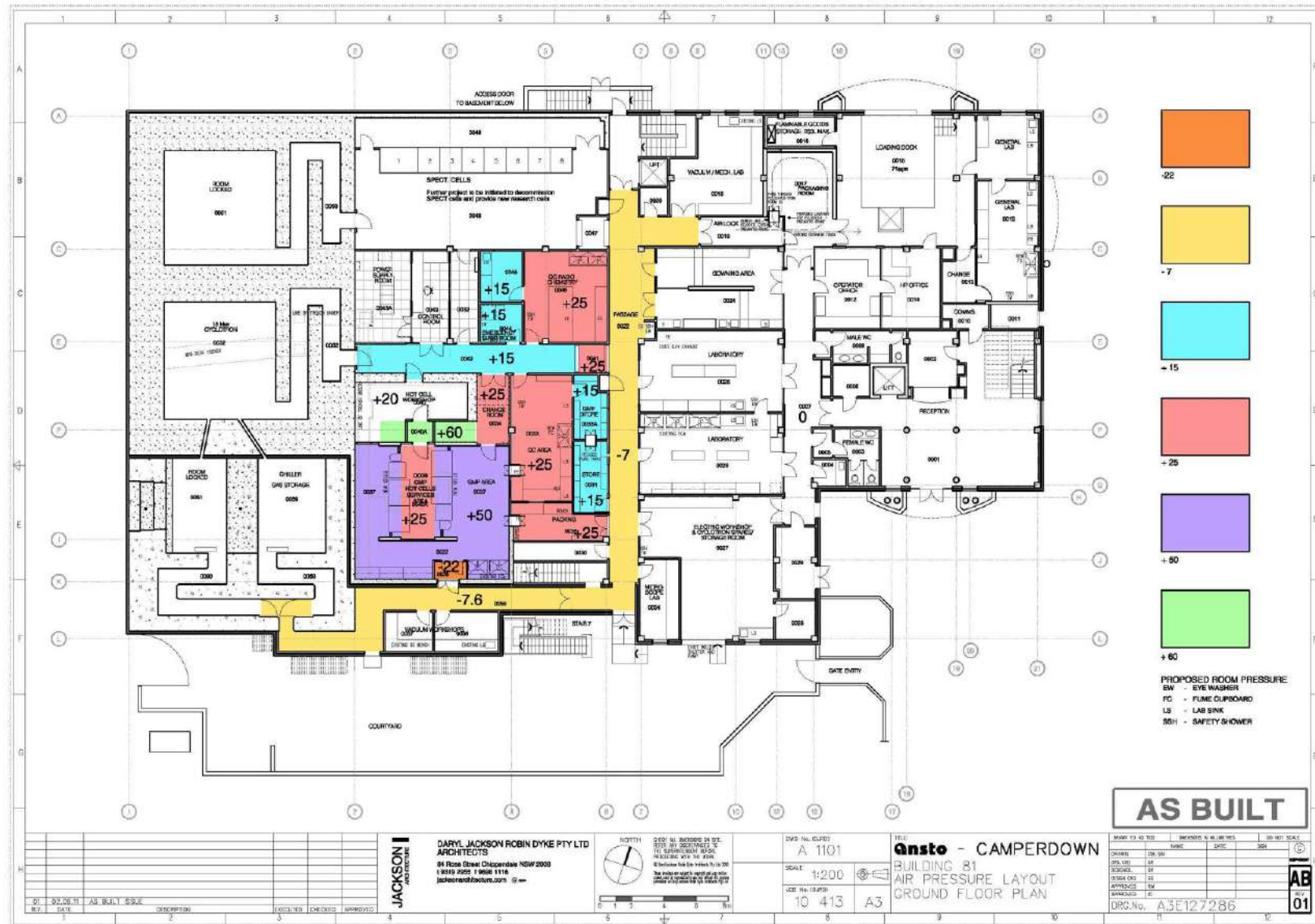


Figure 17: Drawing A3E127286 Building 81 Air Pressure Layout Ground Floor Plan

Source: ANSTO ERIS [21]

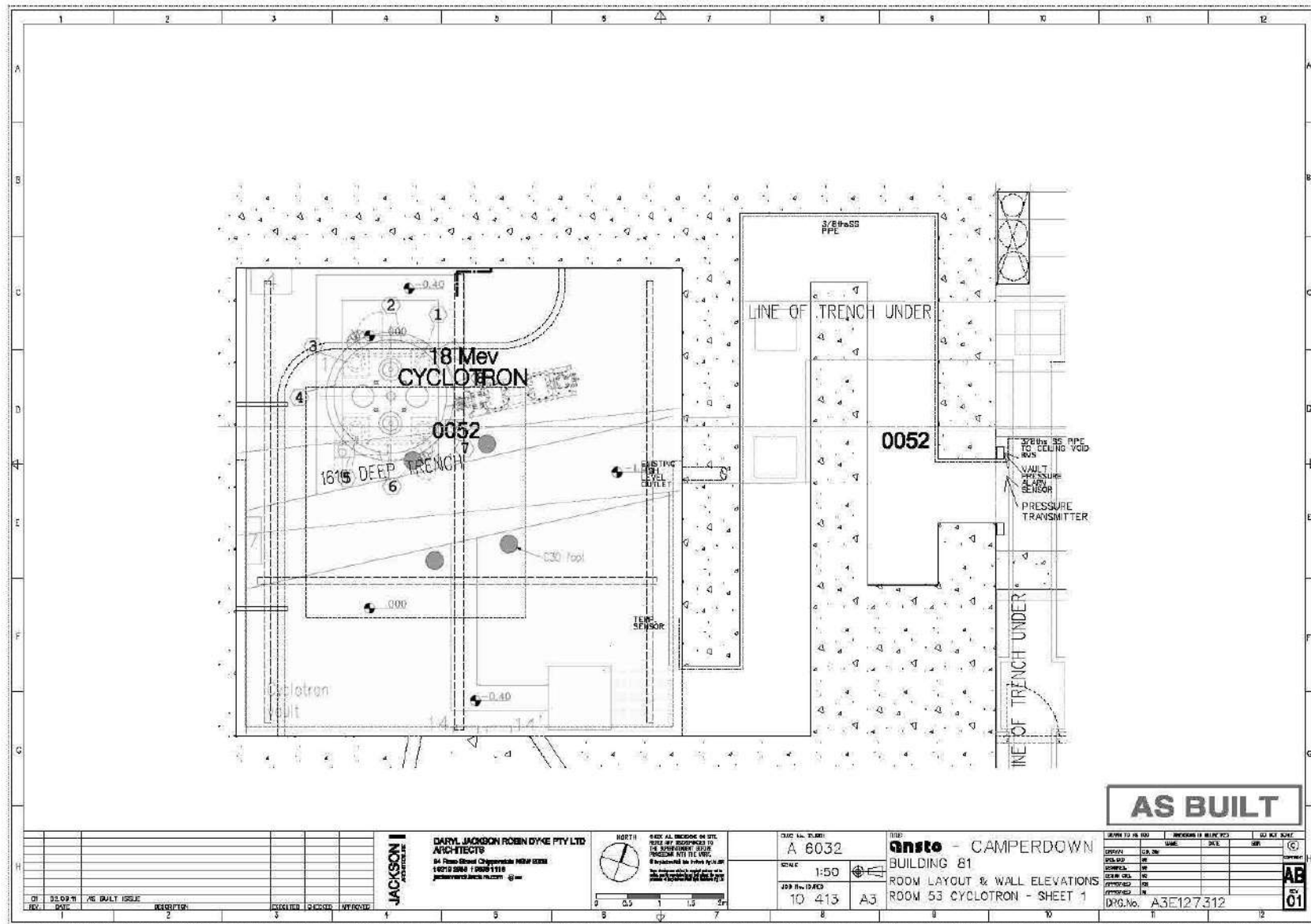


Figure 18: Drawing A3E127312 Room Layout Room 53 Cyclotron (Sheet 1)

Source: ANSTO ERIS [21]

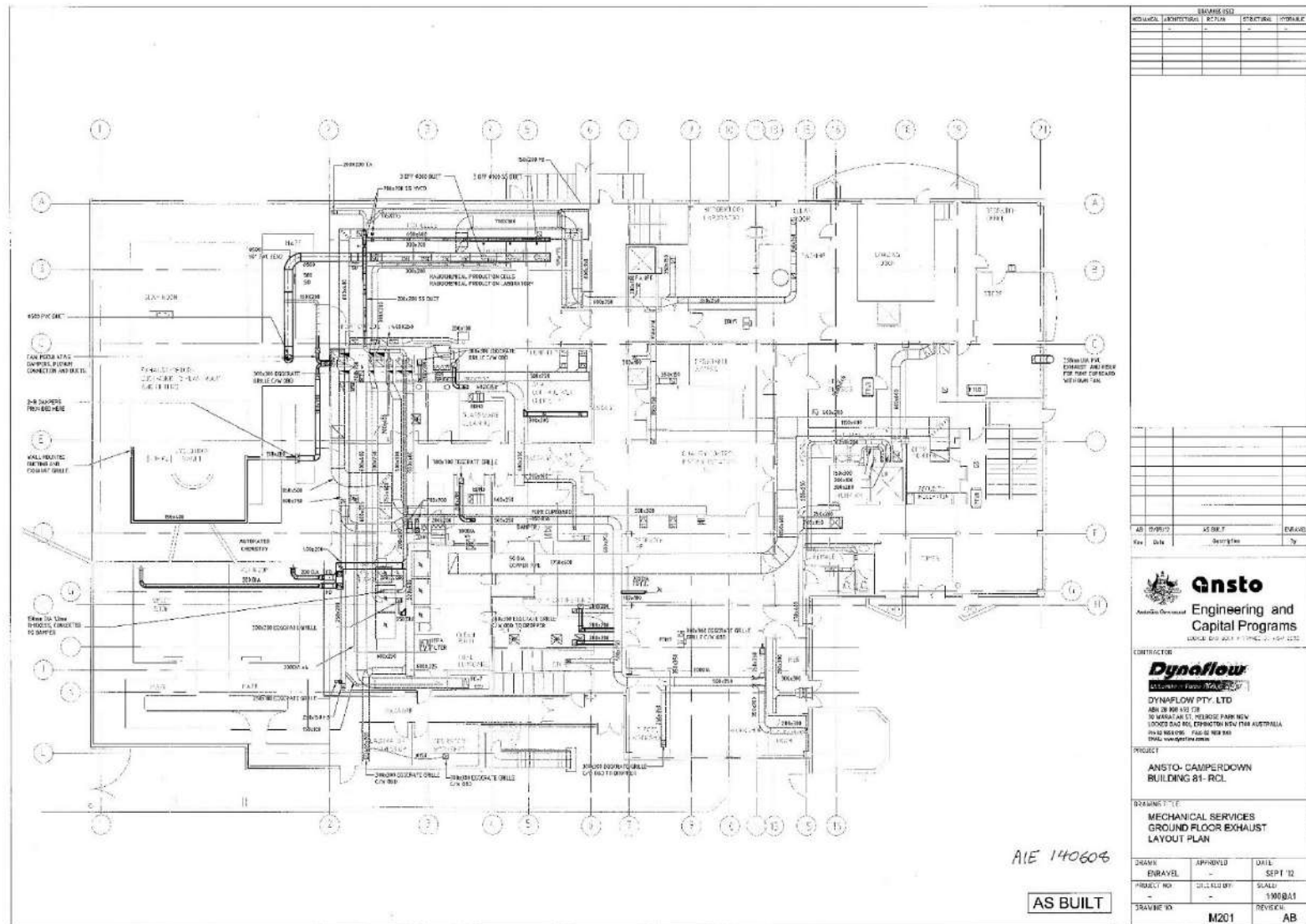


Figure 19: Drawing A1E140608 – MS Ground Floor Exhaust Layout Plan

Source: ANSTO ERIS [21]

Appendix B: Historic Facility Configuration

The figures provided in this section are:

- Figure 20: Drawing A1E100605 – Demolition for Cyclotron Building
- Figure 21: Drawing A3E62407 – Lease Plan NMC Facility
- Figure 22: Drawing A3E100602 – National Medical Cyclotron Time Scale
- Figure 23: Drawing A1E101180 NMC Civil Works Layout
- Figure 24: Drawing A1E62426 Original Ground Floor Plan
- Figure 25: Drawing A1E62425 Original Basement Plan and Sections
- Figure 26: Layout of 30Mev Cyclotron, Beamlines and Target Stations
- Figure 27: Drawing A1E1000768 – Cyclotron Radio Isotope Cells Layout
- Figure 28: Drawing A1E103963 – NMC Basement Plan - Extension
- Figure 29: Drawing A1E 059081 – NMC Ground Floor Plan - Extensions

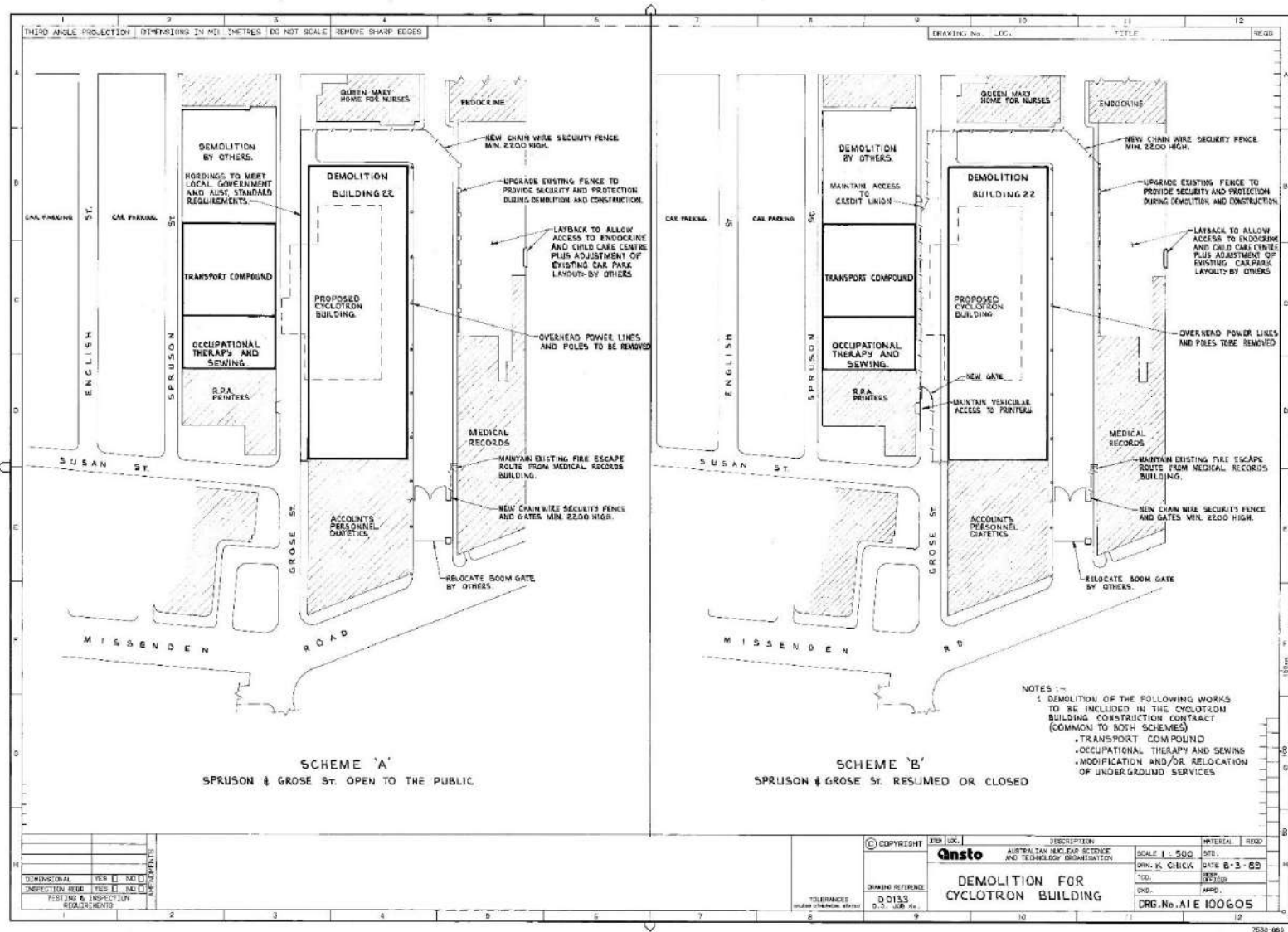


Figure 20: Drawing A1E100605 – Demolition for Cyclotron Building

Source: ANSTO ERIS [21]

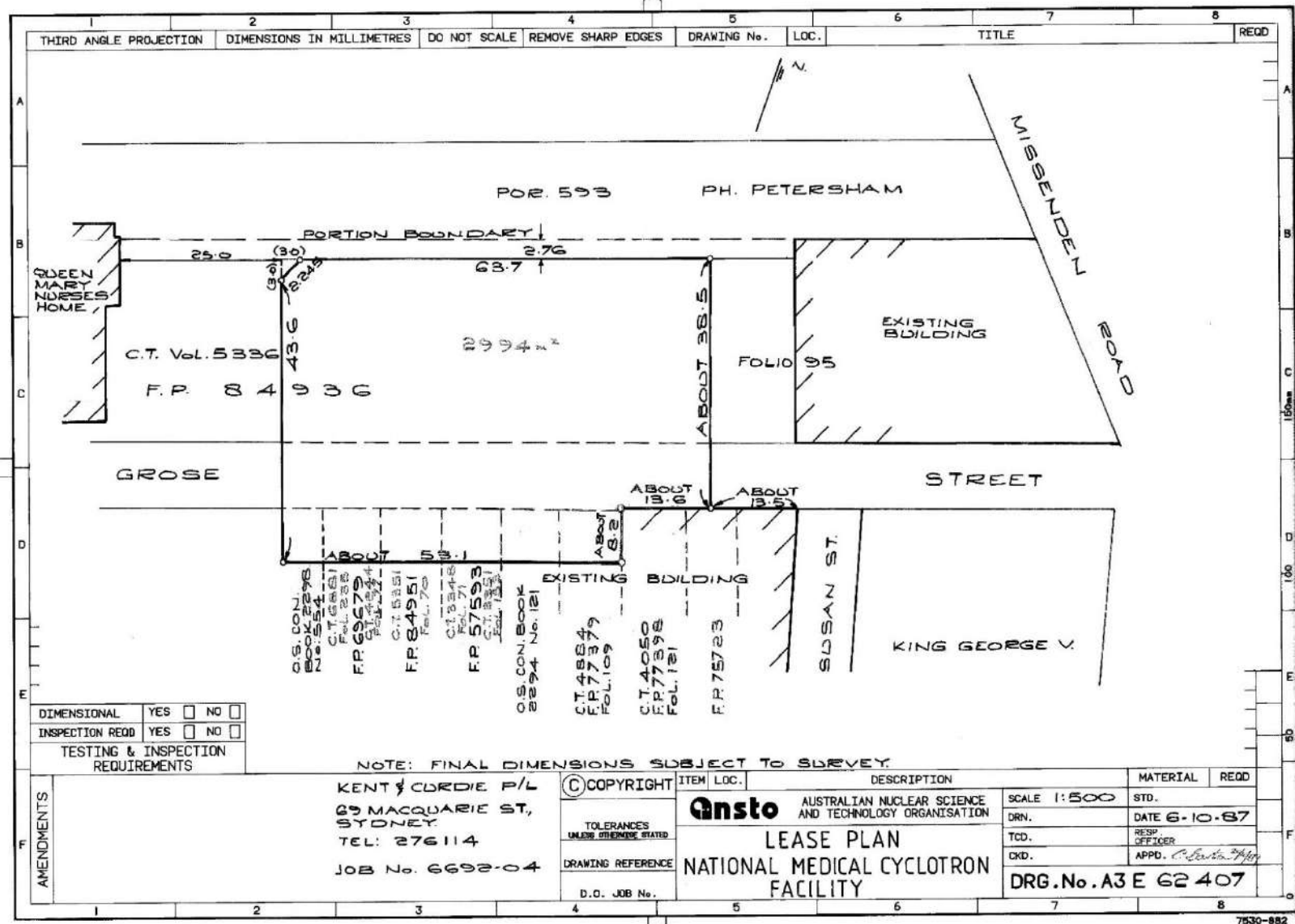


Figure 21: Drawing A3E62407 – Lease Plan NMC Facility

Source: ANSTO ERIS [21]

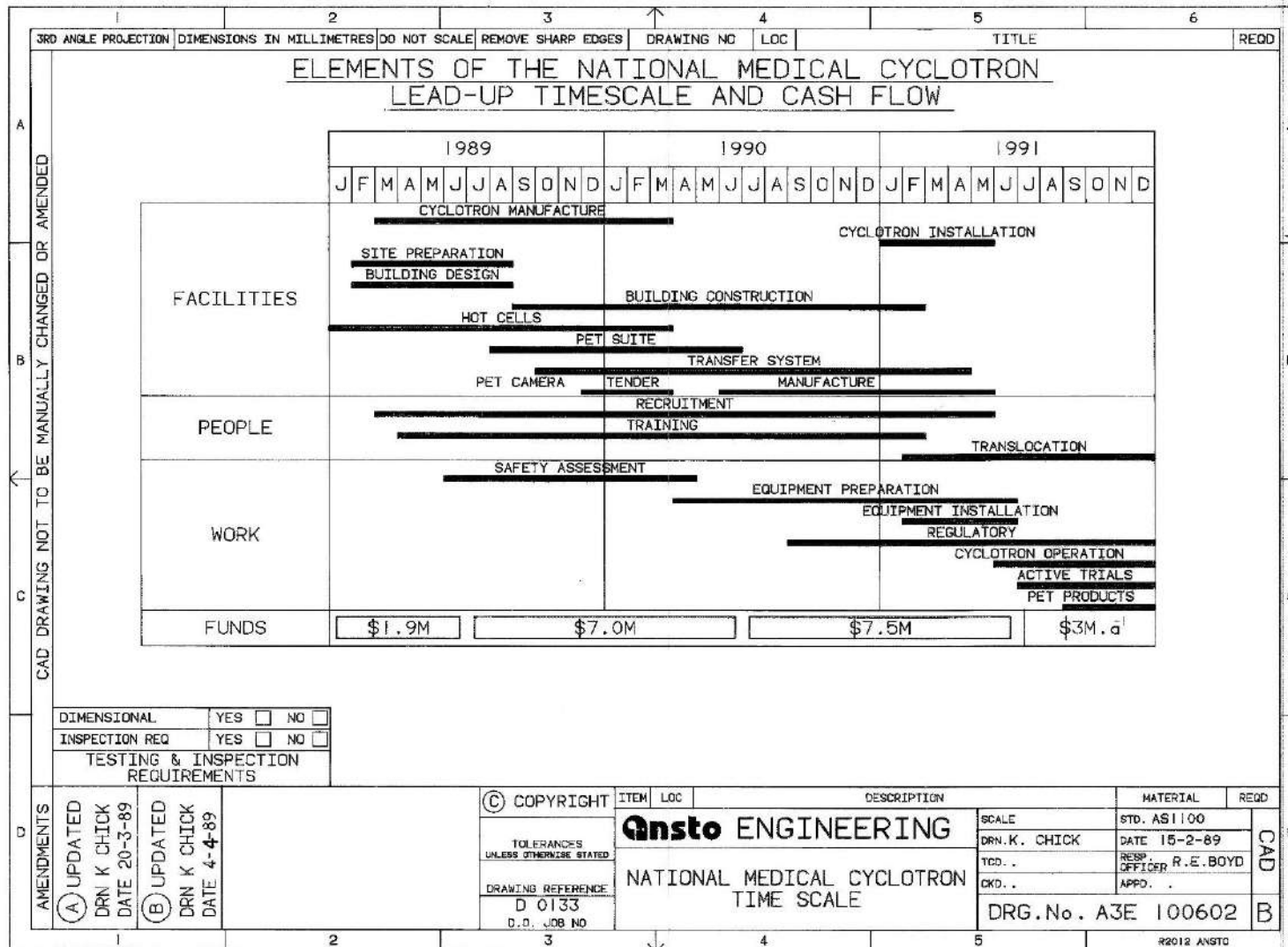


Figure 22: Drawing A3E100602 – National Medical Cyclotron Time Scale

Source: ANSTO ERIS [21]

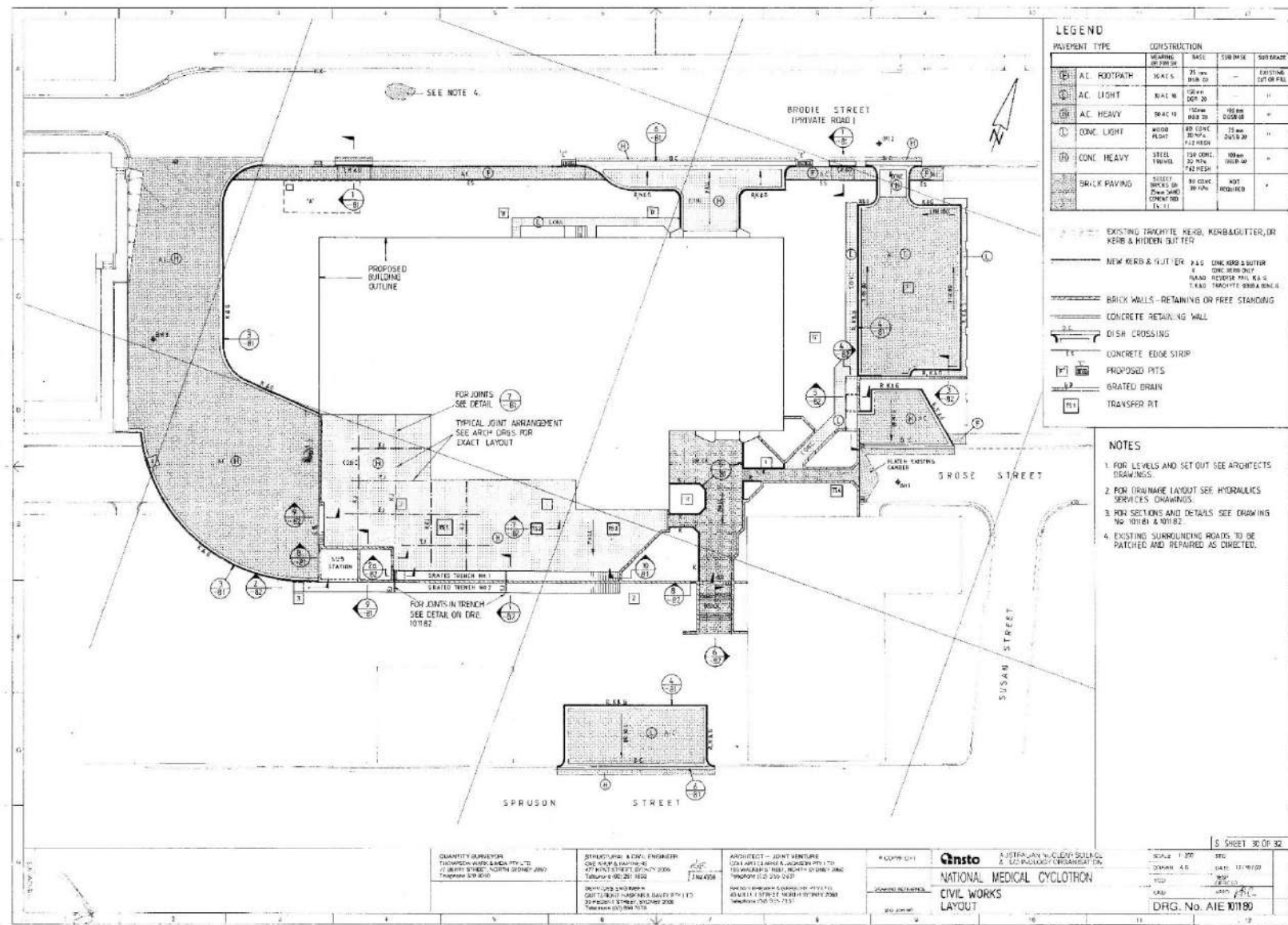


Figure 23: Drawing AIE101180 NMC Civil Works Layout

Source: ANSTO ERIS [21]

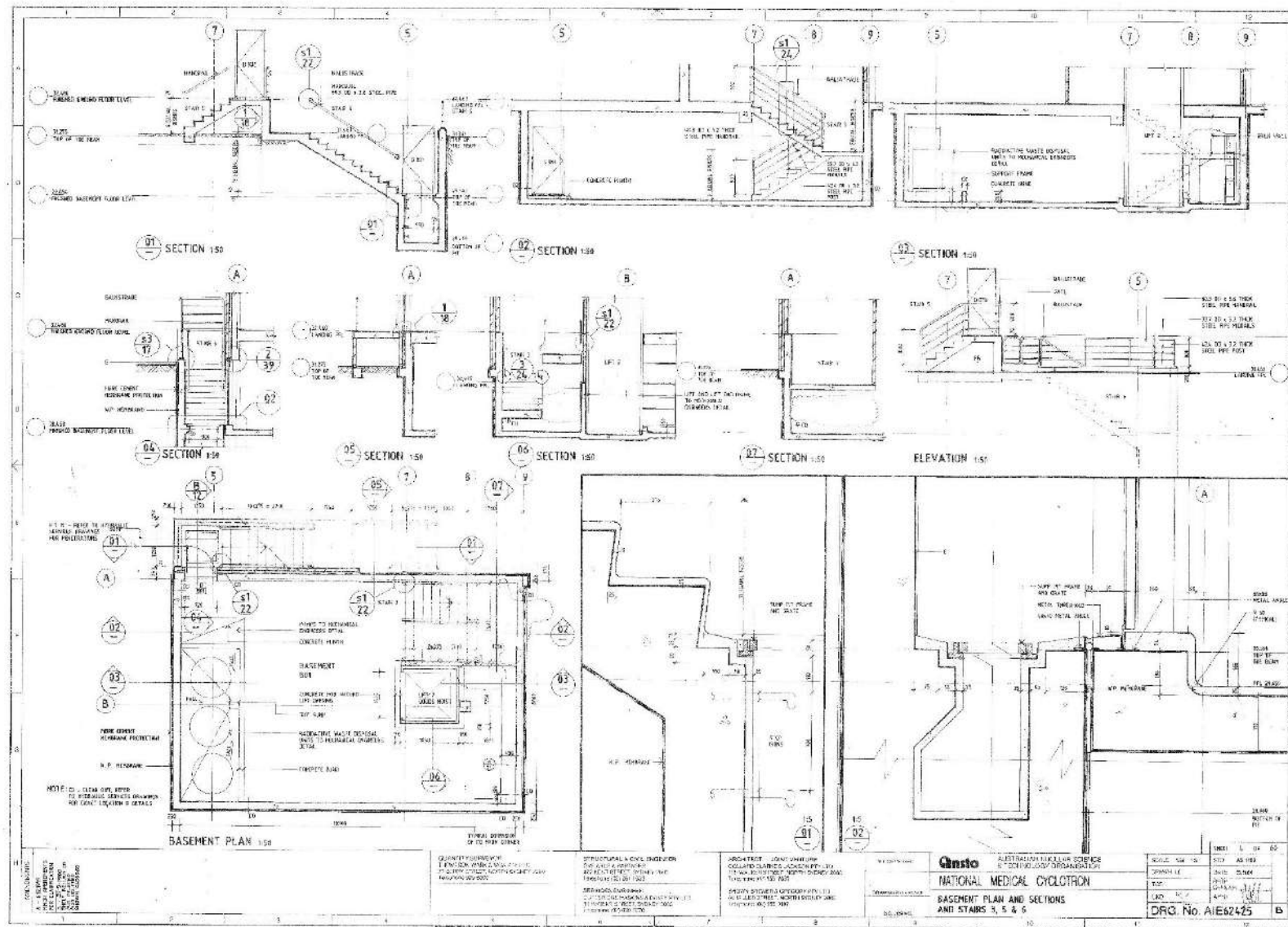
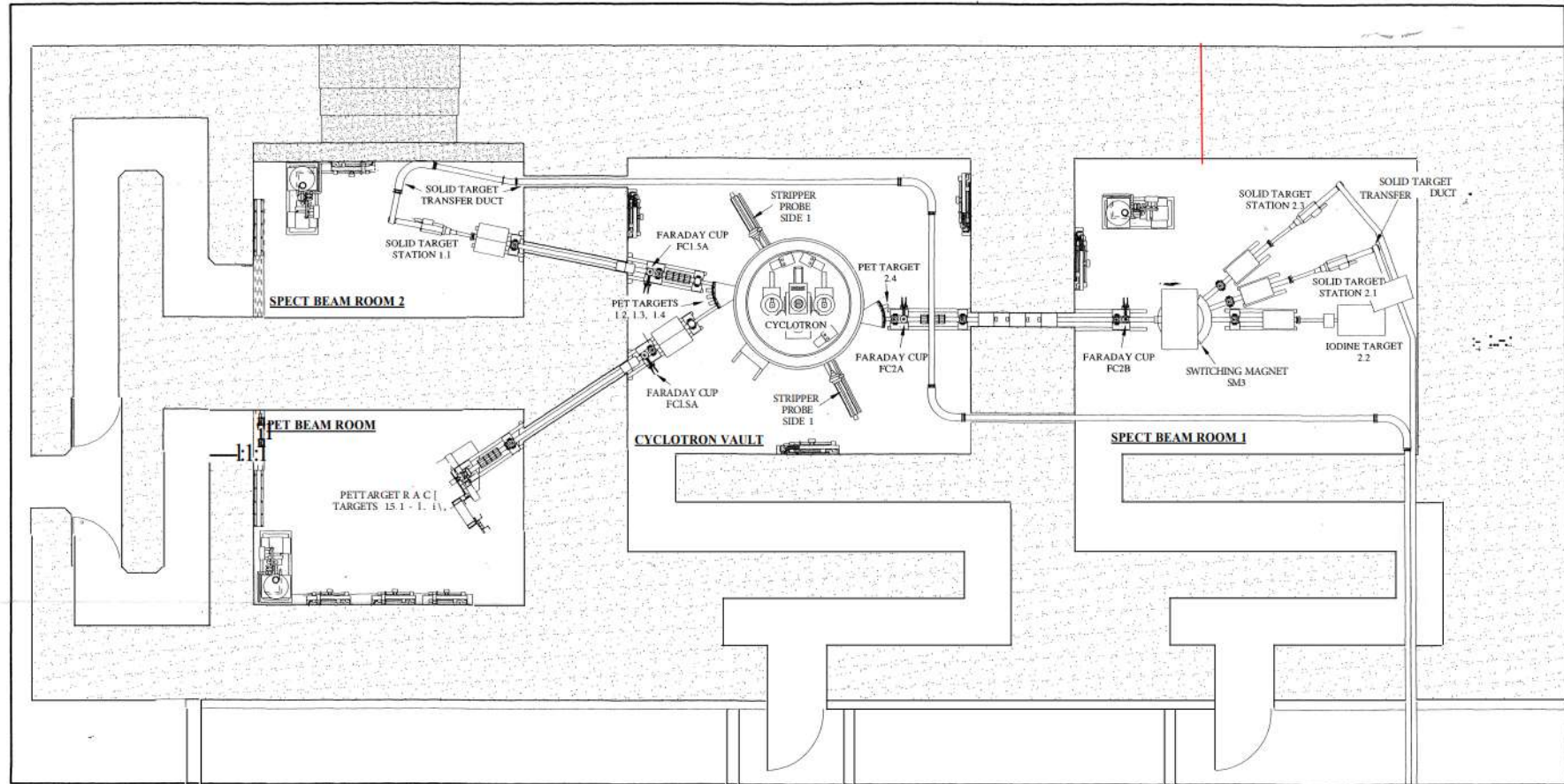


Figure 25: Drawing AIE62425 Original Basement Plan and Sections

Source: ANSTO ERIS [21]

LAYOUT OF CYCLOTRON VAULT AND TARGET BEAM ROOMS



PET TARGETS - F-18, NH-13, C-11, 0-15

SOLID TARGET STATION - TI-201, Ga-67

IODINE TARGET - I-123

0 1 2 3 4
Metres

Figure 26: Layout of 30Mev Cyclotron, Beamlines and Target Stations	Source: ANSTO Health	
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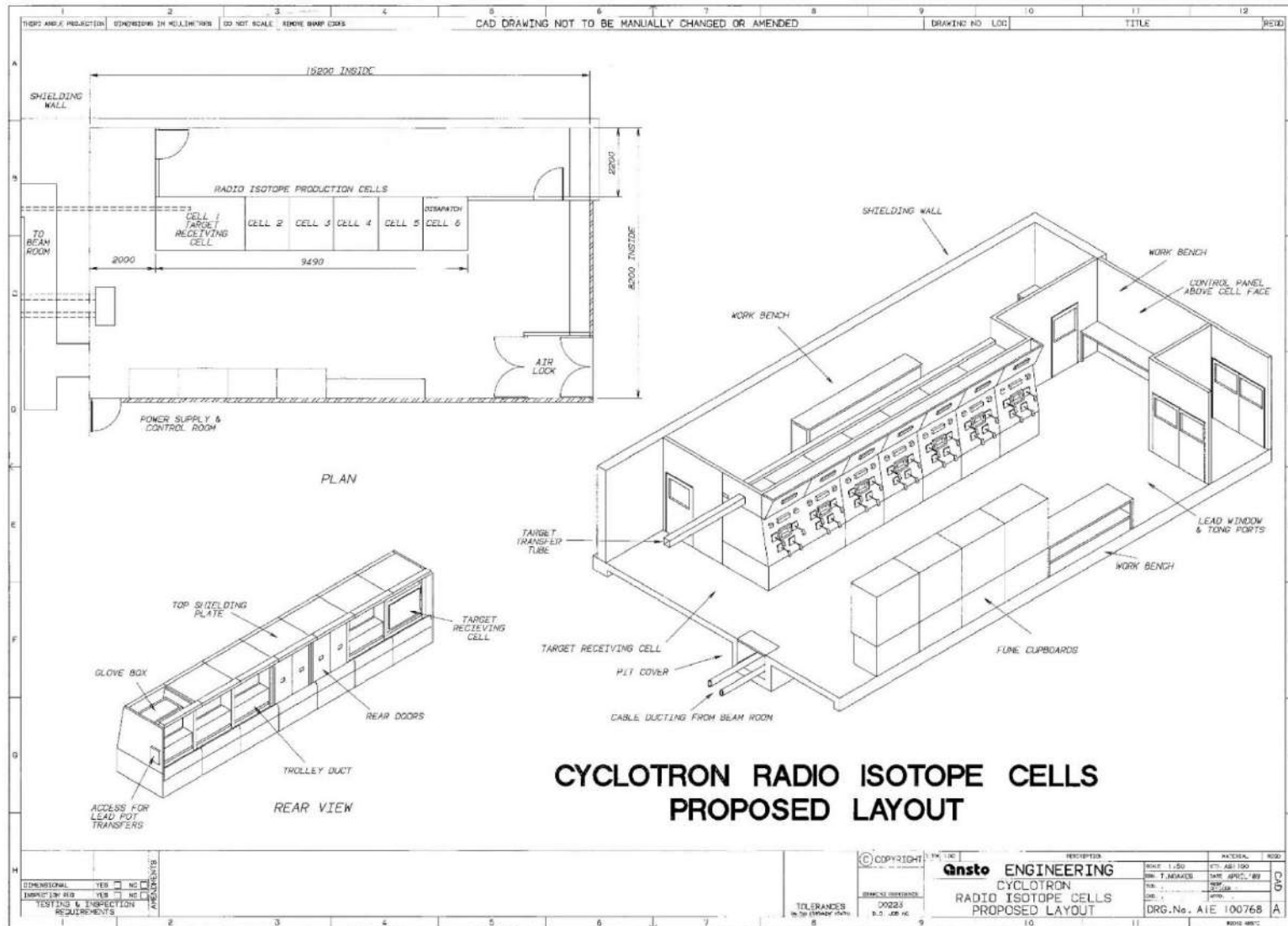


Figure 27: Drawing AIE1000768 – Cyclotron Radio Isotope Cells Layout

Source: ANSTO ERIS [21]

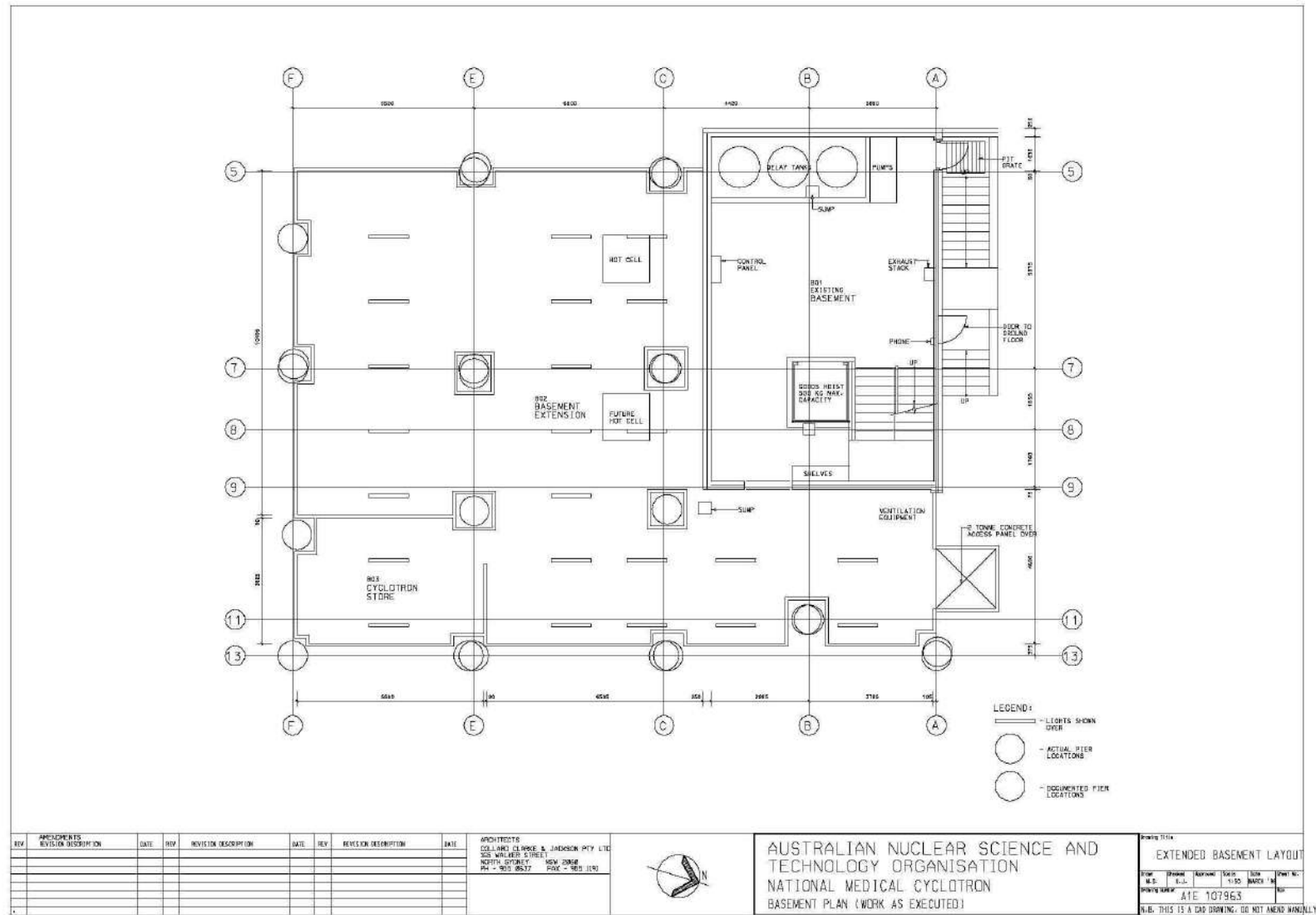


Figure 28: Drawing AIE103963 – NMC Basement Plan - Extension

Source: ANSTO ERIS [21]

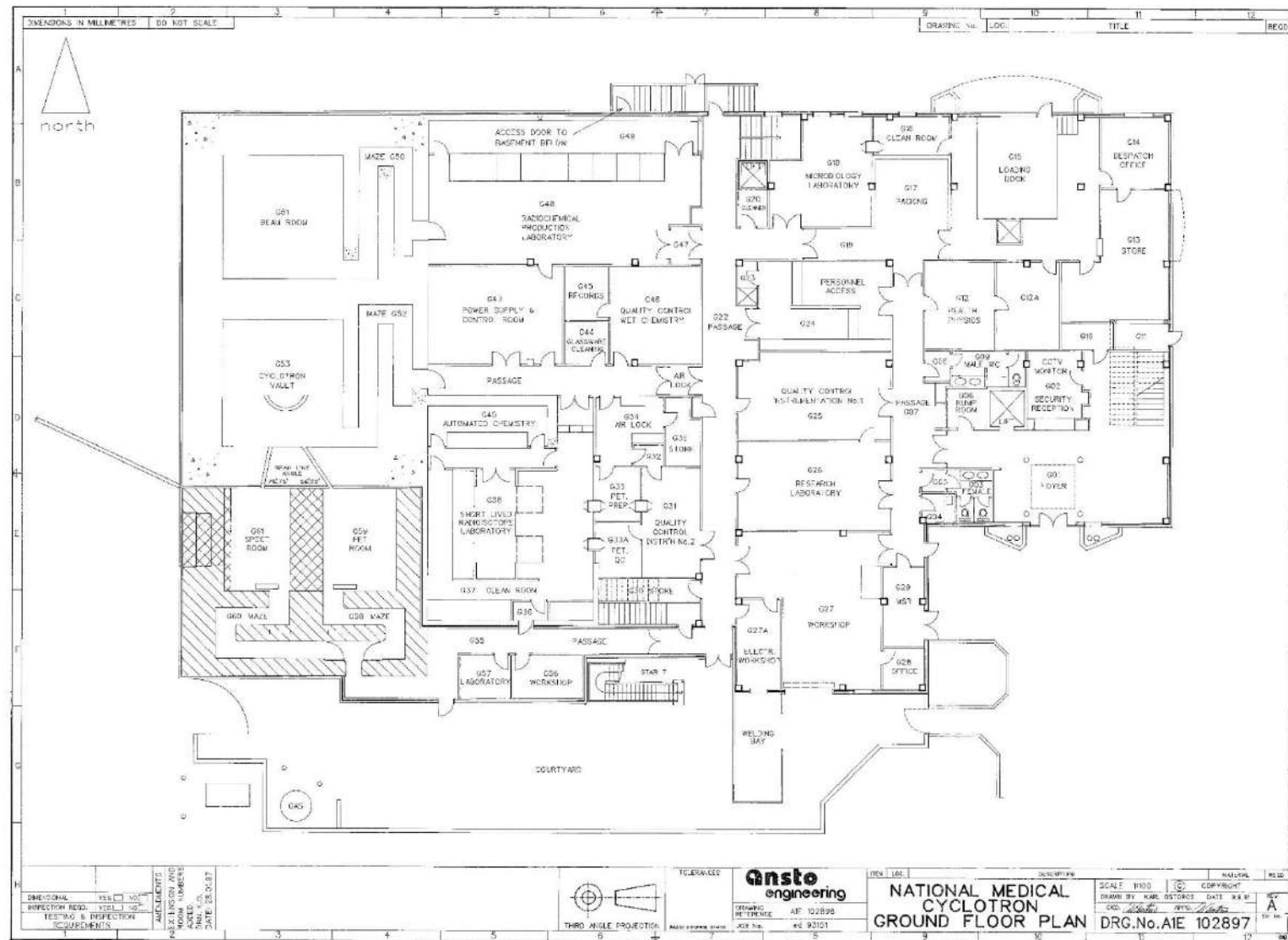


Figure 29: Drawing AIE 059081 – NMC Ground Floor Plan - Extensions

Source: ANSTO ERIS [21]

Appendix C: Historical Aerial Photos

The provided historical aerial photos of the facility are:

- Figure 30: Historical Aerial Photograph, 1945
- Figure 31: Historical Aerial Photograph, 1955
- Figure 32: Historical Aerial Photograph, 1982
- Figure 33: Historical Aerial Photograph, 1986
- Figure 34: Historical Aerial Photograph, 1994
- Figure 35: Historical Aerial Photograph, 2006
- Figure 36: Historical Aerial Photograph, 2020

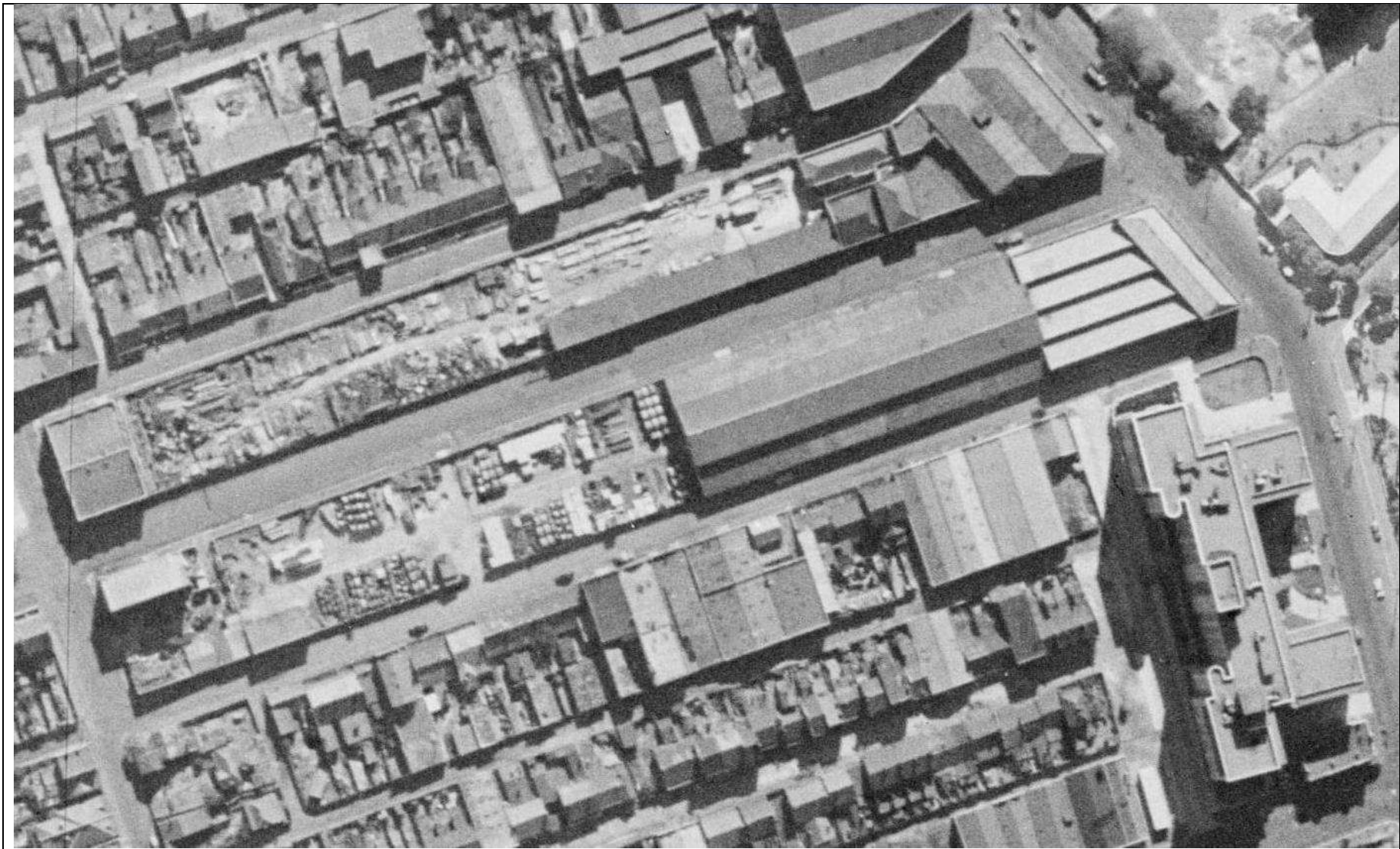


Figure 30: Historical Aerial Photograph, 1945

Source: Six Maps Sydney 1943 Imagery [6]

Legend



Figure 31: Historical Aerial Photograph, 1955

Source: NSW Government, Spatial NSW [6]

Legend



Figure 32: Historical Aerial Photograph, 1982

Source: NSW Government, Spatial NSW [6]

Legend



Figure 33: Historical Aerial Photograph, 1986

Source: NSW Government, Spatial NSW [6]

Legend



Figure 34: Historical Aerial Photograph, 1994

Source NSW Government, Spatial NSW [6]

Legend



Figure 35: Historical Aerial Photograph, 2006

Source: NSW Government, Spatial NSW [6]

Legend

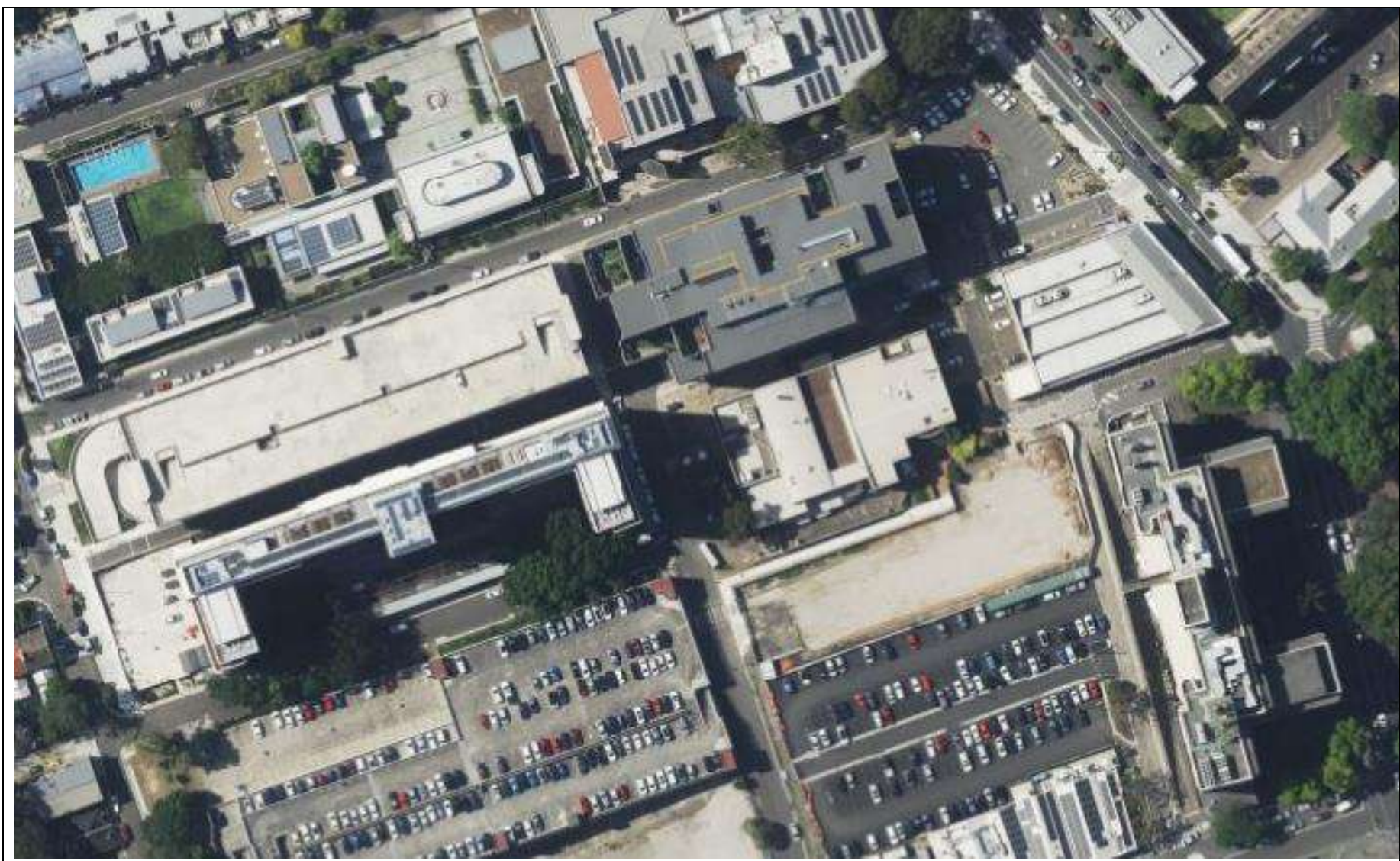


Figure 36: Historical Aerial Photograph, 2020

Source: National Map [6]

Legend

End of Document



DUE DILIGENCE CONTAMINATION ASSESSMENT

**81 Missenden Road
CAMPERDOWN NSW 2050**



DUE DILIGENCE CONTAMINATION ASSESSMENT

CLIENT: ANSTO

SITE: 81 Missenden Road
CAMPERDOWN NSW 2050

REPORT NUMBER: 11761.01.TDDR

DATE OF REPORT: 11 April 2022

CONSULTANT: Chris Chen BSc (App Chem)

GETEX PTY LIMITED

ABN 99 116 287 471

Unit 2, Building B, 64 Talavera Road,
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DOCUMENT CONTROL

Revision Number	Revision Date	Document Number	Author	Author Signature	Reviewer	Reviewer Signature
Revision 0	11/04/22	11761.01.TDDR	Chris Chen BSc (App Chem)		Justin Thompson-Laing BSc (Hons), CEnvP (SC) No. SC40071	

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1. EXECUTIVE SUMMARY

Getex Pty Ltd (Getex) was engaged by Simon Breslin of the Australian Nuclear Science and Technology Organisation (ANSTO) to undertake a Due Diligence Contamination Assessment under legal privilege of 81 Missenden Road, CAMPERDOWN NSW 2050 (the Site) for the purpose of returning the land to the lessor.

The objectives of the investigation were to assess for the presence of widespread/gross soil contamination on the Site. It is noted that the assessment of surface and ground water are not included in the scope of this investigation.

The scope of the investigation comprised of:

- A site surface walkover inspection;
- Undertaking a subsurface soil sampling and analysis regime on the Site that included:
 - The collection of samples from 11 locations selected to focus on the soil affected by sources of potential contamination;
 - The following analysis regime:
 - i. 21 Samples analysed for Metals (As, Cd, Cr, Cu, Hg, Pb, Ni, Zn, Mo & Be);
 - ii. 21 Samples analysed for Polycyclic Aromatic Hydrocarbons (PAHs);
 - iii. 21 Samples analysed for Total Recoverable Hydrocarbons (TRH);
 - iv. 21 Samples analysed for Benzene, Toluene, Ethyl Benzene and Xylenes (BTEX);
 - v. 10 Samples analysed for Phenols;
 - vi. 10 Samples analysed for Volatile Organic Compounds (VOCs);
 - vii. 10 Samples analysed for Organochloride Pesticides (OCP);
 - viii. 10 Samples analysed for Polychlorinated Biphenyls (PCBs);
 - ix. 10 Samples analysed for pH; and
 - x. 11 Samples analysed for Asbestos.
- Prepare a report for the purpose of returning the land to the lessor outlining the findings of the investigation including an assessment of the potential for widespread/gross contamination of the Site based on the results of the investigation.

Samples of belowground soils were analysed for a broad range of identified potential contaminants including TRH, BTEX, Metals, PAHs, OCP, PCBs, Phenols, VOCs, pH and Asbestos.

Elevated levels of pH (9.1, 9.2, 9.5, 9.2) were identified within samples 11761/BH08/S1, 11761/BH09/S1, 11761/BH11/S1 & 11761/BH12/S1 respectively. However, the samples were only marginally above the adopted criteria. Therefore, it is the opinion of the consultant that the elevated pH level does not indicate the presence of acids that would be a potential risk to current and future receptors.

The concentrations detected for all contaminants did not identify the belowground presence of widespread/gross soil contamination. Furthermore, no contamination was identified which would preclude continued present Commercial/Industrial use under the current conditions.

Please note, prior to any proposed change in land use or development of the Site a detailed site contamination assessment would be required to confirm if the Site is suitable for such land use/development.

The assessment of surface water and groundwater was not included in the scope of the investigation. Furthermore, this report only addresses the potential chemical and physical contamination indicated within this report and does not address any human health/ecological risk associated with radiological contamination.

This Executive Summary should be read in conjunction with all sections of this report.

2. SCOPE

Getex Pty Ltd (Getex) was engaged by Simon Breslin of the Australian Nuclear Science and Technology Organisation (ANSTO) to undertake a Due Diligence Contamination Assessment under legal privilege of 81 Missenden Road, CAMPERDOWN NSW 2050 (the Site) for the purpose of returning the land to the lessor.

The objectives of the investigation were to assess for the presence of widespread/gross soil contamination on the Site. It is noted that the assessment of surface and ground water are not included in the scope of this investigation.

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- A site surface walkover inspection;
- Undertaking a subsurface soil sampling and analysis regime on the Site that included:
 - The collection of samples from 11 locations selected to focus on the soil affected by sources of potential contamination;
 - The following analysis regime:
 - i. 21 Samples analysed for Metals (As, Cd, Cr, Cu, Hg, Pb, Ni, Zn, Mo & Be);
 - ii. 21 Samples analysed for Polycyclic Aromatic Hydrocarbons (PAHs);
 - iii. 21 Samples analysed for Total Recoverable Hydrocarbons (TRH);
 - iv. 21 Samples analysed for Benzene, Toluene, Ethyl Benzene and Xylenes (BTEX);
 - v. 10 Samples analysed for Phenols;
 - vi. 10 Samples analysed for Volatile Organic Compounds (VOCs);
 - vii. 10 Samples analysed for Organochloride Pesticides (OCP);
 - viii. 10 Samples analysed for Polychlorinated Biphenyls (PCBs);
 - ix. 10 Samples analysed for pH; and
 - x. 11 Samples analysed for Asbestos.
- Prepare a report for the purpose of returning the land to the lessor outlining the findings of the investigation including an assessment of the potential for widespread/gross contamination of the Site based on the results of the investigation.

3. LIMITATIONS

The investigation conducted was limited in scope. The area considered in the investigation was limited to 81 Missenden Road, CAMPERDOWN NSW 2050.

No part of this investigation included the collection and/or analysis of surface, ground water or radiological material samples or the assessment of surface, ground water or radiological material quality on site. The investigation involved the inspection/review of a limited number of locations/materials at the time of inspection which may or may not identify/intercept any contamination, potential contamination or issues of concern if present. Furthermore, conditions on site may also change over time subsequent to the Getex assessment.

The investigation is limited to a soil assessment depth of 5.0m.

As such, although all work is performed to a professional and diligent standard, the potential variance between the practical limitations of the scope of work undertaken, the cost of our services, all possible issues of concern, and any loss or damages which may be associated with our work are such that we cannot warrant that all issues of concern/contamination or potential contamination have been identified. We therefore limit any potential liability associated with our work to the cost of our services.

All work conducted and/or reports/information produced by Getex are prepared for a specific objective and within a specified scope of work as agreed between the Client and Getex. As such this document is only for the use of the Client for the intended objective and may not be suitable for any other purpose. Before passing this document onto a third party, the third party must be informed by the client of any relevant information relating to this document. It is the responsibility of any party using this report to fully check to their satisfaction if this report is suitable for their intended use.

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4. SITE IDENTIFICATION

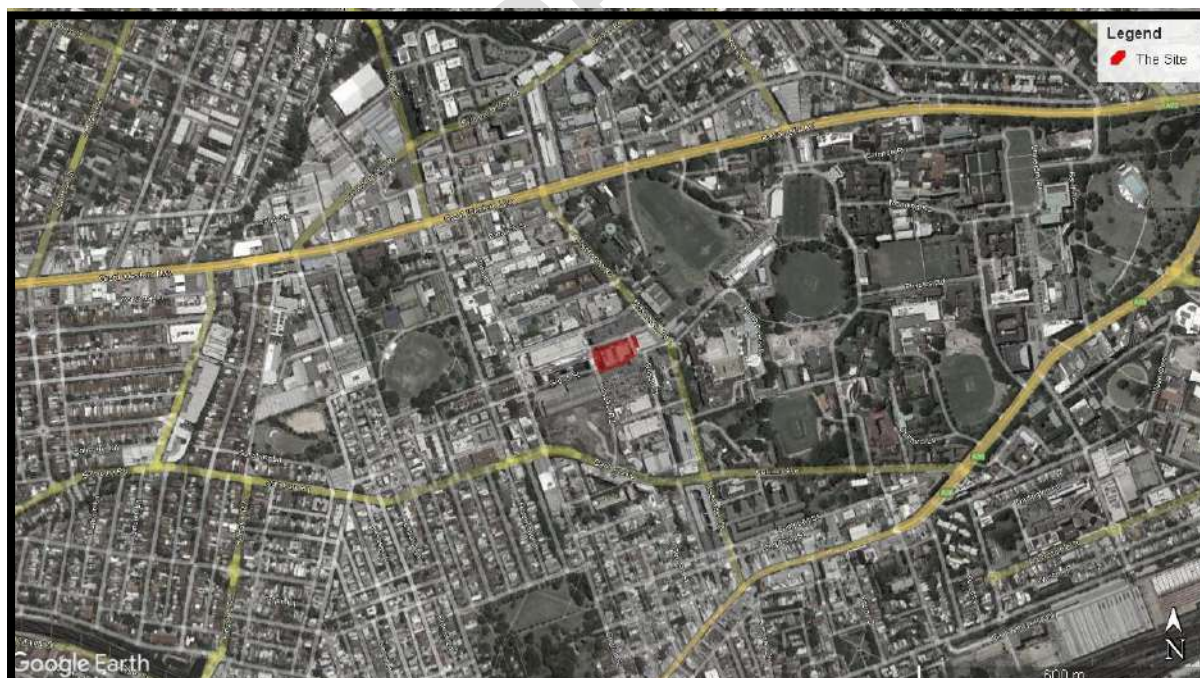
The investigation area of this assessment is 81 Missenden Road, CAMPERDOWN NSW 2060, which is located within the Parish Alexandria, County of Cumberland. The local government authority was City of Sydney.

The site identification details are summarised in the following table.

Site Address:	81 Missenden Road, CAMPERDOWN NSW 2050
Lot & Deposited Plan:	Part of Lot 101 DP1179349
Current Land Use:	Cyclotron – Produce Radioisotopes & Radiotracers
Proposed Land Use:	Unknown
Local Government Authority:	City of Sydney Council
Geographical Location (MGA56):	Easting: 331769 Northing: 6248640 (approximately)
Site Investigation Area:	4,500m ²

Table 4-1: Site Identification Details

Refer to Figure 1 for the general location of the Site.



*Aerial image derived from Google Earth and is indicative of on-ground locations only.

Figure 1. Site Locality Map

5. DESCRIPTION OF SITE AND SURROUNDING ENVIRONMENT

A limited surface walkover inspection of the Site and surrounding area was conducted on the 17th of March 2022. The Site is also identified as part of Lot 101 DP1179349. At the time of inspection, the Site was being used by ANSTO as a Cyclotron Facility.

The Site is located in a high-density commercial area. Neighbouring properties were Prince Alfred Hospital, apartment blocks and a commercial car park.

5.1 Lot 101 DP1179349

Also identified as 81 Missenden Road, majority of the Site is covered by a multi-storey, brick building. Within the building the ground floor contains offices and the cyclotron, the upper level contains office spaces, bathrooms and kitchens. The basement of building was used as general storage.

The northern end of the Site is a strip of disturbed soils with minor vegetation growth (Appendix II, Photograph 01) with a storm water drain and manhole located on the eastern end (Appendix II (Photograph 02), central stormwater drain (Appendix II, Photograph 03) and two (2) storm water drains located on the western end (Appendix II, Photograph 04).

The eastern end of the Site is car park covered in asphalt (Appendix II, Photograph 05).

South of the Site is an outdoor area for the building on Site and is covered in concrete hardstand used for gas cylinder storage. A strip of drains is also present along the southern border (Appendix II, Photograph 06). Additionally, anecdotal evidence from ANSTO indicated the presence of underground cyclotron transfer lines that are not currently used. Access pits to the transfer lines are present within the eastern end, western end and central section of the outdoor area (Appendix II, Photograph 07).

The western end of the Site contains two (2) large water tanks (Appendix II, Photograph 08) followed by two (2) large gas tanks (Appendix II, Photograph 09). Two (2) electrical control cabinets (Appendix II, Photograph 10) are also present within the north-west corner of the Site

5.2 Surrounding Area

North of the Site is the Royal Prince Alfred Hospital

East of the Site is a large brick building currently used as a Renal Dialysis Service Centre.

South of the Site is ongoing construction and a large car parking complex.

West of the Site is apartments.

6. TOPOGRAPHY, GEOLOGY, HYDROLOGY AND HYDROGEOLOGY

6.1 Topography

The topography of the Site and the surrounding area slopes down in a north direction.

6.2 Geology

The NSW Office of Environment and Heritage eSPADE map shows the Site to be within the Residual Blacktown Soil Landscapes.

The Soil Landscapes of the Sydney 1:100,000 Sheet maps show the site is in Residual, Blacktown Soil Landscape. This type of landscape is characterized by gently undulating rises on Wianamatta Group shales and Hawkesbury Shale, local relief to 30 m, slopes usually <5% and broad rounded crests and ridges with gently inclined slopes. This landscape contains cleared Eucalypt woodland and tall open-forest (dry sclerophyll forest). The soils comprise of shallow to moderately deep (<100 cm) Red and Brown Podzolic Soils on crests, upper slopes and well-drained areas. Deep Yellow Podzolic Soils and Soloths on lower slopes and in areas of poor drainage. The limitations to development are moderately reactive highly plastic subsoil, low soil fertility and poor soil drainage.

The Department of Industry, Resources & Energy shows the bedrock underlying the Site to be Ashfield Shale of the Wianamatta Group consisting of laminate and dark grey siltstone and Bringelly Shale which consists of shale, with occasional calcareous claystone, laminate and coal. This unit is occasionally underlain by claystone and laminite lenses within the Hawkesbury Sandstone such as at Duffys Forest..

From field observations the geological profile was as following:

Fill

Fill material consisted of dark brown and brown loose and clayey loam fill, orange/yellow sand and reddish-brown clays within instances of crushed rock and . at depths ranging 0.0-1.35mbgl.

Natural Soils

Across the Site the natural soil horizons were reddish brown clays, dark red clays and white clays with minor instances of red shale rock at depths of 0.25m to 5.0m

Bedrock

Bedrock was not encountered at the depth of this assessment.

Groundwater

Groundwater was not encountered at the depth of this assessment.

6.3 Hydrology

No water reservoirs or drainage channels were observed.

Where no hardstand is present, precipitation is expected to infiltrate the surface at a rate reflective of the soil. Surface runoff is expected to run towards the north and into stormwater drainage.

6.4 Hydrogeology

According to the Groundwater Map provided by Water NSW (<https://realtimedata.watarnsw.com.au/>) there are two (2) registered bores within 500m of the Site and a summary of these bores are presented in Table 6.1.

Bore ID	Use	Approximate Distance from Site	Bore Depth (m)	Standing Water Level (mbgl)
GW109230	Monitoring Bore	420m North-east	1.8	-
GW109231	Monitoring Bore	430m North-east	3.2	-

Table 6-1: Summary of Groundwater Bores

No apparent on-site use of groundwater was observed during the Site assessment.

Groundwater was not encountered at the depth of this assessment..

7. PRELIMINARY CONCEPTUAL SITE MODEL

The following sections detail a preliminary conceptual site model which has been developed in relation to the potential origin, impact and migration of contaminants. This model has been developed for the Site based on the findings of limited walkover inspection.

7.1 Sources of Potential Contaminants

The following table lists potential contaminants based on site activities and conditions identified during the limited walkover inspection (refer to Section 5). Refer to Appendix I for Site Map of the sources.

Source	Location	Potential Contaminants
Current occupation by cyclotron	Entire Site	Solvents, Radiological Material
Neighbouring hospital	North of Site	Solvents
Potentially contaminated fill	Entire Site.	TRH, BTEX, Metals, PAHs, Phenols, OCP, PCBs, Asbestos
Environmental fallout due to traffic and industrial emissions.	Entire Site.	Lead.

Table 7-1: Potential Contaminants

7.2 Potentially Contaminated Media

Potentially contaminated media present at the Site may include:

- Topsoil/fill; and
- Natural Soils and/or Bedrock.

The walkover inspection has identified current ownership of the Site by a cyclotron. Adjacent current ownership and occupation of premises in close proximity to the Site include a hospital. During such activities application, spillage and/or leakage of chemicals associated with these activities may have resulted in localised impacts at the ground surface. The proximity of the Site to heavily used road corridors has also been indicated as a potential source of contamination due to emissions and fallout. There is also the potential for potentially contaminated material to be imported onsite as the Site is in an area of disturbed terrain. Based on this, topsoil and fill material has been identified as potentially contaminated media.

Based on the potential mobility of contaminants and their associated potential leachability through the soil profile, vertical migration of the contaminants from the surface into the underlying natural soils/bedrock may have occurred. As a result, the natural soils and underlying bedrock are also considered to be potentially contaminated media.

Depth to groundwater is expected to be at depth within the bedrock. It is therefore considered that the groundwater is not likely to have a potential to facilitate the migration of contaminants due to the expected depth of groundwater and the limited mobility of groundwater through the bedrock profiles, with higher mobility confined to faults in the bedrock (if present).

7.3 Potential for Migration

Contaminants generally migrate from Site via a combination of windblown dusts, rainwater infiltration, groundwater migration and surface water runoff. The potential for contaminants to migrate is a combination of:

- The nature of the contaminants (solid/liquid and mobility characteristics);
- The extent of the contaminants (isolated or widespread);
- The location of the contaminants (surface soils or at depth);
- The site topography, geology, hydrology and hydrogeology;
- The adjacent properties; and
- Underground utility corridors.

The potential contaminants identified as part of the Site inspection are generally in either a solid form (e.g. metals, asbestos etc) or liquid form (e.g. hydrocarbons, etc).

The potential for contaminants to migrate along the underground utility corridors is likely as there are underground utilities identified to be traversing through the property.

The Site hardstand surface has reduced the dust and water erosion potential of the Site. As such, provided the hardstand is maintained, the potential for the migration of contaminants via surface water runoff or from windblown dust from the Site is anticipated to be negligible. Additionally, the northern border of the Site does not contain hardstand, therefore, the potential for rainwater infiltration to occur at the north end of the Site was relatively high given the permeable surface. If rainfall does penetrate the natural soil, this movement may result in vertical migration of contaminants through the natural soil profile however this is likely to be intermittent and dependent on rainfall.

Some potential contaminants identified may be in liquid form (i.e. hydrocarbons). There is the potential for natural dispersion/diffusion of these contaminants to migrate north-west due to the Site's topography and anticipated groundwater flow direction.

The potential sources of contamination are likely to be present within topsoil / natural soil material. Groundwater was not assessed as part of this investigation

7.4 Preliminary Conceptual Site Model Summary

The following table provides a summary of the preliminary conceptual site model detailed in the previous sections and includes potential contaminant origin, impact, migration and receptor's exposure pathways.

Source	Contaminants	Location	Affected Media	Migration Potential	Current Receptors	Current Exposure Pathway	Future Potential Receptors	Future Potential Exposure Pathway
Current occupation by cyclotron	Solvents, Radiological Material	Entire Site	Surface soil/fill; Underlying natural soils and bedrock..	Surface water and dust - Negligible; Vertical/ horizontal migration; Along conduits.	Site occupants; Neighbouring properties.	Skin contact with potentially contaminated soil; Vapour inhalation of potentially contaminated soil; Ingestion of potentially contaminated soil; Plant uptake.	Site occupants; Neighbouring properties; Ecological receptors Dam; Construction workers.	Skin contact with potentially contaminated soil; Vapour Inhalation; Ingestion of potentially contaminated soil; Plant uptake.
Neighbouring hospital	Solvents	North of Site	Surface soil/fill; Underlying natural soils and bedrock.	Surface water and dust - Negligible; Vertical/ horizontal migration; Along conduits.	Site occupants; Neighbouring properties.	Skin contact with potentially contaminated soil; Vapour inhalation of potentially contaminated soil; Ingestion of potentially contaminated soil; Plant uptake.	Site occupants; Neighbouring properties; Ecological receptors; Construction workers.	Skin contact with potentially contaminated soil; Vapour Inhalation; Ingestion of potentially contaminated soil; Plant uptake.

Source	Contaminants	Location	Affected Media	Migration Potential	Current Receptors	Current Exposure Pathway	Future Potential Receptors	Future Potential Exposure Pathway
Potentially contaminated fill	TRH, BTEX, Metals, PAHs, Phenols, OCP, PCBs, Asbestos	Entire Site.	Surface soil/fill; Underlying natural soils and bedrock.	Surface water and dust - Negligible; Vertical/ horizontal migration; Along conduits.	Site occupants; Neighbouring properties; Ecological receptors.	Skin contact with potentially contaminated soil; Vapour inhalation of potentially contaminated soil; Inhalation of asbestos fibres; Ingestion of potentially contaminated soil; Plant uptake.	Site occupants; Neighbouring properties; Construction workers; Ecological receptors.	Skin contact with potentially contaminated soil; Vapour inhalation of potentially contaminated soil; Inhalation of asbestos fibres; Ingestion of potentially contaminated; Plant uptake.
Environmental fallout due to traffic and industrial emissions.	Lead.	Entire Site.	Surface soil/fill; Underlying natural soils and bedrock.	Surface water and dust - Negligible; Vertical/ horizontal migration; Along conduits.	Site occupants; Neighbouring properties; Ecological receptors.	Skin contact with potentially contaminated soil; Ingestion of potentially contaminated soil; Plant uptake.	Site occupants; Neighbouring properties; Construction workers; Ecological receptors.	Skin contact with potentially contaminated soil; Ingestion of potentially contaminated soil; Plant uptake.

Table 7-2: Preliminary Conceptual Site Model

8. SAMPLING AND ANALYSIS PLAN

8.1 Data Quality Objectives

Data Quality Objectives (DQOs) have been developed for this investigation, as discussed in the following sections.

8.1.1 State the Problem

The site walkover of the current Site uses has identified the potential for Site contamination conditions to occur at the Site (**Sections 5 and 6**).

Assessment of contamination conditions is necessary to assess the presence of gross or widespread contamination of the Site soil for the purpose of due diligence information related to returning the land to the lessor.

Information on Site contamination conditions presented in earlier sections of this report resulted in the preliminary conceptual site contamination information presented in **Section 6** of this report.

The assessment of surface water and groundwater is not included in the scope of the investigation. Furthermore, this report only addresses the potential chemical and physical contamination indicated within this report and does not address any human health/ecological risk associated with radiological contamination.

8.1.2 Identify the Decision

Based on the decision-making process for assessing urban redevelopment sites detailed in *Guidelines for the NSW Site Auditor Scheme (3rd edition)*, Environmental Protection Authority (EPA) (October 2017), the following decisions were required to be made as part of the Site assessment:

- Has widespread/gross soil contamination been identified?

8.1.3 Identify Inputs into the Decision

Inputs identified to provide sufficient data to make the decisions nominated above include:

- The Site description and history as provided in **Section 4 and 5** respectively;
- Potential contamination issues as described in **Section 6**;
- Visual and olfactory indications;
- Soil environmental data as collected by soil sampling and analysis in **Appendix III**;
- Soil criteria to be achieved on the Site as based on a current land-use as defined by assessment criteria prepared in **Section 8**; and
- Confirmation that data generated by sample analysis are of a sufficient quality to allow reliable comparison to assessment criteria as undertaken by assessment of

quality assurance / quality control as per the data quality indicators established in **Sections 7.1.6, 9 and Appendix IV.**

8.1.4 Define the Study Boundaries

The study area is defined as 81 Missenden Road, CAMPERDOWN NSW 2050, as shown in **Figure 1**. The site has an area of approximately 4,500m².

The vertical extent of the investigation was to a maximum depth of 5.0m below the existing ground level.

Due to the nature of potential contaminants identified and project deadline requirements, seasonality and other temporal variables were not assessed as part of this investigation.

The temporal boundaries of this investigation are limited to the period of field investigation during March 2022 and reported during April 2022.

The assessment of surface water and groundwater is not included in the scope of the investigation.

8.1.5 Develop a Decision Rule

Soil analytical data was assessed against NSW Environmental Protection Authority (EPA) endorsed criteria including:

- *National Environment Protection (Assessment of Site Contamination) Measure*, National Environment Protection Council, 2013.

The decision rule adopted to answer the decisions identified in **Section 7.1.2** is summarised in the following table.

Decision Required to be Made	Decision Rule
1. Has widespread/gross soil contamination been identified?	<i>Soil analytical data will be compared against EPA endorsed criteria.</i> <i>Statistical analysis of the data in accordance with relevant guidance documents will be undertaken, if appropriate, to facilitate the decisions.</i> <i>The following statistical criteria will be adopted with respect to soils:</i> <i>Either: the reported concentrations are all below the site criteria;</i> <i>Or: the average site concentration for each analyte must be below the adopted site criterion; no single analyte concentration exceeds 250% of the adopted site criterion; and the standard deviation of the results must be less than 50% of the site criteria.</i> <i>And: the 95% upper confidence limit (UCL) of the average concentration for each analyte must be below the adopted site criterion as per the NSW EPA Contaminated Sites - Sampling Design Guidelines, 1995.</i> <i>If the statistical criteria stated above are satisfied, the decision is No.</i>

	<i>If the statistical criteria are not satisfied, the decision is potentially Yes – further assessment is warranted.</i>
--	--

Table 8-1: Decision Rules

8.1.6 Specify Limits on Decision Errors

Specific limits for this project have been adopted in accordance with the appropriate guidance from the NEPC (2013), EPA (2017), appropriate indicators of data quality (DQIs used to assess quality assurance / quality control) and standard Getex procedures for field sampling and handling.

To assess the usability of the data prior to making decisions, the data will be assessed against predetermined Data Quality Indicators (DQIs) for completeness, comparability, representativeness, precision and accuracy. The acceptable limit on decision error is 95% compliance with DQIs.

The pre-determined Data Quality Indicators (DQIs) established for the investigation are discussed below in relation to precision, accuracy, representativeness, comparability, completeness and sensitivity (PARCCS parameters) and are shown in Table 10.2.

Precision - measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is assessed by calculating the Relative Percent Difference (RPD) of duplicate samples for chemical COPCs.

Accuracy - measures the bias in a measurement system. The accuracy of the laboratory data that are generated during this study is a measure of the closeness of the analytical results obtained by a method to the 'true' value. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards. Note only applied to chemical COPC.

Representativeness – expresses the degree which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples on a representative basis across the Site, and by using an adequate number of sample locations to characterise the Site to the required accuracy.

Comparability – expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples; and ensuring analysing laboratories use consistent analysis techniques; and reporting methods.

Completeness – is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is set at there being sufficient valid data generated during the study.

Sensitivity – expresses the appropriateness of the chosen laboratory methods, including the limits of reporting, in producing reliable data in relation to the adopted Site assessment criteria.

Data Quality Indicator	Frequency	Data Quality Criteria
Precision		
Blind soil duplicates (intra laboratory) analysis	1/20 samples	RPD <30% inorganics and <50% for organics
Split soil duplicates (inter laboratory)	1/20 samples	RPD <30% inorganics and <50%

Data Quality Indicator	Frequency	Data Quality Criteria
Accuracy Laboratory control samples Surrogate spikes Matrix spikes Representativeness Sampling appropriate for media and analytes Samples extracted and analysed within holding times Rinsate Blank Trip Blank Comparability Standard operating procedures for sample collection & handling Standard analytical methods used for all analyses Consistent field conditions, sampling staff and laboratory analysis Limits of reporting appropriate and consistent Completeness Soil description and COCs completed and appropriate Appropriate documentation Satisfactory frequency and result for QC samples Data from critical samples is considered valid Sensitivity Analytical methods and limits of recovery appropriate for media and adopted site assessment criteria	1 per lab batch 1 per lab batch 1 per lab batch All samples All samples 1 per sample batch 1 per sample batch All samples All samples All samples All samples All samples All samples All QA/QC samples - All samples	for organics <LOR 70-130% 70-130% All samples Within holding times <LOR <LOR All samples All samples All samples All samples All samples All samples - Critical samples valid LOR<= site assessment criteria

Table 8-2: Summary of DQI

Note: If the RPD between duplicates is greater than the pre-determined data quality criteria, a judgement will be made as to whether the excess is critical in relation to the validation of the data set or unacceptable sampling error is occurring in the field.

The DQIs for the assessment of the laboratory analytical data include the following conditions:

- Maximum sample holding times for organics are 7 days. Metals and metalloids holding times are 6 months. Mercury (Hg) holding time is 28 days;
- Sample preservation and handling will be conducted in accordance with industry accepted standards;
- All sample analyses will be conducted by NATA accredited laboratories;
- Laboratory blank analysis to be below practical quantitation limits (PQLs); and
- The relative percentage difference (RPD) of duplicates/soil replicates and percent recoveries of control spikes to be calculated and compared to the following criteria:
 - Less than 30% for field soil replicates; and
 - Less than 40% for internal duplicate samples and less than 44% on duplicates with 10 times the limit of reporting; and
 - 75-125% recovery for internal recovery samples.

8.1.7 Optimise the Design for Obtaining Data

Various strategies for developing a statistically based sampling plan are identified in NSW EPA Contaminated Sites - Sampling Design Guidelines, 1995, including judgemental, random, systematic and stratified sampling patterns.

As the objective of the assessment is a preliminary investigation of the potential for widespread/gross contamination of the Site, the sampling density of twelve (12) locations was implemented. The sampling was to be conducted around the building as there was no access available to conduct sampling within the building footprint.

Due to the size of the Site and findings from the walkover inspection, a semi-systematic based sampling approach containing sampling locations across the Site with locations aligned to assess higher likelihood of contaminated areas was considered to be the most appropriate for the current investigation.

Location borehole BH10 was not sample as the underground service markings were erased due to heavy rainfall. Location BH10 marking was also erased, therefore, drilling/sampling within this location could not be conducted.

Boreholes were penetrated using a Geoprobe Drill Rig with push tubes or a hand auger at selected locations across the Site. Soil samples were collected at multiple depths within fill and natural material.

At the time of sampling, Site history information available was land titles.

Based upon the objectives of this investigation, the density of the sampling undertaken as part of the investigation of the Site is considered appropriate.

8.2 Soil Sampling Program

Chris Chen of Getex Pty Ltd attended the site on the 17th of March 2022.

Boreholes were drilled using a drill rig with push tube capabilities and samples were collected at selected locations across the Site at multiple depths within fill and natural material to allow for evaluation of the strata. Eleven locations were drilled with six (6) locations drilled to a maximum depth of 2.7m via push tube and the remaining five (5) locations drilled to a maximum depth of 5.0m via flight auger.

The soil profile consisted of the following:

- Fill material consisted of dark brown and brown loose and clayey loam fill, orange/yellow sand and reddish-brown clays within instances of crushed rock and . at depths ranging 0.0-1.35mbgl.
- The underlain soil was reddish brown clays, dark red clays and white clays with minor instances of red shale rock at depths of 0.25m to 5.0m.
- Bedrock was not encountered at the time of the inspection.

A 10.6eV Photo-Ionisation Detector (PID) was used to screen soils via head space analysis for VOCs at 1m intervals including 0.5m deep at each sampling location. Small samples of soil were collected and placed within zip-loc plastic bags, each bag was then sealed. Samples were then disturbed to release any gas held within the void space between grains.

The PID intake was then inserted into the bag via a small gap and the VOC levels were recorded. Results are noted within the Borehole Logs in **Appendix VI**.

The following table presents a summary of the locations for the eleven (11) boreholes and samples collected within the Site. Please refer to **Appendix I** for the Site Map and **Appendix VI** for the Borehole Logs.

Sample Number	Sample Type	Location Collected	Analysis Performed
11761/BH01/S1	Primary Soil Sample	Sample taken at 0.05-0.15mbgl at location BH01. Refer to Appendix I.	TRH, BTEX, Heavy Metals, PAHs
11761/BH01/S2	Primary Soil Sample	Sample taken at 2.15-2.25mbgl at location BH01. Refer to Appendix I.	TRH, BTEX, Heavy Metals, PAHs
11761/BH01/AS01	Primary Soil Sample	Sample taken at 0.2-0.25mbgl at location BH01. Refer to Appendix I.	Asbestos
11761/BH02/S1	Primary Soil Sample	Sample taken at 0.05-0.15mbgl at location BH02. Refer to Appendix I.	TRH, BTEX, Heavy Metals, PAHs, PCBs, OCPs, Phenols, VOCs, pH
11761/BH02/S2	Primary Soil Sample	Sample taken at 2.2-2.3mbgl at location BH02. Refer to Appendix I.	TRH, BTEX, Heavy Metals, PAHs
11761/BH02/AS01	Primary Soil Sample	Sample taken at 0.15-0.25mbgl at location BH02. Refer to Appendix I.	Asbestos
11761/BH03/S1	Primary Soil Sample	Sample taken at 0.3-0.4mbgl at location BH03. Refer to Appendix I.	TRH, BTEX, Heavy Metals, PAHs, PCBs, OCPs, Phenols, VOCs, pH
11761/BH03/AS01	Primary Soil Sample	Sample taken at 0.4-0.5mbgl at location BH03. Refer to Appendix I.	Asbestos
11761/BH04/S1	Primary Soil Sample	Sample taken at 0.3-0.4mbgl at location BH04. Refer to Appendix I.	TRH, BTEX, Heavy Metals, PAHs, PCBs, OCPs, Phenols, VOCs, pH
11761/BH04/S2	Primary Soil Sample	Sample taken at 4.9-5.0mbgl at location BH04. Refer to Appendix I.	TRH, BTEX, Heavy Metals, PAHs
11761/BH04/AS01	Primary Soil Sample	Sample taken at 0.25-0.3mbgl at location BH04. Refer to Appendix I.	Asbestos
11761/BH05/S1	Primary Soil Sample	Sample taken at 0.5-0.6mbgl at location BH05. Refer to Appendix I.	TRH, BTEX, Heavy Metals, PAHs, PCBs, OCPs, Phenols, VOCs, pH
11761/BH05/S2	Primary Soil Sample	Sample taken at 1.9-2.0mbgl at location BH05. Refer to Appendix I.	TRH, BTEX, Heavy Metals, PAHs
11761/BH05/AS01	Primary Soil Sample	Sample taken at 0.6-0.7mbgl at location BH05. Refer to Appendix I.	Asbestos

Sample Number	Sample Type	Location Collected	Analysis Performed
11761/BH06/S1	Primary Soil Sample	Sample taken at 0.35-0.45mbgl at location BH06. Refer to Appendix I.	TRH, BTEX, Heavy Metals, PAHs, PCBs, OCPs, Phenols, VOCs, pH
11761/BH06/S2	Primary Soil Sample	Sample taken at 2.0-2.1mbgl at location BH06. Refer to Appendix I.	TRH, BTEX, Heavy Metals, PAHs
11761/BH06/AS01	Primary Soil Sample	Sample taken at 0.3-0.35mbgl at location BH06. Refer to Appendix I.	Asbestos
11761/BH07/S1	Primary Soil Sample	Sample taken at 0.2-0.3mbgl at location BH07. Refer to Appendix I.	TRH, BTEX, Heavy Metals, PAHs, PCBs, OCPs, Phenols, VOCs, pH
11761/BH07/S2	Primary Soil Sample	Sample taken at 4.9-5.0mbgl at location BH07. Refer to Appendix I.	TRH, BTEX, Heavy Metals, PAHs
11761/BH07/AS01	Primary Soil Sample	Sample taken at 0.3-0.4mbgl at location BH07. Refer to Appendix I.	Asbestos
11761/BH08/S1	Primary Soil Sample	Sample taken at 0.3-0.4mbgl at location BH08. Refer to Appendix I.	TRH, BTEX, Heavy Metals, PAHs, PCBs, OCPs, Phenols, VOCs, pH
11761/BH08/S2	Primary Soil Sample	Sample taken at 4.9-5.0mbgl at location BH08. Refer to Appendix I.	TRH, BTEX, Heavy Metals, PAHs
11761/BH08/AS01	Primary Soil Sample	Sample taken at 0.2-0.3mbgl at location BH08. Refer to Appendix I.	Asbestos
11761/BH09/S1	Primary Soil Sample	Sample taken at 0.2-0.3mbgl at location BH09. Refer to Appendix I.	TRH, BTEX, Heavy Metals, PAHs, PCBs, OCPs, Phenols, VOCs, pH
11761/BH09/S2	Primary Soil Sample	Sample taken at 2.05-2.15mbgl at location BH09. Refer to Appendix I.	TRH, BTEX, Heavy Metals, PAHs
11761/BH09/AS01	Primary Soil Sample	Sample taken at 0.3-0.4mbgl at location BH09. Refer to Appendix I.	Asbestos
11761/BH11/S1	Primary Soil Sample	Sample taken at 0.4-0.5mbgl at location BH11. Refer to Appendix I.	TRH, BTEX, Heavy Metals, PAHs, PCBs, OCPs, Phenols, VOCs, pH
11761/BH11/S2	Primary Soil Sample	Sample taken at 4.9-5.0mbgl at location BH11. Refer to Appendix I.	TRH, BTEX, Heavy Metals, PAHs
11761/BH11/AS01	Primary Soil Sample	Sample taken at 0.6-0.7mbgl at location BH11. Refer to Appendix I.	Asbestos
11761/BH12/S1	Primary Soil Sample	Sample taken at 0.05-0.15mbgl at location BH12. Refer to Appendix I.	TRH, BTEX, Heavy Metals, PAHs, PCBs, OCPs, Phenols, VOCs, pH

Sample Number	Sample Type	Location Collected	Analysis Performed
11761/BH12/S2	Primary Soil Sample	Sample taken at 4.9-5.0mbgl at location BH12. Refer to Appendix I.	TRH, BTEX, Heavy Metals, PAHs
11761/BH12/AS01	Primary Soil Sample	Sample taken at 0.15-0.25mbgl at location BH12. Refer to Appendix I.	Asbestos
11761/BH01/S1a	Replicate Soil Sample	Blind Replicate of 11761/BH01/S1 (BH01)	TRH, BTEX, Heavy Metals, PAHs
11761/BH01/S1b	Replicate Soil Sample	Split Replicate of 11761/BH01/S1 (BH01)	TRH, BTEX, Heavy Metals, PAHs

Table 8-3: Sample Descriptions

Primary and replicate soil samples that were to be analysed were either sampled directly from the push tube or hand auger and placed directly into new 250mL clean glass jars with screw top plastic lids with inert plastic inserts.

Asbestos samples that were to be analysed were sampled directly from the push tube or hand auger and placed directly into new zip-lock bags.

Between samples sampling equipment was decontaminated using a 5% Decon 90 solution, rinsed with Milli Q water and dried with Kimberly Clark Epic Wipes.

The glass jars and zip-lock bags were labelled using a waterproof permanent marker pen with the date, a Getex unique reference number that indicated the sampling location, and a sub sample number. The samples were then stored on ice in an insulated container until they were delivered to the laboratory within acceptable holding times.

The chain of custody process involved writing the Getex unique reference number on the sample jars and zip-lock bags at the time of sampling and on the chain of custody form. The chain of custody form remained with the samples until they were delivered to the laboratory. Once delivered to the laboratory the officer at sample receipt signed the chain of custody form taking responsibility for the samples. A copy of the chain of custody showing the time of delivery, condition of samples (cold etc) and the unique laboratory number was emailed to Getex by the laboratory. On receipt Getex checked that the laboratory details were correct.

9. ASSESSMENT CRITERIA

9.1 Regulatory Guidelines

The investigation was undertaken in general accordance with the following guidelines, as relevant:

- *Contaminated Sites: Sampling Design Guidelines*, NSW EPA, 1995;
- *Consultants Reporting on Contaminated Land: Contaminated Land Guidelines*, NSW EPA, 2020;
- *Contaminated Land Management: Guidelines for NSW Site Auditor Scheme*, NSW EPA, 2017;

- *Contaminated Sites: Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997*, NSW EPA, 2015;
- *National Environment Protection (Assessment of Site Contamination) Measure*, National Environment Protection Council, 2013; and
- *Environmental Health Risk Assessment: Guidelines for Assessing Human Health Risks from Environmental Hazards*, Department of Health and EnHealth Council, Commonwealth of Australia, June 2012.

9.2 Soil Criteria

Health-based soil criteria levels can be applied for a range of different exposure settings, which are based on the nature of the use(s) for which the land is currently used and/or its approved use(s).

Given that the current use of the Site is for a cyclotron the assessment criteria are based on following exposure setting within the National Environment Protection (Assessment of Site Contamination) Measure, National Environmental Protection Council, 2013:

- Health investigation level setting D (Commercial/Industrial) from Table 1A(1); and
- Health screening level setting D and soil classification sand or clay (dependent on the sample) for petroleum hydrocarbon compounds from Table 1A(3).

For F3 and F4, health screening levels were used from Table B4 of HSLs for petroleum hydrocarbons in soil, part 1: technical development document, Technical report no. 10, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia (2011).

For asbestos, presence/absence of asbestos was used.

Acceptance criteria levels are given within **Appendix III** alongside the sample analysis results.

9.3 Soil Ecological Criteria

Ecological Screening/Investigation Levels are to be applied to soil within 2m below the proposed ground level.

Ecological Screening Levels for petroleum hydrocarbon compounds are based on Commercial and Industrial and soil texture Coarse from Table 1B(6) from the *National Environment Protection (Assessment of Site Contamination) Measure*, National Environment Protection Council, 2013.

Ecological Screening Levels for Carcinogenic PAHS, in particular, Benzo(a)pyrene, are based on Commercial and Industrial from Table 11 from *CRC CARE Technical Report No. 39 Risk-based remediation and management guidance for benzo(a)pyrene* (March 2017).

Ecological Investigation Levels (EILs) are based on Commercial and Industrial from the *National Environment Protection (Assessment of Site Contamination) Measure*, National Environment Protection Council, 2013. EILs have been derived for arsenic, copper, chromium (III), DDT, naphthalene, nickel, lead and zinc.

Values presented for arsenic, naphthalene and DDT are generic EILs based on total concentrations and aged contaminants.

The EIL for lead has been calculated using the most conservative SQG value based upon the reported pH and exchangeable cation values. All other EIL's have assumed that the majority of any contamination on site is greater than 2 years old. Where EIL values required input including CEC, pH and organic content, the values from the samples 11761/BH03/S1 and 11761/BH04/S1 collected within the fill material were used.

A summary of the EIL input values are:

Soil Property	Input
Cation Exchange Capacity cmolc/kg	25
pH	7.4
Organic Compound %	0.9
Iron %	1.3
Clay Content %	7

Table 9-1: EIL Input Value Information

Acceptance criteria levels are given within **Appendix III** alongside the sample analysis results.

10. QUALITY ASSURANCE/QUALITY CONTROL RESULTS

10.1 STANDARD OPERATING PROCEDURES

Field works were conducted by Chris Chen BSc (App Chem) an experienced Environmental Consultant in accordance with Getex internal procedures. This includes but is not limited to; inspections, the methods of sampling, decontamination of sampling equipment, sample preparation and storage, the documentation of site conditions, and the completion of chain of custody documentation.

All inspection and sampling information was documented and where necessary collected utilising properly maintained equipment. Prior to use all equipment was assessed for appropriateness and inspected for defects.

10.2 QA/QC DATA EVALUATION

Data Quality Indicators (DQI) are used to document and quantify compliance, or otherwise with the requirements of the Data Quality Objectives (DQO). They are used to assess the reliability of the field procedures and analytical results. The DQIs are Completeness, Comparability, Representativeness, Precision, and Accuracy. Evaluation of the DQIs is documented in the following table.

Please Refer to **Appendix IV** for QA/QC Results and Assessment.

DQI		Consideration	Compliance
Completeness	Field	All critical locations sampled	Sampling was conducted across the Site and within areas of potentially higher likelihood of contamination.
		All samples collected (from location and at depth)	Samples were collected from multiple depths within fill and natural material.
		Sampling procedures appropriate and complied with	All samples were collected in accordance with relevant guidelines, industry practices, and Australian Standards
		Experienced sampler	Samples were recovered by one (1) suitably qualified and experienced sampler
		Documentation correct	All required documentation was completed including borehole logs and photographic logs
		Duplicates at least 5% of primary samples	>5% duplicates
	Laboratory	Critical samples analysed	Location BH10 not sampled due to service locating markings destroyed. All remaining samples requested for analysis were analysed
		Analysis addresses contaminants of concern	100% of samples analysed for requested contaminant
		Industry recognised methods	All laboratory methods used are NATA accredited
		Within holding times	All samples analysed within acceptable holding times

DQI		Consideration	Compliance
		Documentation supplied	SRA and COC supplied from laboratories
Comparability	Field	Same sampling procedures used on each occasion	Each sample was recovered in accordance with the sampling procedures
		Experienced sampler	Samples were recovered by one (1) suitably qualified and experienced sampler
		Climatic conditions	No potential for variation based on climatic conditions exists.
		Same types of samples collected	The type of samples collected was consistent
	Laboratory	NATA registered laboratories	EnviroLab Services Pty Ltd, Eurofins mgt and ASET are NATA registered
		Consistent analysis methods for samples	Analysis methods were equivalent across all samples
Representativeness	Field	Appropriate media sampled according to NEPM	All samples were recovered in accordance with NEPM
		All media identified	The soil profile to a depth of 5.0m was identified and recorded within borehole logs
	Laboratory	Critical samples analysed	Location BH10 not sampled due to service locating markings destroyed. All remaining samples requested for analysis were analysed
		Analysis addresses contaminants of concern	100% of samples analysed for requested contaminant
Precision	Field	Sampling procedures appropriate and complied with	All samples were recovered in accordance with the sampling procedures

DQI		Consideration	Compliance
		Acceptable RPD's for all replicates	All QA/QC data is either within the RPD, the result was less than three times the laboratories limit of reporting or less than 10% of the acceptance criteria. Therefore, acceptable
	Laboratory	Acceptable RPD's for all laboratory duplicates	Laboratory RPD's acceptable
Accuracy	Field	Sampling procedures appropriate and complied with	All samples were recovered in accordance with the sampling procedures
	Laboratory	Satisfactory results for: blank samples, matrix spikes, control samples, and surrogate spike samples.	All results within acceptable levels and therefore satisfactory

Table 10-1: Data Quality Indicators

Based on the results from Table 9-1, it is the opinion of the consultant that the Data Quality Indicators have been met.

11. DISCUSSION

11.1 Soil Aesthetic Discussion

Low occurrences (<5%) of foreign materials were identified within the fill material across the Site. These included brick, concrete, glass and coke. The amount of foreign material is not considered to be a trigger with regards to aesthetic soil considerations.

11.2 Soil Headspace Screening Discussion

PID screening of soil sample headspace within boreholes did not identify levels above 0.7ppm and are considered well below the level that would require further investigation.

11.3 Soil Analytical Discussion

The summaries of laboratory results are discussed in the following sections.

11.3.1 TRH

A total of 21 soil samples were analysed for TRH fractions. All results for F1 (C6-C10 minus BTEX), F2 (C10-C16 minus Napthalene), F3 (C16-C34) and F4 (C34-C40) were below the adopted Site assessment criteria.

11.3.2 BTEX

A total of 21 soil samples were analysed for BTEX. All concentrations were below the adopted Site assessment criteria.

11.3.3 Metals

A total of 21 soil samples were analysed for Metals. All concentrations were below the adopted Site assessment criteria.

11.3.4 Carcinogenic PAHs

A total of 21 soil samples were analysed for Carcinogenic PAHs (as Benzo(a)Pyrene TEQ). All concentrations were below the adopted Site assessment criteria.

11.3.5 Total PAHs

A total of 21 soil samples were analysed for PAHs. All concentrations were below the adopted Site assessment criteria.

11.3.6 OCP

A total of 10 soil samples were analysed for OCP. All concentrations were below the adopted Site assessment criteria.

11.3.7 PCBs

A total of 10 soil samples were analysed for PCBs. All concentrations were below the adopted Site assessment criteria.

11.3.8 Phenols

A total of 10 soil samples were analysed for Phenols. All concentrations were below the adopted Site assessment criteria.

11.3.9 pH

A total of 10 soil samples were analysed for pH. Elevated levels of pH (9.1, 9.2, 9.5, 9.2) were identified within samples 11761/BH08/S1, 11761/BH09/S1, 11761/BH11/S1 & 11761/BH12/S1 respectively, above the adopted Site assessment criteria of 5-9.

All concentrations were within the adopted Site assessment criteria.

11.3.10 VOCs

A total of 10 soil samples were analysed for VOCs. All concentrations were below the laboratory limit of reporting and considered satisfactory.

11.3.11 Asbestos

A total of 11 soil samples were analysed for Asbestos. No asbestos was detected within any of the samples.

11.4 Response to Identified Decisions

The results are discussed in the following sections in relation to the identified decisions developed as part of the DQO process (**Section 7.1.2**):

- Has widespread/gross soil contamination been identified?

11.4.1 Widespread/Gross Soil Contamination

Samples of belowground soils were analysed for a broad range of identified potential contaminants including TRH, BTEX, Metals, PAHs, OCPs, PCBs, Phenols, VOCs, pH and Asbestos.

Elevated levels of pH (9.1, 9.2, 9.5, 9.2) were identified within samples 11761/BH08/S1, 11761/BH09/S1, 11761/BH11/S1 & 11761/BH12/S1 respectively. However, the samples were only marginally above the adopted criteria. Therefore, it is the opinion of the consultant that the elevated pH level does not indicate the presence of acids that would be a potential risk to current and future receptors.

Concentrations of TRH, BTEX, Metals, PAHs, OCPs, PCBs, Phenols, VOCs and Asbestos were below the adopted criteria or considered satisfactory.

As such, no widespread/gross soil contamination was identified.

The assessment of surface water and groundwater is not included in the scope of the investigation. Furthermore, this report only addresses the potential chemical and physical contamination indicated within this report and does not address any human health/ecological risk associated with radiological contamination.

12. UPDATE OF CONCEPTUAL SITE MODEL

Based on the findings from the assessment, the updated CSM is provided in Table 11-1.

12.1 Updated Conceptual Site Model

Source	Receptors	Contaminants of Concern	Exposure Pathway	Potential for Completeness
Contaminated soils from: - Current use as a cyclotron; - Neighbouring hospital; - Potentially contaminated fill; and - Environmental fallout due to traffic and industrial emissions.	Site Occupants; Neighbouring properties; Construction workers; Ecological receptors.	TRH, BTEX, Metals, PAHs, Phenols, OCPs, PCBs, VOCs, Asbestos	Skin contact with potentially contaminated soil; Inhalation of asbestos fibres; Vapour Inhalation; Ingestion of potentially contaminated soil; Plant uptake.	Pathway incomplete – With the exception of pH, no CoPC detected above criteria levels within the Site. Elevated levels of pH (9.1, 9.2, 9.5, 9.2) were identified within samples 11761/BH08/S1, 11761/BH09/S1, 11761/BH11/S1 & 11761/BH12/S1 respectively. However, the samples were only marginally above the adopted criteria. Therefore, it is the opinion of the consultant that the elevated pH level does not indicate the presence of acids that would be a potential risk to current and future receptors.
		Radiological Material	Skin contact with potentially contaminated soil; Ingestion of potentially contaminated soil.	Pathway unknown – Human health/ecological risk associated with radiological contamination not addressed as part of the scope of this investigation.

Table 12-1: Updated Conceptual Site Model

13. CONCLUSIONS

Samples of belowground soils were analysed for a broad range of identified potential contaminants including heavy metals, TRH, BTEX, Metals, PAHs, OCP, PCBs, Phenols, VOCs, pH and Asbestos.

Elevated levels of pH (9.1, 9.2, 9.5, 9.2) were identified within samples 11761/BH08/S1, 11761/BH09/S1, 11761/BH11/S1 & 11761/BH12/S1 respectively. However, the samples were only marginally above the adopted criteria. Therefore, it is the opinion of the consultant that the elevated pH level does not indicate the presence of acids that would be a potential risk to current and future receptors.

The concentrations detected for all contaminants did not identify the belowground presence of widespread/gross soil contamination. Furthermore, no contamination was identified which would preclude continued present Commercial/Industrial use under the current conditions.

Please note, prior to any proposed change in land use or development of the Site a detailed site contamination assessment would be required to confirm if the Site is suitable for such land use/development.

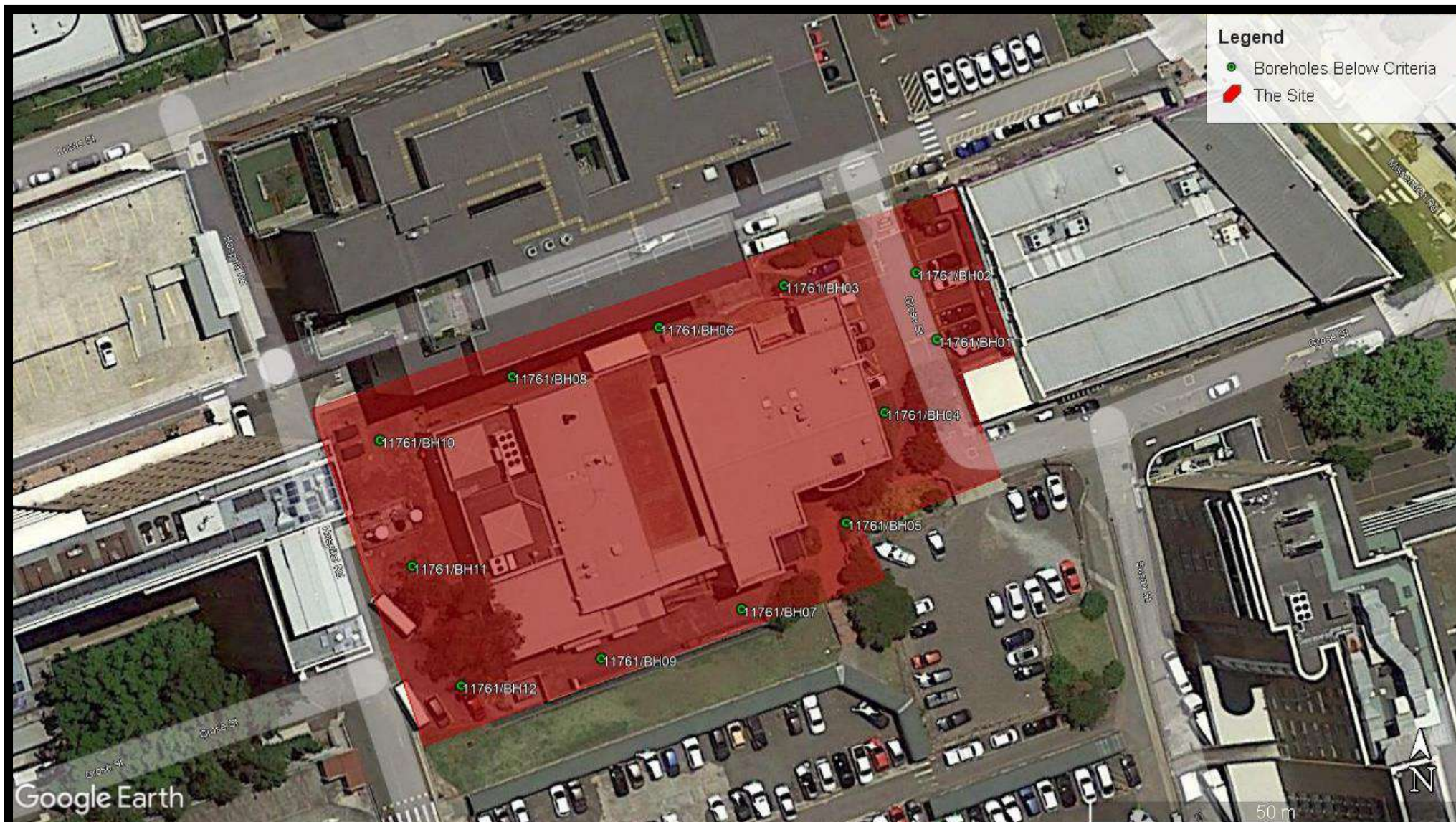
The assessment of surface water and groundwater was not included in the scope of the investigation. Furthermore, this report only addresses the potential chemical and physical contamination indicated within this report and does not address any human health/ecological risk associated with radiological contamination.

LEGAL PRIVILEGE



APPENDIX I

SITE MAP





APPENDIX II

SITE PHOTOGRAPHS



Photograph 01
Northern nature strip as view from the east.



Photograph 04
View of western stormwater drains in northern nature strip as viewed from the east.



Photograph 02
View of eastern stormwater drain and manhole in northern nature strip as viewed from the north.



Photograph 05
View of eastern carpark as viewed from the south



Photograph 03
View of central stormwater drain in northern nature strip as viewed from the east.



Photograph 06
View of southern exterior hardstand area as view from the west.



Photograph 07

View of access to pit to cyclotron transfer lines as viewed from the south.



Photograph 09

View of gas tanks on the western end of the Site as viewed from the north.



Photograph 08

View of water tanks on the western end of the Site as viewed from the West.



Photograph 10

View of electrical control cabinets on the north-west corner of the Site as view from the north-east.



APPENDIX III

ANALYSIS RESULTS

Metals				Sample Number	11761/BH01/S1	11761/BH01/S2	11761/BH02/S1	11761/BH02/S2	11802/BH03/S1	11802/BH04/S1	11802/BH04/S2	11802/BH05/S1	11802/BH05/S2	11802/BH06/S1	11802/BH06/S2	11802/BH07/S1	11761/BH07/S2	11761/BH08/S1	11761/BH08/S2	11761/BH09/S1	11761/BH09/S2	11761/BH11/S1	11761/BH11/S2	11761/BH12/S1	11761/BH12/S2
				Sample Location	BH01	BH01	BH02	BH02	BH03	BH04	BH04	BH05	BH05	BH06	BH06	BH07	BH07	BH08	BH08	BH09	BH09	BH11	BH11	BH12	BH12
				Sample Depth from Surface (m)	0.05	2.15	0.05	2.2	0.3	0.3	5	0.5	2	0.35	2	0.2	5	0.3	5	0.2	2.05	0.4	5	0.05	5
ANALYTE	NEPM HIL	NEPM EIL	Units	PQL																					
Arsenic	3000	160	mg/kg	1	<4	<4	5	<4	<4	<4	<4	<4	5	<4	9	8	<4	5	<4	<4	<4	<4	<4	<4	6
Cadmium	900	-	mg/kg	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	3600	600	mg/kg	1	6	6	27	11	8	10	5	10	16	7	26	32	7	14	7	7	10	4	7	7	4
Copper	240000	340	mg/kg	1	51	1	18	<1	49	9	2	2	2	16	<1	7	2	17	<1	43	<1	5	5	55	7
Lead	1500	1800	mg/kg	1	1	10	11	10	40	23	27	10	9	14	11	24	9	95	12	1	14	45	19	2	9
Mercury	730	-	mg/kg	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	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	6000	530	mg/kg	1	59	<1	26	<1	44	7	<1	<1	<1	5	<1	5	<1	6	<1	81	<1	2	<1	46	<1
Zinc	400000	1400	mg/kg	1	24	<1	46	1	38	35	<1	12	10	32	1	18	5	95	<1	24	<1	53	5	29	2
Molybdenum	-	-	mg/kg	1	<1	<1	1	<1	<1	<1	<1	<1	1	<1	1	<1	<1	<1	2	<1	<1	<1	<1	<1	<1
Beryllium	500	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

TRH/BTEX													Sample Number	11761/BH01/S1	11761/BH01/S2	11761/BH02/S1	11761/BH02/S2	11802/BH03/S1	11802/BH04/S1	11802/BH04/S2	11802/BH05/S1	11802/BH05/S2	11802/BH06/S1	11802/BH06/S2
													Sample Location	BH01	BH01	BH02	BH02	BH03	BH04	BH04	BH05	BH05	BH06	BH06
Sample Depth from Surface (m)	0 to <1	1 to <2	2 to <4	0 to <1	1 to <2	2 to <4	2 to <4							0.05	2.15	0.05	2.2	0.3	0.3	5	0.5	2	0.35	2
Soil Type	Sand	Sand	Sand	Clay	Clay	Clay	Clay	Coarse/Fine		Fine	Course			Sand	Sand	Sand	Clay	Sand	Sand	Sand	Sand	Sand	Clay	Sand
ANALYTE	NEPM HSL	NEPM HSL	NEPM HSL	NEPM HSL	NEPM HSL	NEPM HSL	NEPM HSL	NEPM ESL	Supplementary Guideline Level	NEPM Management Limits	NEPM Management Limits	Units	PQL											
TRH C6 - C9	-	-	-	-	-	-	-	-	-	800	700	mg/kg	25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25
TRH C6 - C10	-	-	-	-	-	-	-	-	-	-	-	mg/kg	25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25
vTPH C6 - C10 less BTEX (F1)	260	370	630	310	480	NL	NL	180/180	-	-	-	mg/kg	25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25
Benzene	3	3	3	4	6	6	20	50/65	-	-	-	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	NL	NL	NL	NL	NL	NL	NL	85/105	-	-	-	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	NL	NL	NL	NL	NL	NL	NL	70/125	-	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
m+p-xylene	-	-	-	-	-	-	-	-	-	-	-	mg/kg	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
o-Xylene	-	-	-	-	-	-	-	-	-	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
naphthalene	NL	NL	NL	5	NL	NL	NL	-	-	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Xylenes	230	NL	NL	NL	NL	NL	NL	105/45	-	-	-	mg/kg	3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TRH C10 - C14	-	-	-	-	-	-	-	-	-	-	-	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
TRH C15 - C28	-	-	-	-	-	-	-	-	-	-	-	mg/kg	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
TRH C29 - C36	-	-	-	-	-	-	-	-	-	-	-	mg/kg	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
TRH >C10-C16	-	-	-	-	-	-	-	-	-	1000	1000	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
TRH >C10 - C16 less Naphthalene (F2)	NL	NL	NL	NL	NL	NL	NL	120/120	-	-	-	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
TRH>C16-C34 (F3)	-	-	-	-	-	-	-	300/1300	4500*	5000	3500	mg/kg	100	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
TRH>C34-C40 (F4)	-	-	-	-	-	-	-	2800/5600	6300*	10000	10000	mg/kg	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	-	-	-	-	-	-	-	-	-	-	-	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50

*Commercial/Industrial within Friebel, E & Nadebaum, P 2011a, HSLs for petroleum hydrocarbons in soil and groundwater, part 1: technical development document, Technical report no. 10, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia.

TRH/BTEX													Sample Number	11802/BH07/S1	11761/BH07/S2	11761/BH08/S1	11761/BH08/S2	11761/BH09/S1	11761/BH09/S2	11761/BH11/S1	11761/BH11/S2	11761/BH12/S1	11761/BH12/S2
													Sample Location	BH07	BH07	BH08	BH08	BH09	BH09	BH11	BH11	BH12	BH12
Sample Depth from Surface (m)	0 to <1	1 to <2	2 to <4	0 to <1	1 to <2	2 to <4	2 to <4							0.2	5	0.3	5	0.2	2.05	0.4	5	0.05	5
Soil Type	Sand	Sand	Sand	Clay	Clay	Clay	Clay	Coarse/Fine		Fine	Course			Sand	Sand	Sand	Sand	Clay	Sand	Sand	Sand	Sand	Sand
ANALYTE	NEPM HSL	NEPM HSL	NEPM HSL	NEPM HSL	NEPM HSL	NEPM HSL	NEPM HSL	NEPM ESL	Supplementary Guideline Level	NEPM Management Limits	NEPM Management Limits	Units	PQL										
TRH C6 - C9	-	-	-	-	-	-	-	-	-	800	700	mg/kg	25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25
TRH C6 - C10	-	-	-	-	-	-	-	-	-	-	-	mg/kg	25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25
vTPH C6 - C10 less BTEX (F1)	45	70	110	50	90	150	NL	215/215	-	-	-	mg/kg	25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25
Benzene	0.5	0.5	0.5	0.7	1	2	20	75/95	-	-	-	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	160	220	310	480	NL	NL	NL	135/135	-	-	-	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	55	NL	NL	NL	NL	NL	NL	165/185	-	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
m+p-xylene	-	-	-	-	-	-	-	-	-	-	-	mg/kg	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
o-Xylene	-	-	-	-	-	-	-	-	-	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
naphthalene	3	NL	NL	5	NL	NL	NL	-	-	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Xylenes	40	60	95	110	NL	NL	NL	180/95	-	-	-	mg/kg	3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TRH C10 - C14	-	-	-	-	-	-	-	-	-	-	-	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
TRH C15 - C28	-	-	-	-	-	-	-	-	-	-	-	mg/kg	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
TRH C29 - C36	-	-	-	-	-	-	-	-	-	-	-	mg/kg	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
TRH >C10-C16	-	-	-	-	-	-	-	-	-	1000	1000	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
TRH >C10 - C16 less Naphthalene (F2)	110	240	440	280	NL	NL	NL	170/170	-	-	-	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
TRH>C16-C34 (F3)	-	-	-	-	-	-	-	1700/2500	4500*	5000	3500	mg/kg	100	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
TRH>C34-C40 (F4)	-	-	-	-	-	-	-	3300/6600	6300*	10000	10000	mg/kg	100	<100	<100	110	<100	<100	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	-	-	-	-	-	-	-	-	-	-	-	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50

*Commercial/Industrial within Friebel, E & Nadebaum, P 2011a, HSLs for petroleum hydrocarbons in soil and groundwater, part 1: technical development document, Technical report no. 10, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia.

PAHs										Sample Number	11761/BH01/S1	11761/BH01/S2	11761/BH02/S1	11761/BH02/S2	11802/BH03/S1	11802/BH04/S1	11802/BH04/S2	11802/BH05/S1	11802/BH05/S2	11802/BH06/S1	11802/BH06/S2
										Sample Location	BH01	BH01	BH02	BH02	BH03	BH04	BH04	BH05	BH05	BH06	BH06
Sample Depth from Surface (m)	0 to <1	1 to <2	2 to <4	0 to <1	1 to <2	2 to <4					0.05	2.15	0.05	2.2	0.3	0.3	5	0.5	2	0.35	2
Soil Type	Sand	Sand	Sand	Clay	Clay	Clay					Sand	Clay	Sand	Clay	Sand	Sand	Clay	Sand	Clay	Sand	Clay
ANALYTE	NEPM HSL	NEPM HSL	NEPM HSL	NEPM HSL	NEPM HSL	NEPM HSL	NEPM HIL	NEPM EIL/ESL	Units	PQL											
Naphthalene	3	NL	NL	5	NL	NL	-	370	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	-	-	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	-	-	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	-	-	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	-	-	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	1.2	<0.1
Anthracene	-	-	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	-	-	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	0.4	<0.1	<0.1	<0.1	<0.1	0.3	<0.1
Pyrene	-	-	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	0.5	<0.1	<0.1	<0.1	<0.1	0.3	<0.1
Benzo(a)anthracene	-	-	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
Chrysene	-	-	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.4	<0.1
Benzo(b,j+k)fluoranthene	-	-	-	-	-	-	-	-	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	0.4	<0.2	<0.2	<0.2	<0.2	0.3	<0.2
Benzo(a)pyrene	-	-	-	-	-	-	-	0.7	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05	0.2	<0.05	<0.05	<0.05	<0.05	0.1	<0.05
Indeno(1,2,3-c,d)pyrene	-	-	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	-	-	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	-	-	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	-	-	-	-	-	-	4000	-	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05	2.6	<0.05	<0.05	<0.05	<0.05	2.6	<0.05
Benzo(a)pyrene TEQ calc (zero)	-	-	-	-	-	-	40	-	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	-	-	-	-	-	-	40	-	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	-	-	-	-	-	-	40	-	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

PAHs										Sample Number	11802/BH07/S1	11761/BH07/S2	11761/BH08/S1	11761/BH08/S2	11761/BH09/S1	11761/BH09/S2	11761/BH11/S1	11761/BH11/S2	11761/BH12/S1	11761/BH12/S2
										Sample Location	BH07	BH07	BH08	BH08	BH09	BH09	BH11	BH11	BH12	BH12
Sample Depth from Surface (m)	0 to <1	1 to <2	2 to <4	0 to <1	1 to <2	2 to <4					0.2	5	0.3	5	0.2	2.05	0.4	5	0.05	5
Soil Type	Sand	Sand	Sand	Clay	Clay	Clay					Sand	Clay	Sand	Clay	Sand	Clay	Sand	Clay	Sand	Clay
ANALYTE	NEPM HSL	NEPM HSL	NEPM HSL	NEPM HSL	NEPM HSL	NEPM HSL	NEPM HIL	NEPM EIL/ESL	Units	PQL										
Naphthalene	3	NL	NL	5	NL	NL	-	370	mg/kg	0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.5	<0.1	<0.1	<0.1
Acenaphthylene	-	-	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	0.8	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1
Acenaphthene	-	-	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	-	-	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	-	-	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	4.2	<0.1	<0.1	<0.1	0.8	<0.1	<0.1	<0.1
Anthracene	-	-	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	1.2	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1
Fluoranthene	-	-	-	-	-	-	-	-	mg/kg	0.1	0.2	<0.1	4.7	<0.1	<0.1	<0.1	1	<0.1	<0.1	<0.1
Pyrene	-	-	-	-	-	-	-	-	mg/kg	0.1	0.2	<0.1	4.9	<0.1	<0.1	<0.1	1	<0.1	<0.1	<0.1
Benzo(a)anthracene	-	-	-	-	-	-	-	-	mg/kg	0.1	0.1	<0.1	2.8	<0.1	<0.1	<0.1	0.4	<0.1	<0.1	<0.1
Chrysene	-	-	-	-	-	-	-	-	mg/kg	0.1	0.1	<0.1	2.4	<0.1	<0.1	<0.1	0.4	<0.1	<0.1	<0.1
Benzo(b,j,k)fluoranthene	-	-	-	-	-	-	-	-	mg/kg	0.2	<0.2	<0.2	4.1	<0.2	<0.2	<0.2	0.6	<0.2	<0.2	<0.2
Benzo(a)pyrene	-	-	-	-	-	-	-	172*	mg/kg	0.05	0.1	<0.05	3.4	<0.05	<0.05	<0.05	0.5	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	-	-	-	-	-	-	-	-	mg/kg	0.1	0.1	<0.1	1.8	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	-	-	-	-	-	-	-	-	mg/kg	0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	-	-	-	-	-	-	-	-	mg/kg	0.1	0.1	<0.1	1.6	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1
Total +ve PAH's	-	-	-	-	-	-	4000	-	mg/kg	0.05	0.84	<0.05	33	<0.05	<0.05	<0.05	6.1	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	-	-	-	-	-	-	40	-	mg/kg	0.5	<0.5	<0.5	4.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	-	-	-	-	-	-	40	-	mg/kg	0.5	<0.5	<0.5	4.5	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	-	-	-	-	-	-	40	-	mg/kg	0.5	<0.5	<0.5	4.5	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5

*Ecological Screening Level for Benz(a)Pyrene is based on Commercial and Industrial from Table 11 of CRC CARE Technical Report No. 39 Risk-based remediation and management guidance for benzo(a)pyrene (March 2017).

OCF				Sample Number	11761/BH02/S1	11761/BH03/S1	11761/BH04/S1	11761/BH05/S1	11761/BH06/S1	11761/BH07/S1	11761/BH08/S1	11761/BH09/S1	11761/BH11/S1	11761/BH12/S1
				Sample Location	BH02	BH03	BH04	BH05	BH06	BH07	BH08	BH09	BH11	BH12
				Sample Depth from Surface (m)	0.05	0.3	0.3	0.5	0.35	0.2	0.3	0.2	0.4	0.05
ANALYTE	NEPM HIL	NEPM EIL	Units	PQL										
alpha-BHC	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	80	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	50	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	100	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	-	640	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	2500	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	-	-	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
DDT+DDE+DDD	3600	-	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Aldrin and Dieldrin	45	-	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Chlordane	530	-	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Endosulfan	2000	-	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Total Endrin	100	-	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Heptachlor	50	-	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

VOCs				Sample Number	11761/BH02/S1	11761/BH03/S1	11761/BH04/S1	11761/BH05/S1	11761/BH06/S1	11761/BH07/S1	11761/BH08/S1	11761/BH09/S1	11761/BH11/S1	11761/BH12/S1
				Sample Location	BH02	BH03	BH04	BH05	BH06	BH07	BH08	BH09	BH11	BH12
				Sample Depth from Surface (m)	0.05	0.3	0.3	0.5	0.35	0.2	0.3	0.2	0.4	0.05
ANALYTE	NEPM HIL	NEPM HSL	Units	PQL										
Dichlorodifluoromethane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloromethane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Vinyl Chloride	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bromomethane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichlorofluoromethane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
trans-1,2-dichloroethene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-dichloroethane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
cis-1,2-dichloroethene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
bromochloromethane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
chloroform	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2-dichloropropane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-dichloroethane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,1-trichloroethane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-dichloropropene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cyclohexane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
carbon tetrachloride	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzene	-	-	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
dibromomethane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-dichloropropane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
trichloroethene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
bromodichloromethane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
trans-1,3-dichloropropene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
cis-1,3-dichloropropene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2-trichloroethane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	-	-	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-dichloropropane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
dibromochloromethane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-dibromoethane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
tetrachloroethene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,1,2-tetrachloroethane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
chlorobenzene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
bromoform	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
m+p-xylene	-	-	mg/kg	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2

VOCs				Sample Number	11761/BH02/S1	11761/BH03/S1	11761/BH04/S1	11761/BH05/S1	11761/BH06/S1	11761/BH07/S1	11761/BH08/S1	11761/BH09/S1	11761/BH11/S1	11761/BH12/S1
				Sample Location	BH02	BH03	BH04	BH05	BH06	BH07	BH08	BH09	BH11	BH12
				Sample Depth from Surface (m)	0.05	0.3	0.3	0.5	0.35	0.2	0.3	0.2	0.4	0.05
ANALYTE	NEPM HIL	NEPM HSL	Units	PQL										
styrene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2,2-tetrachloroethane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
o-Xylene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2,3-trichloropropane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
isopropylbenzene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
bromobenzene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
n-propyl benzene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-chlorotoluene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4-chlorotoluene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,3,5-trimethyl benzene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
tert-butyl benzene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2,4-trimethyl benzene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,3-dichlorobenzene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
sec-butyl benzene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,4-dichlorobenzene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4-isopropyl toluene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-dichlorobenzene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
n-butyl benzene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-dibromo-3-chloropropane	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2,4-trichlorobenzene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
hexachlorobutadiene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2,3-trichlorobenzene	-	-	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

PCBs			Sample Number	11761/BH02/S1	11761/BH03/S1	11761/BH04/S1	11761/BH05/S1	11761/BH06/S1	11761/BH07/S1	11761/BH08/S1	11761/BH09/S1	11761/BH11/S1	11761/BH12/S1
			Sample Location	BH02	BH03	BH04	BH05	BH06	BH07	BH08	BH09	BH11	BH12
			Sample Depth from Surface (m)	0.05	0.3	0.3	0.5	0.35	0.2	0.3	0.2	0.4	0.05
ANALYTE	NEMP HIL	Units	PQL										
Total PCBs (1016-1260)	7	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Phenols			Sample Number	11761/BH02/S1	11761/BH03/S1	11761/BH04/S1	11761/BH05/S1	11761/BH06/S1	11761/BH07/S1	11761/BH08/S1	11761/BH09/S1	11761/BH11/S1	11761/BH12/S1
			Sample Location	BH02	BH03	BH04	BH05	BH06	BH07	BH08	BH09	BH11	BH12
			Sample Depth from Surface (m)	0.05	0.3	0.3	0.5	0.35	0.2	0.3	0.2	0.4	0.05
ANALYTE	NEPM HIL	Units	PQL										
Total Phenolics (as Phenol)	240000	mg/kg	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5

pH			Sample Number	11761/BH02/S1	11761/BH03/S1	11761/BH04/S1	11761/BH05/S1	11761/BH06/S1	11761/BH07/S1	11761/BH08/S1	11761/BH09/S1	11761/BH11/S1	11761/BH12/S1
			Sample Location	BH02	BH03	BH04	BH05	BH06	BH07	BH08	BH09	BH11	BH12
			Sample Depth from Surface (m)	0.05	0.3	0.3	0.5	0.35	0.2	0.3	0.2	0.4	0.05
ANALYTE	EPA ENM Order^	Units	PQL										
pH 1:5 soil:water	5-9	pH Units		8.0	8.6	6.6	8.1	8.8	8.8	9.1	9.2	9.5	9.2

^NSW EPA The Excavated Natural Material Order, 2014.

Asbestos			Sample Number	11761/BH01/AS01	11761/BH02/AS01	11761/BH03/AS01	11761/BH04/AS01	11761/BH05/AS01	11761/BH06/AS01	11761/BH07/AS01	11761/BH08/AS01	11761/BH09/AS01	11761/BH11/AS01	11761/BH12/AS01
			Sample Location	BH01	BH02	BH03	BH04	BH05	BH06	BH07	BH08	BH09	BH11	BH12
Sample Depth from Surface (m)				0.2	0.05	0.4	0.15	0.6	0.3	0.3	0.2	0.3	0.5	0.15
ANALYTE		Units	PQL											
Asbestos	Presence/Absence	-	0.1g/kg	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD

NAD – No Asbestos Detected

Inputs
Select contaminant from list below
As
Below needed to calculate fresh and aged ACLs
Below needed to calculate fresh and aged ABCs
or for fresh ABCs only
or for aged ABCs only

Outputs		
Land use	Arsenic generic EILs	
	(mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	20	40
Urban residential and open public spaces	50	100
Commercial and industrial	80	160

Inputs	
Select contaminant from list below	
Cr_III	
Below needed to calculate fresh and aged ACLs	
Enter % clay (values from 0 to 100%)	
7	
Below needed to calculate fresh and aged ABCs	
Measured background concentration (mg/kg). Leave blank if no measured value	
or for fresh ABCs only	
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration	
1.3	
or for aged ABCs only	
Enter State (or closest State)	
NSW	
Enter traffic volume (high or low)	
high	

Outputs		
Land use	Cr III soil-specific EILs	
	(mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	65	130
Urban residential and open public spaces	160	370
Commercial and industrial	260	600

Inputs
Select contaminant from list below
Cu
Below needed to calculate fresh and aged ACLs
Enter cation exchange capacity (silver thiourea method) (values from 0 to 100 cmolc/kg dwt)
25
Enter soil pH (calcium chloride method) (values from 1 to 14)
7.4
Enter organic carbon content (%OC) (values from 0 to 50%)
0.9
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
1.3
or for aged ABCs only
Enter State (or closest State)
NSW
Enter traffic volume (high or low)
high

Outputs		
Land use	Cu soil-specific EILs	
	(mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	60	100
Urban residential and open public spaces	120	240
Commercial and industrial	170	340

Inputs
Select contaminant from list below
DDT
Below needed to calculate fresh and aged ACLs
Below needed to calculate fresh and aged ABCs
or for fresh ABCs only
or for aged ABCs only

Outputs		
Land use	DDT generic EILs	
	(mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	3	3
Urban residential and open public spaces	180	180
Commercial and industrial	640	640

Inputs
Select contaminant from list below
Naphthalene
Below needed to calculate fresh and aged ACLs
Below needed to calculate fresh and aged ABCs
or for fresh ABCs only
or for aged ABCs only

Outputs		
Land use	Naphthalene generic EILs	
	(mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	10	10
Urban residential and open public spaces	170	170
Commercial and industrial	370	370

Inputs
Select contaminant from list below
Ni
Below needed to calculate fresh and aged ACLs
Enter cation exchange capacity (silver thiourea method) (values from 0 to 100 cmolc/kg dwt)
25
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
1.3
or for aged ABCs only
Enter State (or closest State)
NSW
Enter traffic volume (high or low)
high

Outputs		
Land use	Ni soil-specific EILs	
	(mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	20	60
Urban residential and open public spaces	100	310
Commercial and industrial	200	530

Inputs
Select contaminant from list below
Pb
Below needed to calculate fresh and aged ACLs
Below needed to calculate fresh and aged ABCs
or for fresh ABCs only
or for aged ABCs only

Outputs		
Land use	Lead generic EILs	
	(mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	110	470
Urban residential and open public spaces	270	1100
Commercial and industrial	440	1800

Inputs
Select contaminant from list below
Zn
Below needed to calculate fresh and aged ACLs
Enter cation exchange capacity (silver thiourea method) (values from 0 to 100 cmolc/kg dwt)
25
Enter soil pH (calcium chloride method) (values from 1 to 14)
7.4
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
1.3
or for aged ABCs only
Enter State (or closest State)
NSW
Enter traffic volume (high or low)
high

Outputs		
Land use	Zn soil-specific EILs	
	(mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	95	300
Urban residential and open public spaces	330	950
Commercial and industrial	520	1400



APPENDIX IV

QUALITY ASSURANCE / QUALITY CONTROL

QUALITY ASSURANCE/QUALITY CONTROL

The sampling and analysis program included, for Quality Assurance / Quality Control (QA/QC) purposes, the analysis of blind and split replicate samples. For soil sampling one blind and one split replicate was taken for TRH, BTEX, PAHs and Metals. The primary and blind replicate samples were sent to the same laboratory (EnviroLab Services Pty Ltd) and the split replicate was sent to independent laboratories (Eurofins | mgt).

The data quality objective was defined as an acceptable relative percentage difference (RPD) between the primary and blind or split sample of 30% - 50%. This variation can be expected to be higher for organic analysis than for inorganics, and for low concentration of analytes. However a higher RPD was considered to be acceptable in cases where the analytical result was less than three times the laboratory's lower limit of reporting, or where the analytical result was less than 10% of the acceptance criteria. In these situations a large RPD value that has little significance.

The RPD is a measure of precision that was calculated by dividing the difference of two laboratory reported values by the average of those values, multiplied by 100.

$$\text{I.e. RPD} = (X_1 - X_2) / X_{\text{ave}} \times 100$$

Where:

X_1 = concentration observed with the first detector or equipment;

X_2 = concentration observed with the second detector, equipment, or absolute value; and

X_{ave} = average concentration = $[(X_1 + X_2) / 2]$

The Laboratory QA/QC procedure must comply with the following minimum requirements:

- At least one blank every 20 samples
- At least one Laboratory control sample every 20 samples
- At least one duplicate every 10 samples
- At least one matrix spike every 20 samples

The assessment of the laboratory analytical data also included the following conditions:

- Maximum sample holding times for organics were 14 days. Metals and metalloids holding times were 6 months. Mercury (Hg) holding times was 28 days;
- Sample preservation and handling were conducted in accordance with industry accepted standards;
- All sample analyses were conducted by NATA accredited laboratories;
- Laboratory blank analysis to be below PQLs; and
- The relative percentage difference (RPD) of duplicates/replicates and percent recoveries of control spikes to be calculated and compared to the following criteria:
 - Less than 30% for field replicates;
 - Less than 40% for internal duplicate samples and less than 44% on duplicates with 10 times the limit of reporting; and
 - 75-125% recovery for internal recovery samples.

Soil QA/QC

Analyte	Analyte Concentration Totals (mg/kg)			Relative Percentage Difference of Blind Replicate	Relative Percentage Difference of Split Replicate
Sample Number	11761/BH01/S1	11761/BH01/S1a	11761/BH01/S1b	%	%
Laboratory	Envirolab Services Pty Ltd	Envirolab Services Pty Ltd	Eurofins \ mgt	-	-
Replicate Description	Primary Sample	Blind Replicate of 11761/BH01/S1	Split Replicate of 11761/BH01/S1	-	-
TRH C6 - C9	<25	<25	<20	0%	22%
TRH C6 - C10	<25	<25	<20	0%	22%
vTPH C6 - C10 less BTEX (F1)	<25	<25	<20	0%	22%
Benzene	<0.2	<0.2	<0.1	0%	67%*
Toluene	<0.5	<0.5	<0.1	0%	133%*
Ethylbenzene	<1	<1	<0.1	0%	164%*
m+p-xylene	<2	<2	<0.2	0%	164%*
o-Xylene	<1	<1	<0.1	0%	164%*
naphthalene	<1	<1	<0.5	0%	67%*
Total +ve Xylenes	<1	<1	<0.3	0%	108%*
TRH C10 - C14	<50	<50	<20	0%	86%*
TRH C15 - C28	<100	<100	<50	0%	67%*
TRH C29 - C36	<100	<100	<50	0%	67%*
TRH >C10-C16	<50	<50	<50	0%	0%
TRH >C10 - C16 less Naphthalene (F2)	<50	<50	<50	0%	0%
TRH >C16-C34	<50	<100	<100	0%	0%
TRH >C34-C40	<100	<100	<100	0%	0%
Total +ve TRH (>C10-C40)	<100	<50	<100	0%	67%*
Naphthalene	<0.1	<0.1	<0.5	0%	133%*
Acenaphthylene	<0.1	<0.1	<0.5	0%	133%*
Acenaphthene	<0.1	<0.1	<0.5	0%	133%*
Fluorene	<0.1	<0.1	<0.5	0%	133%*
Phenanthrene	<0.1	<0.1	<0.5	0%	133%*
Anthracene	<0.1	<0.1	<0.5	0%	133%*
Fluoranthene	<0.1	<0.1	<0.5	0%	133%*
Pyrene	<0.1	<0.1	<0.5	0%	133%*
Benzo(a)anthracene	<0.1	<0.1	<0.5	0%	133%*
Chrysene	<0.1	<0.1	<0.5	0%	133%*
Benzo(b,j+k)fluoranthene	<0.2	<0.2	<0.5	0%	86%*
Benzo(a)pyrene	<0.05	<0.05	<0.5	0%	164%*
Indeno(1,2,3-c,d)pyrene	<0.1	<0.1	<0.5	0%	133%*
Dibenzo(a,h)anthracene	<0.1	<0.1	<0.5	0%	133%*

Analyte	Analyte Concentration Totals (mg/kg)			Relative Percentage Difference of Blind Replicate	Relative Percentage Difference of Split Replicate
Sample Number	11761/BH01/S1	11761/BH01/S1a	11761/BH01/S1b	%	%
Laboratory	Envirolab Services Pty Ltd	Envirolab Services Pty Ltd	Eurofins \ mgt	-	-
Replicate Description	Primary Sample	Blind Replicate of 11761/BH01/S1	Split Replicate of 11761/BH01/S1	-	-
Benzo(g,h,i)perylene	<0.1	<0.1	<0.5	0%	133%*
Total +ve PAH's	<0.05	<0.05	<0.5	0%	164%*
Benzo(a)pyrene TEQ calc (zero)	<0.5	<0.5	<0.5	0%	0%
Benzo(a)pyrene TEQ calc(half)	<0.5	<0.5	0.6	0%	18%
Benzo(a)pyrene TEQ calc(PQL)	<0.5	<0.5	1.2	0%	82%*
Arsenic	<4	<4	<2	0%	67%*
Cadmium	<0.4	<0.4	<0.4	0%	0%
Chromium	6	6	19	0%	56%^
Copper	51	59	79	15%	104%^
Lead	1	1	<5	0%	133%*
Mercury	<0.1	<0.1	<0.1	0%	0%
Nickel	59	60	100	2%	52%^
Zinc	24	25	73	4%	134%^

*Results less than three times the laboratory detection limits.

^Results less than 10% of criteria.

Laboratory QA/QC

Envirolab Services Pty Ltd and Eurofins | mgt both comply with the minimum laboratory QA/QC requirements, which include performing the following:

- At least one blank every 20 samples;
- At least one Laboratory control sample every 20 samples;
- At least one duplicate every 10 samples; and
- At least one matrix spike every 20 samples.

The laboratories have met the previously determined QA/QC requirements. The QA/QC data is considered satisfactory and the quality of the analytical results considered suitable for the purposes of the soil sampling.

Field Replicates QA/QC

All QA/QC data is either within the RPD, the result was less than three times the laboratories limit of reporting or less than 10% of the acceptance criteria. Based on the overall results of the QA/QC, the data is considered satisfactory to meet the predetermined data quality objective.



APPENDIX V

LABORATORY ANALYSIS RESULTS

CERTIFICATE OF ANALYSIS 291362

Client Details

Client	Getex Pty Ltd
Attention	Chris Chen
Address	Unit 2, Building B, 64 Talavera Road, MACQUARIE PARK, NSW, 2113

Sample Details

Your Reference	11761
Number of Samples	23 Soil, 1 Water
Date samples received	18/03/2022
Date completed instructions received	18/03/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
 Samples were analysed as received from the client. Results relate specifically to the samples as received.
 Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

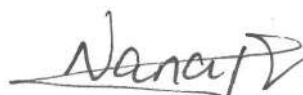
Report Details

Date results requested by	28/03/2022
Date of Issue	28/03/2022
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. Tests not covered by NATA are denoted with *	

Results Approved By

Diego Bigolin, Inorganics Supervisor
 Dragana Tomas, Senior Chemist
 Giovanni Agosti, Group Technical Manager
 Hannah Nguyen, Metals Supervisor
 Josh Williams, Organics and LC Supervisor
 Priya Samarawickrama, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

Client Reference: 11761

VOCs in soil						
Our Reference		291362-4	291362-6	291362-7	291362-9	291362-11
Your Reference	UNITS	11761/BH02/S1	11761/BH03/S1	11761/BH04/S1	11761/BH05/S1	11761/BH06/S1
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
Dichlorodifluoromethane	mg/kg	<1	<1	<1	<1	<1
Chloromethane	mg/kg	<1	<1	<1	<1	<1
Vinyl Chloride	mg/kg	<1	<1	<1	<1	<1
Bromomethane	mg/kg	<1	<1	<1	<1	<1
Chloroethane	mg/kg	<1	<1	<1	<1	<1
Trichlorofluoromethane	mg/kg	<1	<1	<1	<1	<1
1,1-Dichloroethene	mg/kg	<1	<1	<1	<1	<1
trans-1,2-dichloroethene	mg/kg	<1	<1	<1	<1	<1
1,1-dichloroethane	mg/kg	<1	<1	<1	<1	<1
cis-1,2-dichloroethene	mg/kg	<1	<1	<1	<1	<1
bromochloromethane	mg/kg	<1	<1	<1	<1	<1
chloroform	mg/kg	<1	<1	<1	<1	<1
2,2-dichloropropane	mg/kg	<1	<1	<1	<1	<1
1,2-dichloroethane	mg/kg	<1	<1	<1	<1	<1
1,1,1-trichloroethane	mg/kg	<1	<1	<1	<1	<1
1,1-dichloropropene	mg/kg	<1	<1	<1	<1	<1
Cyclohexane	mg/kg	<1	<1	<1	<1	<1
carbon tetrachloride	mg/kg	<1	<1	<1	<1	<1
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
dibromomethane	mg/kg	<1	<1	<1	<1	<1
1,2-dichloropropane	mg/kg	<1	<1	<1	<1	<1
trichloroethene	mg/kg	<1	<1	<1	<1	<1
bromodichloromethane	mg/kg	<1	<1	<1	<1	<1
trans-1,3-dichloropropene	mg/kg	<1	<1	<1	<1	<1
cis-1,3-dichloropropene	mg/kg	<1	<1	<1	<1	<1
1,1,2-trichloroethane	mg/kg	<1	<1	<1	<1	<1
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-dichloropropane	mg/kg	<1	<1	<1	<1	<1
dibromochloromethane	mg/kg	<1	<1	<1	<1	<1
1,2-dibromoethane	mg/kg	<1	<1	<1	<1	<1
tetrachloroethene	mg/kg	<1	<1	<1	<1	<1
1,1,1,2-tetrachloroethane	mg/kg	<1	<1	<1	<1	<1
chlorobenzene	mg/kg	<1	<1	<1	<1	<1
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1

Client Reference: 11761

VOCs in soil						
Our Reference		291362-4	291362-6	291362-7	291362-9	291362-11
Your Reference	UNITS	11761/BH02/S1	11761/BH03/S1	11761/BH04/S1	11761/BH05/S1	11761/BH06/S1
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
bromoform	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
styrene	mg/kg	<1	<1	<1	<1	<1
1,1,2,2-tetrachloroethane	mg/kg	<1	<1	<1	<1	<1
o-Xylene	mg/kg	<1	<1	<1	<1	<1
1,2,3-trichloropropane	mg/kg	<1	<1	<1	<1	<1
isopropylbenzene	mg/kg	<1	<1	<1	<1	<1
bromobenzene	mg/kg	<1	<1	<1	<1	<1
n-propyl benzene	mg/kg	<1	<1	<1	<1	<1
2-chlorotoluene	mg/kg	<1	<1	<1	<1	<1
4-chlorotoluene	mg/kg	<1	<1	<1	<1	<1
1,3,5-trimethyl benzene	mg/kg	<1	<1	<1	<1	<1
tert-butyl benzene	mg/kg	<1	<1	<1	<1	<1
1,2,4-trimethyl benzene	mg/kg	<1	<1	<1	<1	<1
1,3-dichlorobenzene	mg/kg	<1	<1	<1	<1	<1
sec-butyl benzene	mg/kg	<1	<1	<1	<1	<1
1,4-dichlorobenzene	mg/kg	<1	<1	<1	<1	<1
4-isopropyl toluene	mg/kg	<1	<1	<1	<1	<1
1,2-dichlorobenzene	mg/kg	<1	<1	<1	<1	<1
n-butyl benzene	mg/kg	<1	<1	<1	<1	<1
1,2-dibromo-3-chloropropane	mg/kg	<1	<1	<1	<1	<1
1,2,4-trichlorobenzene	mg/kg	<1	<1	<1	<1	<1
hexachlorobutadiene	mg/kg	<1	<1	<1	<1	<1
1,2,3-trichlorobenzene	mg/kg	<1	<1	<1	<1	<1
Surrogate Dibromofluorometha	%	98	100	95	100	96
Surrogate aaa-Trifluorotoluene	%	92	95	81	88	91
Surrogate Toluene-d ₈	%	105	106	105	110	106
Surrogate 4-Bromofluorobenzene	%	95	94	93	94	92

Client Reference: 11761

VOCs in soil						
Our Reference		291362-13	291362-15	291362-17	291362-19	291362-21
Your Reference	UNITS	11761/BH07/S1	11761/BH08/S1	11761/BH09/S1	11761/BH11/S1	11761/BH12/S1
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
Dichlorodifluoromethane	mg/kg	<1	<1	<1	<1	<1
Chloromethane	mg/kg	<1	<1	<1	<1	<1
Vinyl Chloride	mg/kg	<1	<1	<1	<1	<1
Bromomethane	mg/kg	<1	<1	<1	<1	<1
Chloroethane	mg/kg	<1	<1	<1	<1	<1
Trichlorofluoromethane	mg/kg	<1	<1	<1	<1	<1
1,1-Dichloroethene	mg/kg	<1	<1	<1	<1	<1
trans-1,2-dichloroethene	mg/kg	<1	<1	<1	<1	<1
1,1-dichloroethane	mg/kg	<1	<1	<1	<1	<1
cis-1,2-dichloroethene	mg/kg	<1	<1	<1	<1	<1
bromochloromethane	mg/kg	<1	<1	<1	<1	<1
chloroform	mg/kg	<1	<1	<1	<1	<1
2,2-dichloropropane	mg/kg	<1	<1	<1	<1	<1
1,2-dichloroethane	mg/kg	<1	<1	<1	<1	<1
1,1,1-trichloroethane	mg/kg	<1	<1	<1	<1	<1
1,1-dichloropropene	mg/kg	<1	<1	<1	<1	<1
Cyclohexane	mg/kg	<1	<1	<1	<1	<1
carbon tetrachloride	mg/kg	<1	<1	<1	<1	<1
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
dibromomethane	mg/kg	<1	<1	<1	<1	<1
1,2-dichloropropane	mg/kg	<1	<1	<1	<1	<1
trichloroethene	mg/kg	<1	<1	<1	<1	<1
bromodichloromethane	mg/kg	<1	<1	<1	<1	<1
trans-1,3-dichloropropene	mg/kg	<1	<1	<1	<1	<1
cis-1,3-dichloropropene	mg/kg	<1	<1	<1	<1	<1
1,1,2-trichloroethane	mg/kg	<1	<1	<1	<1	<1
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-dichloropropane	mg/kg	<1	<1	<1	<1	<1
dibromochloromethane	mg/kg	<1	<1	<1	<1	<1
1,2-dibromoethane	mg/kg	<1	<1	<1	<1	<1
tetrachloroethene	mg/kg	<1	<1	<1	<1	<1
1,1,1,2-tetrachloroethane	mg/kg	<1	<1	<1	<1	<1
chlorobenzene	mg/kg	<1	<1	<1	<1	<1
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1

Client Reference: 11761

VOCs in soil						
Our Reference		291362-13	291362-15	291362-17	291362-19	291362-21
Your Reference	UNITS	11761/BH07/S1	11761/BH08/S1	11761/BH09/S1	11761/BH11/S1	11761/BH12/S1
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
bromoform	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
styrene	mg/kg	<1	<1	<1	<1	<1
1,1,2,2-tetrachloroethane	mg/kg	<1	<1	<1	<1	<1
o-Xylene	mg/kg	<1	<1	<1	<1	<1
1,2,3-trichloropropane	mg/kg	<1	<1	<1	<1	<1
isopropylbenzene	mg/kg	<1	<1	<1	<1	<1
bromobenzene	mg/kg	<1	<1	<1	<1	<1
n-propyl benzene	mg/kg	<1	<1	<1	<1	<1
2-chlorotoluene	mg/kg	<1	<1	<1	<1	<1
4-chlorotoluene	mg/kg	<1	<1	<1	<1	<1
1,3,5-trimethyl benzene	mg/kg	<1	<1	<1	<1	<1
tert-butyl benzene	mg/kg	<1	<1	<1	<1	<1
1,2,4-trimethyl benzene	mg/kg	<1	<1	<1	<1	<1
1,3-dichlorobenzene	mg/kg	<1	<1	<1	<1	<1
sec-butyl benzene	mg/kg	<1	<1	<1	<1	<1
1,4-dichlorobenzene	mg/kg	<1	<1	<1	<1	<1
4-isopropyl toluene	mg/kg	<1	<1	<1	<1	<1
1,2-dichlorobenzene	mg/kg	<1	<1	<1	<1	<1
n-butyl benzene	mg/kg	<1	<1	<1	<1	<1
1,2-dibromo-3-chloropropane	mg/kg	<1	<1	<1	<1	<1
1,2,4-trichlorobenzene	mg/kg	<1	<1	<1	<1	<1
hexachlorobutadiene	mg/kg	<1	<1	<1	<1	<1
1,2,3-trichlorobenzene	mg/kg	<1	<1	<1	<1	<1
Surrogate Dibromofluorometha	%	98	99	95	97	98
Surrogate aaa-Trifluorotoluene	%	83	91	85	81	92
Surrogate Toluene-d ₈	%	111	108	108	106	108
Surrogate 4-Bromofluorobenzene	%	96	94	92	94	95

Client Reference: 11761

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		291362-1	291362-2	291362-3	291362-4	291362-5
Your Reference	UNITS	11761/BH01/S1	11761/BH01/S1a	11761/BH01/S2	11761/BH02/S1	11761/BH02/S2
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
TRH C ₆ - C ₉	mg/kg	<25	<25	<25	<25	<25
TRH C ₆ - C ₁₀	mg/kg	<25	<25	<25	<25	<25
vTPH C ₆ - C ₁₀ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	82	97	87	92	90

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		291362-6	291362-7	291362-8	291362-9	291362-10
Your Reference	UNITS	11761/BH03/S1	11761/BH04/S1	11761/BH04/S2	11761/BH05/S1	11761/BH05/S2
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
TRH C ₆ - C ₉	mg/kg	<25	<25	<25	<25	<25
TRH C ₆ - C ₁₀	mg/kg	<25	<25	<25	<25	<25
vTPH C ₆ - C ₁₀ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	95	81	77	88	88

Client Reference: 11761

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		291362-11	291362-12	291362-13	291362-14	291362-15
Your Reference	UNITS	11761/BH06/S1	11761/BH06/S2	11761/BH07/S1	11761/BH07/S2	11761/BH08/S1
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
TRH C ₆ - C ₉	mg/kg	<25	<25	<25	<25	<25
TRH C ₆ - C ₁₀	mg/kg	<25	<25	<25	<25	<25
vTPH C ₆ - C ₁₀ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	91	85	83	82	91

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		291362-16	291362-17	291362-18	291362-19	291362-20
Your Reference	UNITS	11761/BH08/S2	11761/BH09/S1	11761/BH09/S2	11761/BH11/S1	11761/BH11/S2
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
TRH C ₆ - C ₉	mg/kg	<25	<25	<25	<25	<25
TRH C ₆ - C ₁₀	mg/kg	<25	<25	<25	<25	<25
vTPH C ₆ - C ₁₀ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	87	85	86	81	79

Client Reference: 11761

vTRH(C6-C10)/BTEXN in Soil				
Our Reference		291362-21	291362-22	291362-23
Your Reference	UNITS	11761/BH12/S1	11761/BH12/S2	11761/TB01
Date Sampled		18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil
Date extracted	-	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022
TRH C ₆ - C ₉	mg/kg	<25	<25	[NA]
TRH C ₆ - C ₁₀	mg/kg	<25	<25	[NA]
vTPH C ₆ - C ₁₀ less BTEX (F1)	mg/kg	<25	<25	[NA]
Benzene	mg/kg	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1
Naphthalene	mg/kg	<1	<1	[NA]
Total +ve Xylenes	mg/kg	<1	<1	[NA]
Surrogate aaa-Trifluorotoluene	%	92	89	91

Client Reference: 11761

svTRH (C10-C40) in Soil						
Our Reference		291362-1	291362-2	291362-3	291362-4	291362-5
Your Reference	UNITS	11761/BH01/S1	11761/BH01/S1a	11761/BH01/S2	11761/BH02/S1	11761/BH02/S2
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
TRH C ₁₀ - C ₁₄	mg/kg	<50	<50	<50	<50	<50
TRH C ₁₅ - C ₂₈	mg/kg	<100	<100	<100	<100	<100
TRH C ₂₉ - C ₃₆	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	<50	<50
TRH >C ₁₀ -C ₁₆	mg/kg	<50	<50	<50	<50	<50
TRH >C ₁₀ - C ₁₆ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C ₁₆ -C ₃₄	mg/kg	<100	<100	<100	<100	<100
TRH >C ₃₄ -C ₄₀	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	100	101	110	71	91

svTRH (C10-C40) in Soil						
Our Reference		291362-6	291362-7	291362-8	291362-9	291362-10
Your Reference	UNITS	11761/BH03/S1	11761/BH04/S1	11761/BH04/S2	11761/BH05/S1	11761/BH05/S2
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
TRH C ₁₀ - C ₁₄	mg/kg	<50	<50	<50	<50	<50
TRH C ₁₅ - C ₂₈	mg/kg	<100	<100	<100	<100	<100
TRH C ₂₉ - C ₃₆	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	<50	<50
TRH >C ₁₀ -C ₁₆	mg/kg	<50	<50	<50	<50	<50
TRH >C ₁₀ - C ₁₆ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C ₁₆ -C ₃₄	mg/kg	<100	<100	<100	<100	<100
TRH >C ₃₄ -C ₄₀	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	91	93	91	87	94

Client Reference: 11761

svTRH (C10-C40) in Soil						
Our Reference		291362-11	291362-12	291362-13	291362-14	291362-15
Your Reference	UNITS	11761/BH06/S1	11761/BH06/S2	11761/BH07/S1	11761/BH07/S2	11761/BH08/S1
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	23/03/2022
TRH C ₁₀ - C ₁₄	mg/kg	<50	<50	<50	<50	<50
TRH C ₁₅ - C ₂₈	mg/kg	<100	<100	<100	<100	<100
TRH C ₂₉ - C ₃₆	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	<50	<50
TRH >C ₁₀ -C ₁₆	mg/kg	<50	<50	<50	<50	<50
TRH >C ₁₀ - C ₁₆ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C ₁₆ -C ₃₄	mg/kg	<100	<100	<100	<100	110
TRH >C ₃₄ -C ₄₀	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	110
Surrogate o-Terphenyl	%	97	85	89	86	94

svTRH (C10-C40) in Soil						
Our Reference		291362-16	291362-17	291362-18	291362-19	291362-20
Your Reference	UNITS	11761/BH08/S2	11761/BH09/S1	11761/BH09/S2	11761/BH11/S1	11761/BH11/S2
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
TRH C ₁₀ - C ₁₄	mg/kg	<50	<50	<50	<50	<50
TRH C ₁₅ - C ₂₈	mg/kg	<100	<100	<100	<100	<100
TRH C ₂₉ - C ₃₆	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	<50	<50
TRH >C ₁₀ -C ₁₆	mg/kg	<50	<50	<50	<50	<50
TRH >C ₁₀ - C ₁₆ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C ₁₆ -C ₃₄	mg/kg	<100	<100	<100	<100	<100
TRH >C ₃₄ -C ₄₀	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	85	85	88	87	85

Client Reference: 11761

svTRH (C10-C40) in Soil			
Our Reference		291362-21	291362-22
Your Reference	UNITS	11761/BH12/S1	11761/BH12/S2
Date Sampled		18/03/2022	18/03/2022
Type of sample		Soil	Soil
Date extracted	-	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022
TRH C ₁₀ - C ₁₄	mg/kg	<50	<50
TRH C ₁₅ - C ₂₈	mg/kg	<100	<100
TRH C ₂₉ - C ₃₆	mg/kg	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50
TRH >C ₁₀ -C ₁₆	mg/kg	<50	<50
TRH >C ₁₀ - C ₁₆ less Naphthalene (F2)	mg/kg	<50	<50
TRH >C ₁₆ -C ₃₄	mg/kg	<100	<100
TRH >C ₃₄ -C ₄₀	mg/kg	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50
Surrogate o-Terphenyl	%	87	89

Client Reference: 11761

PAHs in Soil						
Our Reference		291362-1	291362-2	291362-3	291362-4	291362-5
Your Reference	UNITS	11761/BH01/S1	11761/BH01/S1a	11761/BH01/S2	11761/BH02/S1	11761/BH02/S2
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	106	103	104	105	103

Client Reference: 11761

PAHs in Soil						
Our Reference		291362-6	291362-7	291362-8	291362-9	291362-10
Your Reference	UNITS	11761/BH03/S1	11761/BH04/S1	11761/BH04/S2	11761/BH05/S1	11761/BH05/S2
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.2	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.4	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	0.5	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	0.2	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	0.2	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	0.4	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.2	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.2	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	2.6	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	108	106	103	103	107

Client Reference: 11761

PAHs in Soil						
Our Reference		291362-11	291362-12	291362-13	291362-14	291362-15
Your Reference	UNITS	11761/BH06/S1	11761/BH06/S2	11761/BH07/S1	11761/BH07/S2	11761/BH08/S1
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.2
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.8
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.3
Phenanthrene	mg/kg	1.2	<0.1	<0.1	<0.1	4.2
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	1.2
Fluoranthene	mg/kg	0.3	<0.1	0.2	<0.1	4.7
Pyrene	mg/kg	0.3	<0.1	0.2	<0.1	4.9
Benzo(a)anthracene	mg/kg	0.1	<0.1	0.1	<0.1	2.8
Chrysene	mg/kg	0.4	<0.1	0.1	<0.1	2.4
Benzo(b,j,k)fluoranthene	mg/kg	0.3	<0.2	<0.2	<0.2	4.1
Benzo(a)pyrene	mg/kg	0.1	<0.05	0.1	<0.05	3.4
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	0.1	<0.1	1.8
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.2
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	0.1	<0.1	1.6
Total +ve PAH's	mg/kg	2.6	<0.05	0.84	<0.05	33
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	4.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	4.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	4.5
Surrogate p-Terphenyl-d14	%	101	101	107	98	107

Client Reference: 11761

PAHs in Soil						
Our Reference		291362-16	291362-17	291362-18	291362-19	291362-20
Your Reference	UNITS	11761/BH08/S2	11761/BH09/S1	11761/BH09/S2	11761/BH11/S1	11761/BH11/S2
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
Naphthalene	mg/kg	<0.1	<0.1	<0.1	0.5	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	0.8	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	1.0	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	0.4	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	0.4	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	0.6	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	0.5	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	6.1	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	0.6	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	0.7	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	0.7	<0.5
Surrogate p-Terphenyl-d14	%	98	101	103	108	97

Client Reference: 11761

PAHs in Soil				
Our Reference		291362-21	291362-22	291362-26
Your Reference	UNITS	11761/BH12/S1	11761/BH12/S2	11761/BH11/S1 - [TRIPLICATE]
Date Sampled		18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil
Date extracted	-	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	24/03/2022
Naphthalene	mg/kg	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	0.2
Acenaphthene	mg/kg	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	1.2
Anthracene	mg/kg	<0.1	<0.1	0.4
Fluoranthene	mg/kg	<0.1	<0.1	1.3
Pyrene	mg/kg	<0.1	<0.1	1.3
Benzo(a)anthracene	mg/kg	<0.1	<0.1	0.4
Chrysene	mg/kg	<0.1	<0.1	0.6
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	0.5
Benzo(a)pyrene	mg/kg	<0.05	<0.05	0.4
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	0.2
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	0.3
Total +ve PAH's	mg/kg	<0.05	<0.05	6.8
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	0.6
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	0.6
Surrogate p-Terphenyl-d14	%	106	99	96

Client Reference: 11761

Misc Soil - Inorg						
Our Reference		291362-4	291362-6	291362-7	291362-9	291362-11
Your Reference	UNITS	11761/BH02/S1	11761/BH03/S1	11761/BH04/S1	11761/BH05/S1	11761/BH06/S1
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Misc Soil - Inorg						
Our Reference		291362-13	291362-15	291362-17	291362-19	291362-21
Your Reference	UNITS	11761/BH07/S1	11761/BH08/S1	11761/BH09/S1	11761/BH11/S1	11761/BH12/S1
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Client Reference: 11761

Organochlorine Pesticides in soil						
Our Reference		291362-4	291362-6	291362-7	291362-9	291362-11
Your Reference	UNITS	11761/BH02/S1	11761/BH03/S1	11761/BH04/S1	11761/BH05/S1	11761/BH06/S1
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	99	102	103	98	96

Client Reference: 11761

Organochlorine Pesticides in soil						
Our Reference		291362-13	291362-15	291362-17	291362-19	291362-21
Your Reference	UNITS	11761/BH07/S1	11761/BH08/S1	11761/BH09/S1	11761/BH11/S1	11761/BH12/S1
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	98	102	96	100	100

Client Reference: 11761

PCBs in Soil						
Our Reference		291362-4	291362-6	291362-7	291362-9	291362-11
Your Reference	UNITS	11761/BH02/S1	11761/BH03/S1	11761/BH04/S1	11761/BH05/S1	11761/BH06/S1
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	99	102	103	98	96

PCBs in Soil						
Our Reference		291362-13	291362-15	291362-17	291362-19	291362-21
Your Reference	UNITS	11761/BH07/S1	11761/BH08/S1	11761/BH09/S1	11761/BH11/S1	11761/BH12/S1
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	98	102	96	100	100

Client Reference: 11761

Acid Extractable metals in soil						
Our Reference		291362-1	291362-2	291362-3	291362-4	291362-5
Your Reference	UNITS	11761/BH01/S1	11761/BH01/S1a	11761/BH01/S2	11761/BH02/S1	11761/BH02/S2
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
Arsenic	mg/kg	<4	<4	<4	5	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	6	6	6	27	11
Copper	mg/kg	51	59	1	18	<1
Lead	mg/kg	1	1	10	11	10
Mercury	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Nickel	mg/kg	59	60	<1	26	<1
Zinc	mg/kg	24	25	<1	46	1
Molybdenum	mg/kg	<1	<1	<1	1	<1
Beryllium	mg/kg	<1	<1	<1	<1	<1

Acid Extractable metals in soil						
Our Reference		291362-6	291362-7	291362-8	291362-9	291362-10
Your Reference	UNITS	11761/BH03/S1	11761/BH04/S1	11761/BH04/S2	11761/BH05/S1	11761/BH05/S2
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
Arsenic	mg/kg	<4	<4	<4	<4	5
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	8	10	5	10	16
Copper	mg/kg	49	9	2	2	2
Lead	mg/kg	40	23	27	10	9
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	44	7	<1	<1	<1
Zinc	mg/kg	38	35	<1	12	10
Molybdenum	mg/kg	<1	<1	<1	<1	1
Beryllium	mg/kg	<1	<1	<1	<1	<1
Iron	mg/kg	[NA]	13,000	[NA]	[NA]	[NA]

Client Reference: 11761

Acid Extractable metals in soil						
Our Reference		291362-11	291362-12	291362-13	291362-14	291362-15
Your Reference	UNITS	11761/BH06/S1	11761/BH06/S2	11761/BH07/S1	11761/BH07/S2	11761/BH08/S1
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
Arsenic	mg/kg	<4	9	8	<4	5
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	7	26	32	7	14
Copper	mg/kg	16	<1	7	2	17
Lead	mg/kg	14	11	24	9	95
Mercury	mg/kg	<0.1	0.2	0.3	<0.1	0.2
Nickel	mg/kg	5	<1	5	<1	6
Zinc	mg/kg	32	1	18	5	95
Molybdenum	mg/kg	<1	1	<1	<1	<1
Beryllium	mg/kg	<1	<1	<1	<1	<1

Acid Extractable metals in soil						
Our Reference		291362-16	291362-17	291362-18	291362-19	291362-20
Your Reference	UNITS	11761/BH08/S2	11761/BH09/S1	11761/BH09/S2	11761/BH11/S1	11761/BH11/S2
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	7	7	10	4	7
Copper	mg/kg	<1	43	<1	5	5
Lead	mg/kg	12	1	14	45	19
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	<1	81	<1	2	<1
Zinc	mg/kg	<1	24	<1	53	5
Molybdenum	mg/kg	2	<1	<1	<1	<1
Beryllium	mg/kg	<1	<1	<1	<1	<1

Client Reference: 11761

Acid Extractable metals in soil					
Our Reference		291362-21	291362-22	291362-25	291362-26
Your Reference	UNITS	11761/BH12/S1	11761/BH12/S2	11761/BH02/S1 - [TRIPLICATE]	11761/BH11/S1 - [TRIPLICATE]
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022
Arsenic	mg/kg	<4	6	5	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	7	4	24	4
Copper	mg/kg	55	7	20	4
Lead	mg/kg	2	9	10	36
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	46	<1	29	2
Zinc	mg/kg	29	2	50	40
Molybdenum	mg/kg	<1	<1	1	<1
Beryllium	mg/kg	<1	<1	<1	<1

Client Reference: 11761

Moisture						
Our Reference		291362-1	291362-2	291362-3	291362-4	291362-5
Your Reference	UNITS	11761/BH01/S1	11761/BH01/S1a	11761/BH01/S2	11761/BH02/S1	11761/BH02/S2
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
Moisture	%	6.3	3.9	14	21	13

Moisture						
Our Reference		291362-6	291362-7	291362-8	291362-9	291362-10
Your Reference	UNITS	11761/BH03/S1	11761/BH04/S1	11761/BH04/S2	11761/BH05/S1	11761/BH05/S2
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
Moisture	%	13	25	13	15	24

Moisture						
Our Reference		291362-11	291362-12	291362-13	291362-14	291362-15
Your Reference	UNITS	11761/BH06/S1	11761/BH06/S2	11761/BH07/S1	11761/BH07/S2	11761/BH08/S1
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
Moisture	%	13	17	19	23	9.7

Moisture						
Our Reference		291362-16	291362-17	291362-18	291362-19	291362-20
Your Reference	UNITS	11761/BH08/S2	11761/BH09/S1	11761/BH09/S2	11761/BH11/S1	11761/BH11/S2
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2022	22/03/2022	22/03/2022	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
Moisture	%	12	9.1	16	13	12

Moisture			
Our Reference		291362-21	291362-22
Your Reference	UNITS	11761/BH12/S1	11761/BH12/S2
Date Sampled		18/03/2022	18/03/2022
Type of sample		Soil	Soil
Date prepared	-	22/03/2022	22/03/2022
Date analysed	-	23/03/2022	23/03/2022
Moisture	%	7.9	13

Client Reference: 11761

Misc Inorg - Soil						
Our Reference		291362-4	291362-6	291362-7	291362-9	291362-11
Your Reference	UNITS	11761/BH02/S1	11761/BH03/S1	11761/BH04/S1	11761/BH05/S1	11761/BH06/S1
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/03/2022	23/03/2022	24/03/2022	23/03/2022	23/03/2022
Date analysed	-	23/03/2022	23/03/2022	24/03/2022	23/03/2022	23/03/2022
pH 1:5 soil:water	pH Units	8.0	8.6	6.6	8.1	8.8
Total Organic Carbon (Walkley Black)	mg/kg	[NA]	9,000	[NA]	[NA]	[NA]
pH 1:5 soil:CaCl ₂	pH Units	[NA]	7.4	[NA]	[NA]	[NA]

Misc Inorg - Soil						
Our Reference		291362-13	291362-15	291362-17	291362-19	291362-21
Your Reference	UNITS	11761/BH07/S1	11761/BH08/S1	11761/BH09/S1	11761/BH11/S1	11761/BH12/S1
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
Date analysed	-	23/03/2022	23/03/2022	23/03/2022	23/03/2022	23/03/2022
pH 1:5 soil:water	pH Units	8.8	9.1	9.2	9.5	9.1

Clay 50-120g		
Our Reference		291362-6
Your Reference	UNITS	11761/BH03/S1
Date Sampled		18/03/2022
Type of sample		Soil
Date prepared	-	24/03/2022
Date analysed	-	25/03/2022
Clay in soils <2µm	% (w/w)	7

CEC		
Our Reference		291362-6
Your Reference	UNITS	11761/BH03/S1
Date Sampled		18/03/2022
Type of sample		Soil
Date prepared	-	25/03/2022
Date analysed	-	25/03/2022
Exchangeable Ca	meq/100g	23
Exchangeable K	meq/100g	0.6
Exchangeable Mg	meq/100g	1.7
Exchangeable Na	meq/100g	0.2
Cation Exchange Capacity	meq/100g	25

Client Reference: 11761

BTEX in Water		
Our Reference		291362-24
Your Reference	UNITS	11761/RB01
Date Sampled		18/03/2022
Type of sample		Water
Date extracted	-	21/03/2022
Date analysed	-	22/03/2022
Benzene	µg/L	<1
Toluene	µg/L	<1
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	<2
o-xylene	µg/L	<1
Surrogate Dibromofluoromethane	%	102
Surrogate toluene-d8	%	96
Surrogate 4-BFB	%	101

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Method ID	Methodology Summary
AS1289.3.6.3	Particle Size Distribution using in house method INORG-107 by way of sieving and/or hydrometer sedimentation testing. Clay fraction at <2µm reported.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-036	Total Organic Carbon or Matter - A titrimetric method that measures the oxidisable organic content of soils.
Metals-020	Determination of various metals by ICP-AES.
Metals-020	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-OES analytical finish.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.

Method ID	Methodology Summary
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL' values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero' values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL' values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

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QUALITY CONTROL: VOCs in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	291362-6
Date extracted	-			22/03/2022	4	22/03/2022	22/03/2022		22/03/2022	22/03/2022
Date analysed	-			23/03/2022	4	23/03/2022	23/03/2022		23/03/2022	23/03/2022
Dichlorodifluoromethane	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
Chloromethane	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
Vinyl Chloride	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
Bromomethane	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
Chloroethane	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
Trichlorofluoromethane	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
1,1-Dichloroethene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
trans-1,2-dichloroethene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
1,1-dichloroethane	mg/kg	1	Org-023	<1	4	<1	<1	0	86	87
cis-1,2-dichloroethene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
bromochloromethane	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
chloroform	mg/kg	1	Org-023	<1	4	<1	<1	0	78	79
2,2-dichloropropane	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
1,2-dichloroethane	mg/kg	1	Org-023	<1	4	<1	<1	0	78	82
1,1,1-trichloroethane	mg/kg	1	Org-023	<1	4	<1	<1	0	70	70
1,1-dichloropropene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
Cyclohexane	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
carbon tetrachloride	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	<0.2	4	<0.2	<0.2	0	[NT]	[NT]
dibromomethane	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
1,2-dichloropropane	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
trichloroethene	mg/kg	1	Org-023	<1	4	<1	<1	0	72	70
bromodichloromethane	mg/kg	1	Org-023	<1	4	<1	<1	0	71	72
trans-1,3-dichloropropene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
cis-1,3-dichloropropene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
1,1,2-trichloroethane	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	<0.5	4	<0.5	<0.5	0	[NT]	[NT]
1,3-dichloropropane	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
dibromochloromethane	mg/kg	1	Org-023	<1	4	<1	<1	0	77	75
1,2-dibromoethane	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
tetrachloroethene	mg/kg	1	Org-023	<1	4	<1	<1	0	76	81
1,1,1,2-tetrachloroethane	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
chlorobenzene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
bromoform	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	<2	4	<2	<2	0	[NT]	[NT]
styrene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
1,1,2,2-tetrachloroethane	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]

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QUALITY CONTROL: VOCs in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	291362-6
o-Xylene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
1,2,3-trichloropropane	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
isopropylbenzene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
bromobenzene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
n-propyl benzene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
2-chlorotoluene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
4-chlorotoluene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
1,3,5-trimethyl benzene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
tert-butyl benzene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
1,2,4-trimethyl benzene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
1,3-dichlorobenzene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
sec-butyl benzene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
1,4-dichlorobenzene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
4-isopropyl toluene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
1,2-dichlorobenzene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
n-butyl benzene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
1,2-dibromo-3-chloropropane	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
1,2,4-trichlorobenzene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
hexachlorobutadiene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
1,2,3-trichlorobenzene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluorometha	%		Org-023	99	4	98	99	1	103	102
Surrogate aaa-Trifluorotoluene	%		Org-023	93	4	92	93	1	87	93
Surrogate Toluene-d ₈	%		Org-023	107	4	105	108	3	105	105
Surrogate 4-Bromofluorobenzene	%		Org-023	94	4	95	92	3	98	97

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QUALITY CONTROL: VOCs in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	291362-21
Date extracted	-			[NT]	11	22/03/2022	22/03/2022		22/03/2022	22/03/2022
Date analysed	-			[NT]	11	23/03/2022	23/03/2022		23/03/2022	23/03/2022
Dichlorodifluoromethane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
Chloromethane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
Vinyl Chloride	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
Bromomethane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
Chloroethane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
Trichlorofluoromethane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
1,1-Dichloroethene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
trans-1,2-dichloroethene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
1,1-dichloroethane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	93	93
cis-1,2-dichloroethene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
bromochloromethane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
chloroform	mg/kg	1	Org-023	[NT]	11	<1	<1	0	86	87
2,2-dichloropropane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
1,2-dichloroethane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	90	90
1,1,1-trichloroethane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	73	72
1,1-dichloropropene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
Cyclohexane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
carbon tetrachloride	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	11	<0.2	<0.2	0	[NT]	[NT]
dibromomethane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
1,2-dichloropropane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
trichloroethene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	76	74
bromodichloromethane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	77	76
trans-1,3-dichloropropene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
cis-1,3-dichloropropene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
1,1,2-trichloroethane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	11	<0.5	<0.5	0	[NT]	[NT]
1,3-dichloropropane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
dibromochloromethane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	79	79
1,2-dibromoethane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
tetrachloroethene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	80	80
1,1,1,2-tetrachloroethane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
chlorobenzene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
bromoform	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	11	<2	<2	0	[NT]	[NT]
styrene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
1,1,2,2-tetrachloroethane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]

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QUALITY CONTROL: VOCs in soil						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	291362-21
o-Xylene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
1,2,3-trichloropropane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
isopropylbenzene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
bromobenzene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
n-propyl benzene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
2-chlorotoluene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
4-chlorotoluene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
1,3,5-trimethyl benzene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
tert-butyl benzene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
1,2,4-trimethyl benzene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
1,3-dichlorobenzene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
sec-butyl benzene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
1,4-dichlorobenzene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
4-isopropyl toluene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
1,2-dichlorobenzene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
n-butyl benzene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
1,2-dibromo-3-chloropropane	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
1,2,4-trichlorobenzene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
hexachlorobutadiene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
1,2,3-trichlorobenzene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluorometha	%		Org-023	[NT]	11	96	95	1	100	103
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	11	91	93	2	90	91
Surrogate Toluene-d ₈	%		Org-023	[NT]	11	106	108	2	103	104
Surrogate 4-Bromofluorobenzene	%		Org-023	[NT]	11	92	94	2	99	96

Client Reference: 11761

QUALITY CONTROL: VOCs in soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	22/03/2022	22/03/2022		[NT]	[NT]
Date analysed	-			[NT]	19	23/03/2022	23/03/2022		[NT]	[NT]
Dichlorodifluoromethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Chloromethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Vinyl Chloride	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Bromomethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Chloroethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Trichlorofluoromethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,1-Dichloroethene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
trans-1,2-dichloroethene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,1-dichloroethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
cis-1,2-dichloroethene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
bromochloromethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
chloroform	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
2,2-dichloropropane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2-dichloroethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,1,1-trichloroethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,1-dichloropropene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Cyclohexane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
carbon tetrachloride	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	19	<0.2	<0.2	0	[NT]	[NT]
dibromomethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2-dichloropropane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
trichloroethene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
bromodichloromethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
trans-1,3-dichloropropene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
cis-1,3-dichloropropene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,1,2-trichloroethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	19	<0.5	<0.5	0	[NT]	[NT]
1,3-dichloropropane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
dibromochloromethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2-dibromoethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
tetrachloroethene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,1,1,2-tetrachloroethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
chlorobenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
bromoform	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	19	<2	<2	0	[NT]	[NT]
styrene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,1,2,2-tetrachloroethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]

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QUALITY CONTROL: VOCs in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2,3-trichloropropane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
isopropylbenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
bromobenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
n-propyl benzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
2-chlorotoluene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
4-chlorotoluene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,3,5-trimethyl benzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
tert-butyl benzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2,4-trimethyl benzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,3-dichlorobenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
sec-butyl benzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,4-dichlorobenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
4-isopropyl toluene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2-dichlorobenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
n-butyl benzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2-dibromo-3-chloropropane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2,4-trichlorobenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
hexachlorobutadiene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2,3-trichlorobenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluorometha	%		Org-023	[NT]	19	97	98	1	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	19	81	86	6	[NT]	[NT]
Surrogate Toluene-d ₈	%		Org-023	[NT]	19	106	108	2	[NT]	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	[NT]	19	94	93	1	[NT]	[NT]

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QUALITY CONTROL: VTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	291362-6
Date extracted	-			22/03/2022	4	22/03/2022	22/03/2022		22/03/2022	22/03/2022
Date analysed	-			23/03/2022	4	23/03/2022	23/03/2022		23/03/2022	23/03/2022
TRH C ₆ - C ₉	mg/kg	25	Org-023	<25	4	<25	<25	0	85	88
TRH C ₆ - C ₁₀	mg/kg	25	Org-023	<25	4	<25	<25	0	85	88
Benzene	mg/kg	0.2	Org-023	<0.2	4	<0.2	<0.2	0	73	75
Toluene	mg/kg	0.5	Org-023	<0.5	4	<0.5	<0.5	0	86	88
Ethylbenzene	mg/kg	1	Org-023	<1	4	<1	<1	0	83	86
m+p-xylene	mg/kg	2	Org-023	<2	4	<2	<2	0	92	95
o-Xylene	mg/kg	1	Org-023	<1	4	<1	<1	0	90	92
Naphthalene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	93	4	92	93	1	87	93

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	291362-21
Date extracted	-			[NT]	11	22/03/2022	22/03/2022		22/03/2022	22/03/2022
Date analysed	-			[NT]	11	23/03/2022	23/03/2022		23/03/2022	23/03/2022
TRH C ₆ - C ₉	mg/kg	25	Org-023	[NT]	11	<25	<25	0	93	93
TRH C ₆ - C ₁₀	mg/kg	25	Org-023	[NT]	11	<25	<25	0	93	93
Benzene	mg/kg	0.2	Org-023	[NT]	11	<0.2	<0.2	0	80	81
Toluene	mg/kg	0.5	Org-023	[NT]	11	<0.5	<0.5	0	93	93
Ethylbenzene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	91	92
m+p-xylene	mg/kg	2	Org-023	[NT]	11	<2	<2	0	101	100
o-Xylene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	99	96
Naphthalene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	11	91	93	2	90	91

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	22/03/2022	22/03/2022		[NT]	[NT]
Date analysed	-			[NT]	19	23/03/2022	23/03/2022		[NT]	[NT]
TRH C ₆ - C ₉	mg/kg	25	Org-023	[NT]	19	<25	<25	0	[NT]	[NT]
TRH C ₆ - C ₁₀	mg/kg	25	Org-023	[NT]	19	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	19	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	19	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	19	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Naphthalene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	19	81	86	6	[NT]	[NT]

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QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	291362-6
Date extracted	-			22/03/2022	4	22/03/2022	22/03/2022		22/03/2022	22/03/2022
Date analysed	-			22/03/2022	4	22/03/2022	22/03/2022		22/03/2022	22/03/2022
TRH C ₁₀ - C ₁₄	mg/kg	50	Org-020	<50	4	<50	<50	0	109	98
TRH C ₁₅ - C ₂₈	mg/kg	100	Org-020	<100	4	<100	<100	0	106	97
TRH C ₂₉ - C ₃₆	mg/kg	100	Org-020	<100	4	<100	<100	0	121	109
TRH >C ₁₀ -C ₁₆	mg/kg	50	Org-020	<50	4	<50	<50	0	109	98
TRH >C ₁₆ -C ₃₄	mg/kg	100	Org-020	<100	4	<100	<100	0	106	97
TRH >C ₃₄ -C ₄₀	mg/kg	100	Org-020	<100	4	<100	<100	0	121	109
Surrogate o-Terphenyl	%		Org-020	100	4	71	94	28	95	91

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	291362-21
Date extracted	-			[NT]	11	22/03/2022	22/03/2022		22/03/2022	22/03/2022
Date analysed	-			[NT]	11	22/03/2022	22/03/2022		23/03/2022	23/03/2022
TRH C ₁₀ - C ₁₄	mg/kg	50	Org-020	[NT]	11	<50	<50	0	103	88
TRH C ₁₅ - C ₂₈	mg/kg	100	Org-020	[NT]	11	<100	<100	0	99	85
TRH C ₂₉ - C ₃₆	mg/kg	100	Org-020	[NT]	11	<100	<100	0	103	84
TRH >C ₁₀ -C ₁₆	mg/kg	50	Org-020	[NT]	11	<50	<50	0	103	88
TRH >C ₁₆ -C ₃₄	mg/kg	100	Org-020	[NT]	11	<100	<100	0	99	85
TRH >C ₃₄ -C ₄₀	mg/kg	100	Org-020	[NT]	11	<100	<100	0	103	84
Surrogate o-Terphenyl	%		Org-020	[NT]	11	97	97	0	91	87

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	22/03/2022	22/03/2022		[NT]	[NT]
Date analysed	-			[NT]	19	23/03/2022	23/03/2022		[NT]	[NT]
TRH C ₁₀ - C ₁₄	mg/kg	50	Org-020	[NT]	19	<50	<50	0	[NT]	[NT]
TRH C ₁₅ - C ₂₈	mg/kg	100	Org-020	[NT]	19	<100	<100	0	[NT]	[NT]
TRH C ₂₉ - C ₃₆	mg/kg	100	Org-020	[NT]	19	<100	<100	0	[NT]	[NT]
TRH >C ₁₀ -C ₁₆	mg/kg	50	Org-020	[NT]	19	<50	<50	0	[NT]	[NT]
TRH >C ₁₆ -C ₃₄	mg/kg	100	Org-020	[NT]	19	<100	<100	0	[NT]	[NT]
TRH >C ₃₄ -C ₄₀	mg/kg	100	Org-020	[NT]	19	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	19	87	87	0	[NT]	[NT]

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QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	291362-6
Date extracted	-			102	4	22/03/2022	22/03/2022		22/03/2022	22/03/2022
Date analysed	-			102	4	23/03/2022	23/03/2022		23/03/2022	23/03/2022
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	103	95
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	99	91
Fluorene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	107	97
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	116	90
Anthracene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	110	67
Pyrene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	115	72
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	109	81
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	4	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	4	<0.05	<0.05	0	94	78
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	108	4	105	105	0	107	102

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	291362-21
Date extracted	-			[NT]	11	22/03/2022	22/03/2022		104	22/03/2022
Date analysed	-			[NT]	11	23/03/2022	23/03/2022		104	23/03/2022
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	101	90
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	97	85
Fluorene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	105	93
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	11	1.2	1.4	15	116	102
Anthracene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	11	0.3	0.3	0	110	98
Pyrene	mg/kg	0.1	Org-022/025	[NT]	11	0.3	0.3	0	115	101
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	11	0.1	0.2	67	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	11	0.4	0.5	22	107	93
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	11	0.3	0.4	29	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	11	0.1	0.1	0	102	104
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	11	101	107	6	106	98

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QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	22/03/2022	22/03/2022		[NT]	[NT]
Date analysed	-			[NT]	19	23/03/2022	23/03/2022		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	19	0.5	<0.1	133	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	19	0.2	<0.1	67	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	19	0.8	<0.1	156	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	19	0.2	<0.1	67	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	19	1	0.2	133	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	19	1.0	0.2	133	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	19	0.4	<0.1	120	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	19	0.4	<0.1	120	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	19	0.6	<0.2	100	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	19	0.5	0.1	133	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	19	0.2	<0.1	67	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	19	0.2	<0.1	67	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	19	108	100	8	[NT]	[NT]

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QUALITY CONTROL: Misc Soil - Inorg						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	291362-6
Date prepared	-			22/03/2022	4	22/03/2022	22/03/2022		22/03/2022	22/03/2022
Date analysed	-			22/03/2022	4	22/03/2022	22/03/2022		22/03/2022	22/03/2022
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	4	<5	<5	0	113	97

QUALITY CONTROL: Misc Soil - Inorg						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	22/03/2022	22/03/2022		[NT]	[NT]
Date analysed	-			[NT]	11	22/03/2022	22/03/2022		[NT]	[NT]
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	[NT]	11	<5	<5	0	[NT]	[NT]

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QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	291362-6
Date extracted	-			22/03/2022	4	22/03/2022	22/03/2022		22/03/2022	22/03/2022
Date analysed	-			23/03/2022	4	23/03/2022	23/03/2022		23/03/2022	23/03/2022
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	108	96
HCB	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	103	92
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	103	93
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	116	103
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	114	102
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	109	101
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	120	102
Endrin	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	102	92
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	104	94
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	102	88
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	101	4	99	102	3	103	98

Client Reference: 11761

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	291362-21
Date extracted	-			[NT]	11	22/03/2022	22/03/2022		22/03/2022	22/03/2022
Date analysed	-			[NT]	11	23/03/2022	23/03/2022		23/03/2022	23/03/2022
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	104	92
HCB	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	99	89
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	99	89
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	113	99
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	110	98
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	111	96
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	118	102
Endrin	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	102	90
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	104	92
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	98	84
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	11	96	99	3	101	93

Client Reference: 11761

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	22/03/2022	22/03/2022		[NT]	[NT]
Date analysed	-			[NT]	19	23/03/2022	23/03/2022		[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	19	100	96	4	[NT]	[NT]

Client Reference: 11761

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	291362-6
Date extracted	-			22/03/2022	4	22/03/2022	22/03/2022		22/03/2022	22/03/2022
Date analysed	-			23/03/2022	4	23/03/2022	23/03/2022		23/03/2022	23/03/2022
Aroclor 1016	mg/kg	0.1	Org-021	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	<0.1	4	<0.1	<0.1	0	109	80
Aroclor 1260	mg/kg	0.1	Org-021	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	101	4	99	102	3	103	98

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	291362-21
Date extracted	-			[NT]	11	22/03/2022	22/03/2022		22/03/2022	22/03/2022
Date analysed	-			[NT]	11	23/03/2022	23/03/2022		23/03/2022	23/03/2022
Aroclor 1016	mg/kg	0.1	Org-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	[NT]	11	<0.1	<0.1	0	101	80
Aroclor 1260	mg/kg	0.1	Org-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	[NT]	11	96	99	3	101	93

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	22/03/2022	22/03/2022		[NT]	[NT]
Date analysed	-			[NT]	19	23/03/2022	23/03/2022		[NT]	[NT]
Aroclor 1016	mg/kg	0.1	Org-021	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1260	mg/kg	0.1	Org-021	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	[NT]	19	100	96	4	[NT]	[NT]

Client Reference: 11761

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	291362-6
Date prepared	-			22/03/2022	4	22/03/2022	22/03/2022		22/03/2022	22/03/2022
Date analysed	-			23/03/2022	4	23/03/2022	23/03/2022		23/03/2022	23/03/2022
Arsenic	mg/kg	4	Metals-020	<4	4	5	6	18	93	71
Cadmium	mg/kg	0.4	Metals-020	<0.4	4	<0.4	<0.4	0	94	84
Chromium	mg/kg	1	Metals-020	<1	4	27	29	7	96	82
Copper	mg/kg	1	Metals-020	<1	4	18	11	48	92	118
Lead	mg/kg	1	Metals-020	<1	4	11	12	9	92	81
Mercury	mg/kg	0.1	Metals-021	<0.1	4	0.1	<0.1	0	116	95
Nickel	mg/kg	1	Metals-020	<1	4	26	17	42	90	111
Zinc	mg/kg	1	Metals-020	<1	4	46	50	8	94	108
Molybdenum	mg/kg	1	Metals-020	<1	4	1	1	0	92	70
Beryllium	mg/kg	1	Metals-020	<1	4	<1	<1	0	92	73
Iron	mg/kg	10	Metals-020	<10	[NT]	[NT]	[NT]	[NT]	121	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	291362-21
Date prepared	-			[NT]	11	22/03/2022	22/03/2022		22/03/2022	22/03/2022
Date analysed	-			[NT]	11	23/03/2022	23/03/2022		23/03/2022	23/03/2022
Arsenic	mg/kg	4	Metals-020	[NT]	11	<4	<4	0	98	72
Cadmium	mg/kg	0.4	Metals-020	[NT]	11	<0.4	<0.4	0	97	81
Chromium	mg/kg	1	Metals-020	[NT]	11	7	7	0	99	76
Copper	mg/kg	1	Metals-020	[NT]	11	16	13	21	95	115
Lead	mg/kg	1	Metals-020	[NT]	11	14	15	7	94	#
Mercury	mg/kg	0.1	Metals-021	[NT]	11	<0.1	<0.1	0	89	89
Nickel	mg/kg	1	Metals-020	[NT]	11	5	4	22	93	90
Zinc	mg/kg	1	Metals-020	[NT]	11	32	23	33	98	70
Molybdenum	mg/kg	1	Metals-020	[NT]	11	<1	<1	0	96	73
Beryllium	mg/kg	1	Metals-020	[NT]	11	<1	<1	0	96	72
Iron	mg/kg	10	Metals-020	[NT]	[NT]	[NT]	[NT]	[NT]	95	[NT]

Client Reference: 11761

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	19	22/03/2022	22/03/2022		[NT]	[NT]
Date analysed	-			[NT]	19	23/03/2022	23/03/2022		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	19	<4	<4	0	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	19	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	19	4	11	93	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	19	5	5	0	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	19	45	36	22	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	19	2	5	86	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	19	53	46	14	[NT]	[NT]
Molybdenum	mg/kg	1	Metals-020	[NT]	19	<1	<1	0	[NT]	[NT]
Beryllium	mg/kg	1	Metals-020	[NT]	19	<1	<1	0	[NT]	[NT]

Client Reference: 11761

QUALITY CONTROL: Misc Inorg - Soil						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			23/03/2022	6	23/03/2022	23/03/2022		23/03/2022	[NT]
Date analysed	-			23/03/2022	6	23/03/2022	23/03/2022		23/03/2022	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	6	8.6	8.7	1	101	[NT]
Total Organic Carbon (Walkley Black)	mg/kg	1000	Inorg-036	<1000	6	9000	[NT]		106	[NT]
pH 1:5 soil:CaCl ₂	pH Units		Inorg-001	[NT]	6	7.4	[NT]		101	[NT]

Client Reference: 11761

QUALITY CONTROL: CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date prepared	-			25/03/2022	[NT]	[NT]	[NT]	[NT]	25/03/2022	[NT]
Date analysed	-			25/03/2022	[NT]	[NT]	[NT]	[NT]	25/03/2022	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	90	[NT]
Exchangeable K	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	101	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	90	[NT]
Exchangeable Na	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]

Client Reference: 11761

QUALITY CONTROL: BTEX in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			21/03/2022	[NT]	[NT]	[NT]	[NT]	21/03/2022	[NT]
Date analysed	-			22/03/2022	[NT]	[NT]	[NT]	[NT]	22/03/2022	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	93	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	93	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	101	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	103	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Surrogate Dibromofluoromethane	%		Org-023	97	[NT]	[NT]	[NT]	[NT]	108	[NT]
Surrogate toluene-d8	%		Org-023	97	[NT]	[NT]	[NT]	[NT]	99	[NT]
Surrogate 4-BFB	%		Org-023	101	[NT]	[NT]	[NT]	[NT]	101	[NT]

Result Definitions	
NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Acid Extractable Metals in Soil:

-The laboratory RPD acceptance criteria has been exceeded for 291362-4 for Cu and Ni. Therefore a triplicate result has been issued as laboratory sample number 291362-25.

-The laboratory RPD acceptance criteria has been exceeded for 291362-19 for Cr. Therefore a triplicate result has been issued as laboratory sample number 291362-26.

-# Percent recovery is not possible to report due to the inhomogeneous nature of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

PAH_S:

The laboratory RPD acceptance criteria has been exceeded for 291362-19,19d. Therefore a triplicate result has been issued as laboratory sample number 291362-26.



From: Getex Pty Ltd
 Address: Building B, Unit 2
 64 Talavera Road
 MACQUARIE PARK NSW 2113
 Phone: (02) 9889 2488
 Facsimile: (02) 9889 2499
 Email: help@getex.com.au
 Attention: Chris Chen

Chain of Custody

To: Envirolab Services Pty Ltd
 Address: 12 Ashley Street
 CHATSWOOD NSW 2067
 Phone: (02) 9910 6200
 Facsimile: (02) 9910 6299

Date: 18/03/2022
 Order Number: 8056
 Project Number: 11761

TAT: 5 Day TAT

Received By: Alonay Zing Date: 18/3/2022
16:30

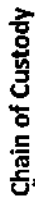
☐ Samples Received at Ambient Temp. ☐ Samples Received Chilled

Notes: Heavy Metals to be Analysed: As, Cd, Cr, Cu, Hg, Pb, Ni, Zn, Mo & Be

Notes:		Heavy Metals to be Analysed: As, Cd, Cr, Cu, Hg, Pb, Ni, Zn, Mo & Be																												
Envirolab Barcode Number	Getex Sample Number	Container	Single Analytes													Soil		Combos and Non-Standard Analytes												
			TRH/BTEX	PAH Routine	PAH Low	OCF	OPF	PCB	Lead	4-17 Metals	Phenolics	Asbestos	BTEX	TCLP Prep	Leachable PAH	6 Leachable Metals	VOCS	PH (1.5)	PFAS	NEPM Soil Char Sure	Combination 3	Combination 7								
1		11761/BH01/S1	GI																	1										
2		11761/BH01/S1a	GI																	1										
3		11761/BH01/S2	GI																	1										
4		11761/BH02/S1	GI												1	1					1									
5		11761/BH02/S2	GI																	1										
6		11761/BH03/S1	GI												1	1					1									
7		11761/BH04/S1	GI												1	1					1									
8		11761/BH04/S2	GI												1	1					1									
9		11761/BH05/S1	GI												1	1					1									
10		11761/BH05/S2	GI												1	1					1									
11		11761/BH06/S1	GI												1	1					1									
12		11761/BH06/S2	GI												1	1					1									
13		11761/BH07/S1	GI												1	1					1									
14		11761/BH07/S2	GI												1	1					1									
15		11761/BH08/S1	GI												1	1					1									
Total															7	7					1	8	7							
																								170C						

Envirolab Services
 12 Ashley St
 Chatswood NSW 2067
 Ph (02) 9910 6200
 25/13/22
 Date Received: 18/3/2022
 Time Received: 16:30
 Recd By: [Signature]
 Term: Cool down
 Cooling: Ice chest
 Security: Inactivated

1706



To: Envirolab Services Pty Ltd
Address: 12 Ashley Street
CHATSWOOD NSW 2067
Phone: (02) 9910 6200
Facsimile: (02) 9910 6299

TAT: 5 Day TAT

Received By: Nancy Zhang Date: 18/3/2022
16:30

Samples Retrieved Chilled

Samples Received at Ambient Temp.

be Analysed: As, Cd, Cr, Cu, Hg, Pb, Ni, Zn, Mo & Be

[illegible]

11761env01-COC Builder

Chain Of Custody Page 2 Of 2



Envirolab Services Pty Ltd
 ABN 37 112 535 645
 12 Ashley St Chatswood NSW 2067
 ph 02 9910 6200 fax 02 9910 6201
 customerservice@envirolab.com.au
 www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Getex Pty Ltd
Attention	Chris Chen

Sample Login Details

Your reference	11761
Envirolab Reference	291362
Date Sample Received	18/03/2022
Date Instructions Received	18/03/2022
Date Results Expected to be Reported	25/03/2022

Sample Condition

Samples received in appropriate condition for analysis

No. of Samples Provided	23 Soil, 1 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	17
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie

Phone: 02 9910 6200
Fax: 02 9910 6201
Email: ahie@envirolab.com.au

Jacinta Hurst

Phone: 02 9910 6200
Fax: 02 9910 6201
Email: jhurst@envirolab.com.au

Analysis Underway, details on the following page:

Sample ID	VOCs in soil	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Misc Soil - Inorg	Organochlorine Pesticides in soil	PCBs in Soil	Acid Extractable metals in soil	Misc Inorg - Soil	Clay 50-120g	CEC	BTEX in Water
11761/BH01/S1		✓	✓	✓				✓				
11761/BH01/S1a		✓	✓	✓				✓				
11761/BH01/S2		✓	✓	✓				✓				
11761/BH02/S1	✓	✓	✓	✓	✓	✓	✓	✓	✓			
11761/BH02/S2		✓	✓	✓				✓				
11761/BH03/S1	✓	✓	✓	✓	✓	✓	✓	✓	✓			
11761/BH04/S1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
11761/BH04/S2		✓	✓	✓				✓				
11761/BH05/S1	✓	✓	✓	✓	✓	✓	✓	✓	✓			
11761/BH05/S2		✓	✓	✓				✓				
11761/BH06/S1	✓	✓	✓	✓	✓	✓	✓	✓	✓			
11761/BH06/S2		✓	✓	✓				✓				
11761/BH07/S1	✓	✓	✓	✓	✓	✓	✓	✓	✓			
11761/BH07/S2		✓	✓	✓				✓				
11761/BH08/S1	✓	✓	✓	✓	✓	✓	✓	✓	✓			
11761/BH08/S2		✓	✓	✓				✓				
11761/BH09/S1	✓	✓	✓	✓	✓	✓	✓	✓	✓			
11761/BH09/S2		✓	✓	✓				✓				
11761/BH11/S1	✓	✓	✓	✓	✓	✓	✓	✓	✓			
11761/BH11/S2		✓	✓	✓				✓				
11761/BH12/S1	✓	✓	✓	✓	✓	✓	✓	✓	✓			
11761/BH12/S2		✓	✓	✓				✓				
11761/TB01		✓										
11761/RB01												✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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NATA # 1261 Site # 18217

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Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

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Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

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IANZ # 1327

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43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Sample Receipt Advice

Company name: Getex Pty Ltd
Contact name: Justin Thompson-Laing
Project name: 8057
Project ID: 11761
Turnaround time: 5 Day
Date/Time received Mar 18, 2022 4:42 PM
Eurofins reference 872734

Sample Information

- ✓ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ✓ All samples have been received as described on the above COC.
- ✓ COC has been completed correctly.
- ✓ Attempt to chill was evident.
- ✓ Appropriately preserved sample containers have been used.
- ✓ All samples were received in good condition.
- ✓ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ✓ Appropriate sample containers have been used.
- ✓ Sample containers for volatile analysis received with zero headspace.
- ✗ Split sample sent to requested external lab.
- ✗ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Asim Khan on phone : or by email: AsimKhan@eurofins.com

Results will be delivered electronically via email to Justin Thompson-Laing - Justin.Thompson-Laing@getex.com.au.

Note: A copy of these results will also be delivered to the general Getex Pty Ltd email address.

Getex Pty Ltd
Unit 2, Building B, 64 Talavera Road
Macquarie Park
NSW 2113



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition
Arrangement for the mutual recognition of the
equivalence of testing, medical testing, calibration,
inspection, proficiency testing scheme providers and
reference materials producers reports and certificates.

Attention: Justin Thompson-Laing

Report 872734-S
Project name 8057
Project ID 11761
Received Date Mar 18, 2022

Client Sample ID			11761/BH01/S1 B
Sample Matrix			Soil
Eurofins Sample No.			S22-Ma40170
Date Sampled			Mar 18, 2022
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons			
TRH C6-C9	20	mg/kg	< 20
TRH C10-C14	20	mg/kg	< 20
TRH C15-C28	50	mg/kg	< 50
TRH C29-C36	50	mg/kg	< 50
TRH C10-C36 (Total)	50	mg/kg	< 50
Naphthalene ^{N02}	0.5	mg/kg	< 0.5
TRH C6-C10	20	mg/kg	< 20
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20
TRH >C10-C16	50	mg/kg	< 50
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 50
TRH >C16-C34	100	mg/kg	< 100
TRH >C34-C40	100	mg/kg	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100
BTEX			
Benzene	0.1	mg/kg	< 0.1
Toluene	0.1	mg/kg	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2
o-Xylene	0.1	mg/kg	< 0.1
Xylenes - Total*	0.3	mg/kg	< 0.3
4-Bromofluorobenzene (surr.)	1	%	83
Polycyclic Aromatic Hydrocarbons			
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2
Acenaphthene	0.5	mg/kg	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5
Anthracene	0.5	mg/kg	< 0.5
Benzo(a)anthracene	0.5	mg/kg	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	< 0.5
Benzo(g,h,i)perylene	0.5	mg/kg	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5
Chrysene	0.5	mg/kg	< 0.5
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5

Client Sample ID			11761/BH01/S1 B
Sample Matrix			Soil
Eurofins Sample No.			S22-Ma40170
Date Sampled			Mar 18, 2022
Test/Reference	LOR	Unit	
Polycyclic Aromatic Hydrocarbons			
Fluoranthene	0.5	mg/kg	< 0.5
Fluorene	0.5	mg/kg	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5
Naphthalene	0.5	mg/kg	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5
Pyrene	0.5	mg/kg	< 0.5
Total PAH*	0.5	mg/kg	< 0.5
2-Fluorobiphenyl (surr.)	1	%	105
p-Terphenyl-d14 (surr.)	1	%	132
Heavy Metals			
Arsenic	2	mg/kg	< 2
Cadmium	0.4	mg/kg	< 0.4
Chromium	5	mg/kg	19
Copper	5	mg/kg	79
Lead	5	mg/kg	< 5
Mercury	0.1	mg/kg	< 0.1
Nickel	5	mg/kg	100
Zinc	5	mg/kg	73
% Moisture	1	%	10.0

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Mar 21, 2022	14 Days
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Mar 21, 2022	14 Days
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Mar 21, 2022	14 Days
BTEX - Method: LTM-ORG-2010 BTEX and Volatile TRH	Sydney	Mar 21, 2022	14 Days
Polycyclic Aromatic Hydrocarbons - Method: LTM-ORG-2130 PAH and Phenols in Soil and Water	Sydney	Mar 21, 2022	14 Days
Metals M8 - Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS	Sydney	Mar 21, 2022	28 Days
% Moisture - Method: LTM-GEN-7080 Moisture	Sydney	Mar 21, 2022	14 Days



Environment Testing

web: www.eurofins.com.au
email: EnviroSales@eurofins.com

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Phone : 0800 856 450
IANZ # 1290

Eurofins Environment Testing NZ Limited

NZBN: 9429046024954

Company Name: Getex Pty Ltd
Address: Unit 2, Building B, 64 Talavera Road
Macquarie Park
NSW 2113
Project Name: 8057
Project ID: 11761

Order No.: 8057
Report #: 872734
Phone: 02 9889 2488
Fax: 02 9889 2499

Received: Mar 18, 2022 4:42 PM
Due: Mar 25, 2022
Priority: 5 Day
Contact Name: Justin Thompson-Laing

Eurofins Analytical Services Manager : Asim Khan

Sample Detail					
Eurofins Suite B7					
Moisture Set					
Melbourne Laboratory - NATA # 1261 Site # 1254					
Sydney Laboratory - NATA # 1261 Site # 18217					
Brisbane Laboratory - NATA # 1261 Site # 20794					
Mayfield Laboratory - NATA # 1261 Site # 25079					
Perth Laboratory - NATA # 2377 Site # 2370					
External Laboratory					
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID
1	11761/BH01/S IB	Mar 18, 2022		Soil	S22-Ma40170
Test Counts					1

Date Reported: Mar 31, 2022

Eurofins Environment Testing Unit F3, Building F, 16 Mars Road, Lane Cove West, NSW, Australia, 2066
ABN : 50 005 085 521 Telephone: +61 2 9900 8400

Page 4 of 10

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	µg/L: micrograms per litre
ppm: parts per million	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (bis-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total*	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g,h,i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a,h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons							
TRH C6-C9	%	89			70-130	Pass	
TRH C10-C14	%	88			70-130	Pass	
Naphthalene	%	72			70-130	Pass	

Test				Units	Result 1		Acceptance Limits	Pass Limits	Qualifying Code
TRH C6-C10				%	88		70-130	Pass	
TRH >C10-C16				%	85		70-130	Pass	
LCS - % Recovery									
BTEX									
Benzene				%	88		70-130	Pass	
Toluene				%	88		70-130	Pass	
Ethylbenzene				%	83		70-130	Pass	
m&p-Xylenes				%	78		70-130	Pass	
o-Xylene				%	80		70-130	Pass	
Xylenes - Total*				%	78		70-130	Pass	
LCS - % Recovery									
Polycyclic Aromatic Hydrocarbons									
Acenaphthene				%	95		70-130	Pass	
Acenaphthylene				%	90		70-130	Pass	
Anthracene				%	84		70-130	Pass	
Benz(a)anthracene				%	88		70-130	Pass	
Benzo(a)pyrene				%	81		70-130	Pass	
Benzo(b&j)fluoranthene				%	77		70-130	Pass	
Benzo(g,h,i)perylene				%	82		70-130	Pass	
Benzo(k)fluoranthene				%	83		70-130	Pass	
Chrysene				%	92		70-130	Pass	
Dibenz(a,h)anthracene				%	82		70-130	Pass	
Fluoranthene				%	87		70-130	Pass	
Fluorene				%	89		70-130	Pass	
Indeno(1,2,3-cd)pyrene				%	74		70-130	Pass	
Naphthalene				%	88		70-130	Pass	
Phenanthrene				%	89		70-130	Pass	
Pyrene				%	91		70-130	Pass	
LCS - % Recovery									
Heavy Metals									
Arsenic				%	87		80-120	Pass	
Cadmium				%	101		80-120	Pass	
Chromium				%	97		80-120	Pass	
Copper				%	82		80-120	Pass	
Lead				%	93		80-120	Pass	
Mercury				%	97		80-120	Pass	
Nickel				%	103		80-120	Pass	
Zinc				%	103		80-120	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons				Result 1					
TRH C6-C9	S22-Ma37152	NCP	%	88			70-130	Pass	
TRH C10-C14	S22-Ma32223	NCP	%	86			70-130	Pass	
Naphthalene	S22-Ma37152	NCP	%	78			70-130	Pass	
TRH C6-C10	S22-Ma37152	NCP	%	88			70-130	Pass	
TRH >C10-C16	S22-Ma32223	NCP	%	83			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S22-Ma37152	NCP	%	93			70-130	Pass	
Toluene	S22-Ma37152	NCP	%	92			70-130	Pass	
Ethylbenzene	S22-Ma37152	NCP	%	88			70-130	Pass	
m&p-Xylenes	S22-Ma37152	NCP	%	81			70-130	Pass	
o-Xylene	S22-Ma37152	NCP	%	86			70-130	Pass	
Xylenes - Total*	S22-Ma37152	NCP	%	83			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	S22-Ma61619	NCP	%	117			70-130	Pass	
Acenaphthylene	S22-Ma61619	NCP	%	102			70-130	Pass	
Anthracene	S22-Ma61619	NCP	%	96			70-130	Pass	
Benzo(a)anthracene	S22-Ma61619	NCP	%	99			70-130	Pass	
Benzo(a)pyrene	S22-Ma61619	NCP	%	85			70-130	Pass	
Benzo(b&j)fluoranthene	S22-Ma61619	NCP	%	90			70-130	Pass	
Benzo(g,h,i)perylene	S22-Ma61619	NCP	%	92			70-130	Pass	
Benzo(k)fluoranthene	S22-Ma61619	NCP	%	97			70-130	Pass	
Chrysene	S22-Ma61619	NCP	%	107			70-130	Pass	
Dibenz(a,h)anthracene	S22-Ma61619	NCP	%	88			70-130	Pass	
Fluoranthene	S22-Ma61619	NCP	%	98			70-130	Pass	
Fluorene	S22-Ma61619	NCP	%	99			70-130	Pass	
Indeno(1,2,3-cd)pyrene	S22-Ma61619	NCP	%	83			70-130	Pass	
Naphthalene	S22-Ma61619	NCP	%	99			70-130	Pass	
Phenanthrene	S22-Ma61619	NCP	%	100			70-130	Pass	
Pyrene	S22-Ma61619	NCP	%	103			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S22-Ma36230	NCP	%	88			75-125	Pass	
Cadmium	S22-Ma36230	NCP	%	99			75-125	Pass	
Chromium	S22-Ma36230	NCP	%	81			75-125	Pass	
Copper	S22-Ma36230	NCP	%	98			75-125	Pass	
Lead	S22-Ma36230	NCP	%	86			75-125	Pass	
Mercury	S22-Ma36230	NCP	%	106			75-125	Pass	
Nickel	S22-Ma36230	NCP	%	95			75-125	Pass	
Zinc	S22-Ma36230	NCP	%	92			75-125	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Total Recoverable Hydrocarbons				Result 1	Result 2	RPD			
TRH C6-C9	S22-Ma37151	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	S22-Ma32212	NCP	mg/kg	83	61	31	30%	Fail	Q15
TRH C15-C28	S22-Ma32212	NCP	mg/kg	260	190	28	30%	Pass	
TRH C29-C36	S22-Ma32212	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
Naphthalene	S22-Ma37151	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S22-Ma37151	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH >C10-C16	S22-Ma32212	NCP	mg/kg	170	120	32	30%	Fail	Q15
TRH >C16-C34	S22-Ma32212	NCP	mg/kg	200	160	22	30%	Pass	
TRH >C34-C40	S22-Ma32212	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S22-Ma37151	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	S22-Ma37151	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	S22-Ma37151	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	S22-Ma37151	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	S22-Ma37151	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total*	S22-Ma37151	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	S22-Ma42515	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	S22-Ma42515	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	S22-Ma42515	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)anthracene	S22-Ma42515	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

Duplicate								
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD		
Benzo(a)pyrene	S22-Ma42515	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Benzo(b&j)fluoranthene	S22-Ma42515	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Benzo(g,h,i)perylene	S22-Ma42515	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Benzo(k)fluoranthene	S22-Ma42515	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Chrysene	S22-Ma42515	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Dibenz(a,h)anthracene	S22-Ma42515	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Fluoranthene	S22-Ma42515	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Fluorene	S22-Ma42515	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Indeno(1,2,3-cd)pyrene	S22-Ma42515	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Naphthalene	S22-Ma42515	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Phenanthrene	S22-Ma42515	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Pyrene	S22-Ma42515	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Duplicate								
Heavy Metals				Result 1	Result 2	RPD		
Arsenic	S22-Ma36229	NCP	mg/kg	33	14	81	30%	Fail Q02
Cadmium	S22-Ma36229	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass
Chromium	S22-Ma36229	NCP	mg/kg	130	79	51	30%	Fail Q02
Copper	S22-Ma36229	NCP	mg/kg	< 5	< 5	<1	30%	Pass
Lead	S22-Ma36229	NCP	mg/kg	31	26	17	30%	Pass
Mercury	S22-Ma36229	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Nickel	S22-Ma36229	NCP	mg/kg	< 5	5.1	4.0	30%	Pass
Zinc	S22-Ma36229	NCP	mg/kg	< 5	6.6	34	30%	Fail Q15
Duplicate								
				Result 1	Result 2	RPD		
% Moisture	S22-Ma40061	NCP	%	20	20	1.0	30%	Pass

Comments
Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q02	The duplicate %RPD is outside the recommended acceptance criteria. Further analysis indicates sample heterogeneity as the cause
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised by:

Asim Khan	Analytical Services Manager
Andrew Sullivan	Senior Analyst-Organic (NSW)
Gabriele Cordero	Senior Analyst-Metal (NSW)
Roopesh Rangarajan	Senior Analyst-Volatile (NSW)



Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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From: Getex Pty Ltd
Address: Building B, Unit 2
64 Talavera Road
MACQUARIE PARK
Phone: (02) 9889 2488
Facsimile: (02) 9889 2499
Email: help@getex.com.
Attention: **Chris Chen**

872734 4:42 PM
C-T 18/03/22
K NSW 2113 18.10C

Date: 18/03/2022
Order Number: 8057
Project Number: 11761

TAT: 5 Day TAT

Phone: (02) 9900 8400
Email: EnviroSampleNSW@eurofins.com.au

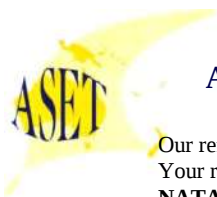
Received By: _____ Date: _____
Signature: _____

Sample Temp: _____
Samples Received Chilled _____

☐ Samples Received at Ambient Temp.

Attention: **Chris Chen**

[illegible]



AUSTRALIAN SAFER ENVIRONMENT & TECHNOLOGY PTY LTD

ABN 36 088 095 112

Our ref : ASET99961 / 103141 / 1 - 11

Your ref : 11761

NATA Accreditation No: 14484

30 March 2022

Getex Pty Ltd
Unit 2 Building B 64 Talavera Road
Macquarie Park NSW 2113



Attn: Mr Chris Chen

Accredited for compliance with ISO/IEC 17025 - Testing.

Dear Chris

Asbestos Identification

This report presents the results of eleven samples, forwarded by Getex Pty Ltd on 29 March 2022, for analysis for asbestos.

1.Introduction: Eleven samples forwarded were examined and analysed for the presence of asbestos on 30 March 2022.

2. Methods : The samples were examined under a Stereo Microscope and selected fibres were analysed by Polarized Light Microscopy in conjunction with Dispersion Staining method (Australian Standard AS 4964 - 2004 and Safer Environment Method 1 as the supplementary work instruction) (Qualitative Analysis only).

3. Results : **Sample No. 1. ASET99961 / 103141 / 1. 11761/BH01/AS01.**
Approx dimensions 8.0 cm x 8.0 cm x 2.1 cm
The sample consisted of a mixture of clayish sandy soil, stones and plant matter.
No asbestos detected.

Sample No. 2. ASET99961 / 103141 / 2. 11761/BH02/AS01.
Approx dimensions 8.0 cm x 8.0 cm x 2.3 cm
The sample consisted of a mixture of clayish sandy soil, stones and plant matter.
No asbestos detected.

Sample No. 3. ASET99961 / 103141 / 3. 11761/BH03/AS01.
Approx dimensions 8.0 cm x 8.0 cm x 1.9 cm
The sample consisted of a mixture of clayish sandy soil, stones, fragments of glass, shale and plant matter.
No asbestos detected.

Sample No. 4. ASET99961 / 103141 / 4. 11761/BH04/AS01.
Approx dimensions 8.0 cm x 8.0 cm x 2.4 cm
The sample consisted of a mixture of clayish sandy soil, stones, fragments of cement like material and plant matter.
No asbestos detected.

Sample No. 5. ASET99961 / 103141 / 5. 11761/BH05/AS01.
Approx dimensions 8.0 cm x 8.0 cm x 2.5 cm
The sample consisted of a mixture of sandy soil, organic fibres, stones and plant matter.
No asbestos detected.

SUITE 710 / 90 GEORGE STREET, HORNSBY NSW 2077 – P.O. BOX 1644 HORNSBY WESTFIELD NSW 1635
PHONE: (02) 99872183 FAX: (02) 99872151 EMAIL: info@ausset.com.au WEBSITE: www.Ausset.com.au

OCCUPATIONAL HEALTH & SAFETY STUDIES • INDOOR AIR QUALITY SURVEYS • HAZARDOUS MATERIAL SURVEYS • RADIATION SURVEYS • ASBESTOS SURVEYS
ASBESTOS DETECTION & IDENTIFICATION • REPAIR & CALIBRATION OF SCIENTIFIC EQUIPMENT • AIRBORNE FIBRE & SILICA MONITORING



Sample No. 6. ASET99961 / 103141 / 6. 11761/BH06/AS01.

Approx dimensions 8.0 cm x 8.0 cm x 2.0 cm

The sample consisted of a mixture of sandy soil, stones and plant matter.

No asbestos detected.

Sample No. 7. ASET99961 / 103141 / 7. 11761/BH07/AS01.

Approx dimensions 8.0 cm x 8.0 cm x 2.1 cm

The sample consisted of a mixture of clayish sandy soil, stones and plant matter.

No asbestos detected.

Sample No. 8. ASET99961 / 103141 / 8. 11761/BH08/AS01.

Approx dimensions 8.0 cm x 8.0 cm x 2.0 cm

The sample consisted of a mixture of clayish sandy soil, stones, fragments of corroded metal and plant matter.

No asbestos detected.

Sample No. 9. ASET99961 / 103141 / 9. 11761/BH09/AS01.

Approx dimensions 8.0 cm x 8.0 cm x 1.9 cm

The sample consisted of a mixture of clayish sandy soil, organic fibres, stones and plant matter.

No asbestos detected.

Sample No. 10. ASET99961 / 103141 / 10. 11761/BH11/AS01.

Approx dimensions 8.0 cm x 8.0 cm x 1.6 cm

The sample consisted of a mixture of clayish sandy soil, stones and plant matter.

No asbestos detected.

Sample No. 11. ASET99961 / 103141 / 11. 11761/BH12/AS01.

Approx dimensions 8.0 cm x 8.0 cm x 3.9 cm

The sample consisted of a mixture of clayish sandy soil, stones and plant matter.

No asbestos detected.

Reported by,

A handwritten signature in black ink, appearing to read "Mahen De Silva".

**Mahen De Silva. BSc, MSc, Grad Dip (Occ Hyg)
Occupational Hygienist / Approved Identifier.
Approved Signatory**



Accredited for compliance with ISO/IEC 17025 - Testing.

The results contained in this report relate only to the sample/s submitted for testing. Australian Safer Environment & Technology accepts no responsibility for whether or not the submitted sample/s is/are representative. Results indicating "No asbestos detected" indicates a reporting limit specified in AS4964 -2004 which is 0.1g/ Kg (0.01%). Any amounts detected at assumed lower level than that would be reported, however those assumed lower levels may be treated as "No asbestos detected" as specified and recommended by AS4964-2004. Trace / respirable level asbestos will be reported only when detected and trace analysis have been performed on each sample as required by AS4964-2004. When loose asbestos fibres/ fibre bundles are detected and reported that means they are larger handpicked fibres/ fibre bundles, and they do not represent respirable fibres. Dust/soil samples are always subjected to trace analysis except where the amounts involved are extremely minute and trace analysis is not possible to be carried out. When trace analysis is not performed on dust samples it will be indicated in the report that trace analysis has not been carried out due to the volume of the sample being extremely minute.

CHAIN OF CUSTODY FORM

To: Australian Safer Environment & Technology Pty Ltd
 Address: Unit 10 Level 7, 90 George Street
 Phone: (02) 99872183
 Facsimile: (02) 99872151
 TAT Required: 1 Day TAT

Getex Pty Ltd
 Address: Unit 2, Building B
 64 Talavera Road
 MACQUARIE PARK NSW 2113
 Phone: (02) 9889 2488
 Facsimile: (02) 9889 2499
 Email: help@getex.com.au
 Attention: Chris Chen

Date: 29/03/2022
 Order No.: 8066
 Project No.: 11761

ASET99961/103141/1-11

☒ Samples received at ambient temperature ☐ Samples received chilled Received by (signature) [Signature] Date: 29/3/22 3p

ASET reference Number	GETEX Sample Number	Container	Analysis Required					
			Asbestos in Soil (presence/absence)	Asbestos in Dust	Asbestos in Material	Asbestos Fibre Counting	Asbestos in Vinyl	
1	11761/BH01/AS01	Plastic Tube - PT Bag - B Petri Dish - PD Plastic Bottle - PB Glass Jar - GJ Glass Bottle - GB Glass Vial - GV	X					
2	11761/BH02/AS01	B	X					
3	11761/BH03/AS01	B	X					
4	11761/BH04/AS01	B	X					
5	11761/BH05/AS01	B	X					
6	11761/BH06/AS01	B	X					
7	11761/BH07/AS01	B	X					
8	11761/BH08/AS01	B	X					
9	11761/BH09/AS01	B	X					
10	11761/BH11/AS01	B	X					
11	11761/BH12/AS01	B	X					
Total			11					

URGENT

29 MAR 2022



APPENDIX VI

BOREHOLE LOGS



ENVIRONMENTAL BOREHOLE BH01

PROJECT NUMBER 11761	DRILLING DATE 17/03/2022	COORDINATES 33°53'20.61"S 151°10'52.09"E
PROJECT NAME Due Diligence Contamination A:	DRILLING COMPANY Stratacore Drilling	LOGGED BY CCC
CLIENT ANSTO	DRILLER Shannon Smith	CHECKED BY JTL
ADDRESS 81 Missenden Road, CAMPERDOWN NSW 2060	DRILLING METHOD Geoprobe - Push Tube	
	TOTAL DEPTH 2.25	

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
	0.3			ASPHALT	
		11761/BH01/S1, S1a & S1b		FILL: Dark brown clayey loam fill with crushed rock	
		11761/BH01/AS01		FILL: Dark brown clayey fill	
				CLAY: Reddish brown clay	
				CLAY: Reddish brown clay with minor light red shale rock	
0.5	0.1			CLAY: Reddish brown clay	
				CLAY: Red clay with light brown clay	
				CLAY: Red clay with light brown clay and red shale rock	
				SHALE: Red shale rock	
				CLAY: Very light brown clay with minor red clay	
1	0.1			SHALE: Red shale rock	
				CLAY: White clay with minor red clay and red shale rock	
1.5	0.0			CLAY: Light orange clay	
				CLAY: White clay with minor red clay	
2	0.1				
		11761/BH01/S2		CLAY: White clay with minor red clay and red shale rock	
	0.0			Termination Depth at: 2.25 m	

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ENVIRONMENTAL BOREHOLE BH02

PROJECT NUMBER 11761	DRILLING DATE 17/03/2022	COORDINATES 33°53'20.32"S 151°10'51.98"E
PROJECT NAME Due Diligence Contamination A:	DRILLING COMPANY Stratacore Drilling	LOGGED BY CCC
CLIENT ANSTO	DRILLER Shannon Smith	CHECKED BY JTL
ADDRESS 81 Missenden Road, CAMPERDOWN NSW 2060	DRILLING METHOD Geoprobe - Push Tube	
	TOTAL DEPTH 2.3	

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
	0.3			ASPHALT	
		11761/BH02/S1		FILL: Dark brown clayey loam fill	
		11761/BH02/AS01		FILL: Brown clayey fill	
0.5	0.2			CLAY: Red clay with grey clay	
1	0.2			CLAY: Red clay with white clay and minor red shale rock	
1.5	0.2			SAND+CLAY: Light orange sand with red and white clay	
2	0.2			CLAY: White clay with minor red clay and minor light orange sand	
		11761/BH02/S2			
	0.4			Termination Depth at: 2.3 m	

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ENVIRONMENTAL BOREHOLE BH03

PROJECT NUMBER 11761	DRILLING DATE 17/03/2022	COORDINATES 33°53'20.37"S 151°10'51.28"E
PROJECT NAME Due Diligence Contamination A:	DRILLING COMPANY Stratacore Drilling	LOGGED BY CCC
CLIENT ANSTO	DRILLER Shannon Smith	CHECKED BY JTL
ADDRESS 81 Missenden Road, CAMPERDOWN NSW 2060	DRILLING METHOD Geoprobe - Push Tube	
	TOTAL DEPTH 2.7	

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
0.4				MULCH TOPSOIL: Dark brown loam topsoil	
				SANDSTONE: Yellow sandstone	
				FILL: Reddish brown clay with minor yellow sand	
		11761/BH03/S1		SANDSTONE: White sandstone	
				FILL: Dark brown loose loam fill	
		11761/BH03/AS01		FILL: Dark brown clayey loam fill	
0.5	0.1				
				CLAY: Reddish brown clay	
1	0.0				
				CLAY: Red clay	
				CLAY: White clay with minor red clay	
				CLAY: Red clay with minor red shale rock	
				CLAY: White clay with minor red clay	
2	0.0				
2.5	0.0				
0.0				Termination Depth at: 2.7 m	

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ENVIRONMENTAL BOREHOLE BH04

PROJECT NUMBER 11761	DRILLING DATE 17/03/2022	COORDINATES 33°53'20.93"S 151°10'51.81"E
PROJECT NAME Due Diligence Contamination A:	DRILLING COMPANY Stratacore Drilling	LOGGED BY CCC
CLIENT ANSTO	DRILLER Shannon Smith	CHECKED BY JTL
ADDRESS 81 Missenden Road, CAMPERDOWN NSW 2060	DRILLING METHOD Geoprobe - Push Tube	
	TOTAL DEPTH 5	

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
0.2				GRASS	
				TOPSOIL: Dark brown loam topsoil	
		11761/BH04/AS01		FILL: Dark red clay	
		11761/BH04/S1		FILL: Brown sand with dark brown clayey fill	
0.5	0.2			FILL: Dark brown clayey fill with orange clay	
				LOSS	
				FILL: Dark brown clayey fill with black bitumen and orange clay	
				CLAY: Brown clay	
1	0.2			LOSS	
				CLAY: Brown clay with red clay	
				LOSS	
				CLAY: Brown clay with red clay	
				CLAY: Orange clay with red clay	
1.5	0.2			CLAY: Reddish brown clay	
2	0.3				
2.5	0.3				
3	0.4			CLAY: White clay with red clay	
3.5	0.6				
4	0.6				
4.5	0.7				
5	0.2	11761/BH04/S2			
				Termination Depth at: 5.0 m	

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ENVIRONMENTAL BOREHOLE BH05

PROJECT NUMBER 11761	DRILLING DATE 17/03/2022	COORDINATES 33°53'21.41"S 151°10'51.60"E
PROJECT NAME Due Diligence Contamination A:	DRILLING COMPANY Stratacore Drilling	LOGGED BY CCC
CLIENT ANSTO	DRILLER Shannon Smith	CHECKED BY JTL
ADDRESS 81 Missenden Road, CAMPERDOWN NSW 2060	DRILLING METHOD Geoprobe - Push Tube	
	TOTAL DEPTH 2	

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
	0.1			TOPSOIL: Dark brown topsoil with minor grass & vegetation	
				FILL: Reddish brown clay	
0.5	0.2	11761/BH05/S1		FILL: Sandy loam fill with crushed rock	
		11761/BH05/AS01			
				FILL: Reddish brown clay	
1	0.1			FILL: Sandy fill with crushed rock	
				FILL: Reddish brown clay	
1.5	0.0			FILL: Reddish brown clay with sand loam fill and crushed rock	
				CLAY: Reddish brown clay	
		11761/BH05/S2			
2	0.0			Termination Depth at: 2.0 m	

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ENVIRONMENTAL BOREHOLE BH06

PROJECT NUMBER 11761	DRILLING DATE 17/03/2022	COORDINATES 33°53'20.56"S 151°10'50.61"E
PROJECT NAME Due Diligence Contamination A:	DRILLING COMPANY Stratacore Drilling	LOGGED BY CCC
CLIENT ANSTO	DRILLER Shannon Smith	CHECKED BY JTL
ADDRESS 81 Missenden Road, CAMPERDOWN NSW 2060	DRILLING METHOD Geoprobe - Push Tube	
	TOTAL DEPTH 2.1	

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
0.0				MULCH FILL: Dark brown loose clayey loam fill with minor white sand	
		11761/BH06/AS01		FILL: Dark brown clayey loam fill	
		11761/BH06/S1		FILL: Light brown sand and crushed rock FILL: Black bitumen FILL: Brown sand	
0.5	0.0			FILL: Red clay FILL: Crushed rock FILL: Red clay FILL: Red clay with 1 fragment of bitumen FILL: Red clay	
				ROCK: Large piece of crushed rock	
1	0.1			SHALE: Grey shale SANDSTONE: White sandstone with white sand CLAY: Orange clay CLAY: Brown clay	
1.5	0.1			CLAY: Red clay	
2	0.2	11761/BH06/S2			
				Termination Depth at: 2.1 m	

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ENVIRONMENTAL BOREHOLE BH07

PROJECT NUMBER 11761	DRILLING DATE 17/03/2022	COORDINATES 33°53'21.80"S 151°10'51.05"E
PROJECT NAME Due Diligence Contamination A:	DRILLING COMPANY Stratacore Drilling	LOGGED BY CCC
CLIENT ANSTO	DRILLER Shannon Smith	CHECKED BY JTL
ADDRESS 81 Missenden Road, CAMPERDOWN NSW 2060	DRILLING METHOD Geoprobe - Push Tube	
	TOTAL DEPTH 5	

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
0.2			▲ ▲ ▲ ▲	CONCRETE HARDSTAND	
		11761/BH07/S1	XXXXXX	FILL: dark brown loose loam fill with crushed rock	
		11761/BH07/AS01		CLAY: Red clay with white clay	
0.5	0.1			CLAY: Red clay with white clay and minor rock	
				CLAY: Red clay with white clay	
1	0.1			SAND: Brown sand	
				CLAY: White clay with red clay	
1.5	0.1			CLAY: White clay	
				CLAY: White clay with red shale staining	
				CLAY: White clay with red shale rock	
2	0.1			CLAY: Light red clay	
2.5	0.0				
3	0.0				
3.5	0.1				
4	0.0				
4.5	0.0				
5	0.0	11761/BH07/S2			
				Termination Depth at: 5.0 m	

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ENVIRONMENTAL BOREHOLE BH08

PROJECT NUMBER 11761	DRILLING DATE 17/03/2022	COORDINATES 33°53'20.77"S 151°10'49.83"E
PROJECT NAME Due Diligence Contamination A:	DRILLING COMPANY Stratacore Drilling	LOGGED BY CCC
CLIENT ANSTO	DRILLER Shannon Smith	CHECKED BY JTL
ADDRESS 81 Missenden Road, CAMPERDOWN NSW 2060	DRILLING METHOD Geoprobe - Push Tube	
	TOTAL DEPTH 5	

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
0.1				FILL: Mulch with dark brown loam fill & minor vegetation	Ground surface appears to have been previously disturbed, foreign materials including ceramics, plastics and cement debris visual on ground surface
		11761/BH08/AS01		FILL: Dark brown loam fill	
		11761/BH08/S1		FILL: Brown clay with light yellow sand	
0.5	0.1			FILL: Brown clay with crushed rock	
				CLAY: Red clay with grey clay	
				ROCK	
				FILL: Loose small black crushed rock	
				SAND+CLAY: Brown sand with brown clay	
1	0.1			CLAY: Dark brown clay with light brown sand	
				CLAY: Light brown clay with minor red clay	
				CLAY: White clay with minor red clay	
1.5	0.1			CLAY: Red clay	
				CLAY: Reddish brown clay	
				LOSS	
				CLAY: Red clay mix with grey clay	
2	0.1				
				CLAY: Red clay mix with grey clay and red shale rock	
2.5	0.0			CLAY: Red clay and grey clay	
				CLAY: Dark red clay	
3	0.0				
3.5	0.0				
4	0.0				
4.5	0.0			CLAY: White clay with red clay	
5	0.0	11761/BH08/S2			
				Termination Depth at: 5.0 m	

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ENVIRONMENTAL BOREHOLE BH09

PROJECT NUMBER 11761	DRILLING DATE 17/03/2022	COORDINATES 33°53'22.01"S 151°10'50.31"E
PROJECT NAME Due Diligence Contamination A:	DRILLING COMPANY Stratacore Drilling	LOGGED BY CCC
CLIENT ANSTO	DRILLER Shannon Smith	CHECKED BY JTL
ADDRESS 81 Missenden Road, CAMPERDOWN NSW 2060	DRILLING METHOD Geoprobe - Push Tube	
	TOTAL DEPTH 2.15	

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
	0.1			CONCRETE HARDSTAND	
		11761/BH09/S1		FILL: Black loose loam fill with crushed rock	
		11761/BH09/AS01		CLAY: Red clay	
0.5	0.1			CLAY: Red clay with white clay and red shale rock	
				CLAY: Red clay with white clay	
				CLAY: White clay with minor red clay	
				ROCK: Thin light grey rock slabs	
1	0.1			SAND: Brown sand	
				SAND+CLAY: White clay with brown sand	
1.5	0.0			CLAY: White clay with red clay	
2	0.0			LOSS	
		11761/BH09/S2		CLAY: White clay with red clay	
				Termination Depth at: 2.15 m	

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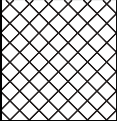
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ENVIRONMENTAL BOREHOLE BH10

PROJECT NUMBER 11761	DRILLING DATE 17/03/2022	COORDINATES 33°53'21.05"S 151°10'49.12"E
PROJECT NAME Due Diligence Contamination A:	DRILLING COMPANY N/A	LOGGED BY CCC
CLIENT ANSTO	DRILLER N/A	CHECKED BY JTL
ADDRESS 81 Missenden Road, CAMPERDOWN NSW 2060	DRILLING METHOD N/A	
	TOTAL DEPTH Location not assessed	

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
				FILL: Loose brown loam fill	Ground surface was visually assessed to contain demolition debris including plastics, ceramics, glass and cement fragments. Ground surface was soft due to loose fill material. Ground surface was also visually assessed to be previously disturbed. Anecdotal evidence from ANSTO indicates area surrounding location BH10 was disturbed for the installation of underground electrical services associated with the two (2) electrical control cabinets located within the north-western corner of the Site.
				Termination Depth at: 0.00 m	

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ENVIRONMENTAL BOREHOLE BH11

PROJECT NUMBER 11761	DRILLING DATE 17/03/2022	COORDINATES 33°53'21.61"S 151°10'49.30"E
PROJECT NAME Due Diligence Contamination A:	DRILLING COMPANY Stratacore Drilling	LOGGED BY CCC
CLIENT ANSTO	DRILLER Shannon Smith	CHECKED BY JTL
ADDRESS 81 Missenden Road, CAMPERDOWN NSW 2060	DRILLING METHOD Geoprobe - Push Tube	
	TOTAL DEPTH 5	

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
0.3			▲ ▲ ▲	CONCRETE HARDSTAND	
			▲ ▲ ▲	FILL: Dark brown clayey loam fill	
			▲ ▲ ▲	FILL: Reddish brown clay	
			▲ ▲ ▲	FILL: Orange sand	
0.5	0.2	11761/BH11/S1	▲ ▲ ▲	FILL: Black bitumen material	
		11761/BH11/AS01	▲ ▲ ▲	FILL: Light brown sand	
			▲ ▲ ▲	CLAY: Brown clay	
			▲ ▲ ▲	CLAY: Reddish brown clay	
1	0.2		▲ ▲ ▲		
1.5	0.1		▲ ▲ ▲	CLAY: White clay with red shale staining	
2	0.1		▲ ▲ ▲		
2.5	0.1		▲ ▲ ▲	CLAY: White clay with red shale	
3	0.0		▲ ▲ ▲	CLAY: White clay with red clay	
3.5	0.0		▲ ▲ ▲		
4	0.0		▲ ▲ ▲		
4.5	0.0		▲ ▲ ▲		
5	0.0	11761/BH11/S2	▲ ▲ ▲		
				Termination Depth at: 5.0 m	

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ENVIRONMENTAL BOREHOLE BH12

PROJECT NUMBER 11761	DRILLING DATE 17/03/2022	COORDINATES 33°53'22.13"S 151°10'49.56"E
PROJECT NAME Due Diligence Contamination A:	DRILLING COMPANY Stratacore Drilling	LOGGED BY CCC
CLIENT ANSTO	DRILLER Shannon Smith	CHECKED BY JTL
ADDRESS 81 Missenden Road, CAMPERDOWN NSW 2060	DRILLING METHOD Geoprobe - Push Tube	
	TOTAL DEPTH 5	

COMMENTS

Depth (m)	PID	Samples	Graphic Log	Material Description	Additional Observations
0.1	0.1	11761/BH12/S1		ASPHALT	
		11761/BH12/AS01		FILL: Black loose loam with crushed rock	
				FILL: Brown clay with minor crushed rock	
				CLAY: Reddish brown clay	
0.5	0.1			CLAY: White clay with red clay	
1	0.0			CLAY: Red sandy clay	
1.5	0.0				
2	0.0			CLAY: White clay with red clay	
2.5	0.0			CLAY: White clay	
3	0.0			CLAY: Reddish brown clay	
3.5	0.0				
4	0.0				
4.5	0.0				
5	0.0	11761/BH12/S2			
				Termination Depth at: 5.0 m	

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CERTIFICATE OF ANALYSIS

Certificate Number: 220810
Company / Organisation: Michael Polewski, ANSTO
Client Identification: Camperdown Soil Samples
AM Identification: CAM-240622-1 to 9
AM Request Number: 2201285
Analysis Requested: Gamma Spectrometry (Natural and Artificial)

Nine (9) soil samples from the Camperdown hospital site were received on 24 June 2022. The sample descriptions, together with corresponding Minerals identifications, are given in the results table.

The soil samples were dried at 105 °C and then pulverised prior to assay.

The pulverised samples were analysed for U-238 and Th-232 decay chain progeny and artificial radionuclides using gamma spectrometry according to ANSTO controlled documents AM-I-052-003 Preparation of Powdered Samples for Gamma Ray Analysis, AM-I-052-004 Counting Procedure using Maestro and AM-I-052-005 Gamma Spectrum Analysis of Solid Samples using GammaVision.

The results are given in Table 1 overleaf. The soil samples contained low concentrations of naturally occurring radionuclides from the U-238 and Th-232 decay chains, commensurate with worldwide background soil concentrations, as shown below. No artificial radionuclides were found in any of the samples tested.

Reference	Concentration in Soil (Bq/g)			
	²³⁸ U	²²⁶ Ra	²³² Th	⁴⁰ K
<i>Background Concentrations (general)</i>				
UNSCEAR ¹	0.035 (0.016 – 0.110)	0.035 (0.017 – 0.060)	0.030 (0.011 – 0.064)	0.40 (0.14 – 0.85)
IAEA ²	0.025 (0.010 – 0.050)	0.025 (0.010 – 0.050)	0.025 (0.007 – 0.050)	0.370 (0.10 – 0.70)

The total contained activities for the samples were calculated from the measured activity concentrations for the long-lived radionuclides, as given in Table 1. The values include the contribution of all radionuclides in the sample, both long- and short-lived, together with K-40

¹ UNSCEAR, *Ionising Radiation: Sources and Biological Effects*, United Nations Scientific Committee on the Effects of Atomic Radiation, 2000.

² IAEA, *Generic Procedures for Assessment and Response during a Radiological Emergency*, IAEA TECDOC Series No. 1162, 2000.

and excluding Th-232, which was not requested. Less than values assume zero concentration in the calculations.

In samples CAM-240622-3, -5 and -8, U-238, Ra-226 and Pb-210 were considered to be in secular equilibrium. The Pb-210 activity concentrations in the remaining six samples were found to be slightly higher than the U-238 and Ra-226 activity concentrations, which is not uncommon in soils. The Pb-210 activity concentrations, however, are still considered to be low.

The Th-232 decay chain radionuclides are considered to be in secular equilibrium in all samples.

Minimum Detectable Activity in Gamma Spectrometry

For any given radionuclide, the minimum detectable activity (MDA) in gamma spectrometry depends on a number of variables, including Compton background, peak energy, peak abundance, detector efficiency and sample matrix.

Unlike more conventional methods of analysis, for example, ICP and XRF, a definitive MDA for “gamma spectrometry” cannot be given for either solid or liquor samples. Each radionuclide in a gamma spectrum is assessed individually by the GammaVision® software, taking into account the parameters listed above, and an MDA derived for that particular radionuclide.

For “less than” values reported in Table 1, there were no peaks found in the gamma spectrum for these radionuclides and the reported value, commensurate with the MDA, is that calculated by the GammaVision® software.

A handwritten signature in dark ink, appearing to read "Sue Brown".

Dr Sue Brown, Senior Radiochemist

Date: 10 August 2022

Table 1
Uranium and Thorium Activity Concentrations (Bq/g)

Client ID	SP1	SP2	SP3	SP4	SP5	SP6	SP7	SP8	SP9
Location	South Entry Garden	East Entry Garden	South Grassed Area Car Park	North Garden Area Car Park	Eastern End of Northern Face	Middle of Northern Face	Western End of Northern Face	Northern End of Western Face	Southern End of Western Face
ANSTO ID	CAM-240622-1	CAM-240622-2	CAM-240622-3	CAM-240622-4	CAM-240622-5	CAM-240622-6	CAM-240622-7	CAM-240622-8	CAM-240622-9
<i>U-238 Decay Chain</i>									
U-238 (a)	0.034 ± 0.003	0.034 ± 0.004	0.026 ± 0.003	0.023 ± 0.003	0.030 ± 0.004	0.019 ± 0.004	0.024 ± 0.003	0.034 ± 0.004	0.017 ± 0.002
Th-230	< 0.039	< 0.072	< 0.035	< 0.037	< 0.042	< 0.043	< 0.043	< 0.046	< 0.027
Ra-226 (b)	0.027 ± 0.003	0.027 ± 0.003	0.023 ± 0.002	0.021 ± 0.002	0.025 ± 0.003	0.020 ± 0.002	0.021 ± 0.002	0.027 ± 0.003	0.017 ± 0.002
Pb-210	0.043 ± 0.004	0.044 ± 0.004	0.025 ± 0.003	0.056 ± 0.006	0.030 ± 0.004	0.029 ± 0.004	0.028 ± 0.003	0.032 ± 0.004	0.024 ± 0.002
<i>U-235 Decay Chain</i>									
U-235	< 0.0071	< 0.0077	< 0.0062	< 0.0069	< 0.0078	< 0.0068	< 0.0045	< 0.0050	< 0.0034
Pa-231	< 0.021	< 0.027	< 0.017	< 0.021	< 0.021	< 0.022	< 0.022	< 0.025	< 0.020
Ac-227 (c)	< 0.0038	< 0.0047	< 0.0032	< 0.0034	< 0.0040	< 0.0037	< 0.0038	< 0.0040	< 0.0027
<i>Th-232 Decay Chain</i>									
Th-232	not requested	not requested	not requested	not requested	not requested	not requested	not requested	not requested	not requested
Ra-228 (d)	0.035 ± 0.004	0.037 ± 0.004	0.039 ± 0.004	0.030 ± 0.003	0.037 ± 0.004	0.033 ± 0.003	0.037 ± 0.004	0.044 ± 0.004	0.024 ± 0.002
Th-228 (e)	0.036 ± 0.004	0.037 ± 0.004	0.037 ± 0.004	0.026 ± 0.003	0.033 ± 0.003	0.031 ± 0.003	0.032 ± 0.003	0.040 ± 0.004	0.020 ± 0.002
K-40	0.16 ± 0.02	0.16 ± 0.02	0.17 ± 0.02	0.21 ± 0.02	0.20 ± 0.02	0.24 ± 0.02	0.15 ± 0.02	0.41 ± 0.04	0.26 ± 0.03
Total Contained Activity (f)	0.91	0.92	0.82	0.84	0.87	0.81	0.75	1.2	0.69

(a) Based on the measured concentration of Th-234, assuming secular equilibrium.

(b) Based on the measured concentrations of Pb-214 and Bi-214, assuming secular equilibrium.

(c) Gamma spectrometry. Based on the measured concentration of Th-227, assuming secular equilibrium.

(d) Gamma spectrometry. Based on the measured concentration of Ac-228, assuming secular equilibrium.

(e) Gamma spectrometry. Based on the measured concentration of Pb-212, assuming secular equilibrium.

(f) Refer to explanation in the text.

AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION



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CIVIL STORMWATER ENGINEERING SERVICES – EROSION AND SEDIMENT CONTROL

8816000 | ANSTO Building 81 - NRCF
81 Missenden Road, Camperdown

DOCUMENT CONTROL

Rev	Date	Description of change	Status
01	21/10/2024	Issued for Information	Current

APPROVALS

Rev	Author	Reviewer	Approver
01	Reagan Ho	Isabella Stewart	James Georgiades

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CIVIL ENGINEERING SERVICES

1. INTRODUCTION

Warren Smith Consulting Engineers (WSce) has been engaged by ANSTO (Australian Nuclear Science and Technology Organisation) to prepare a Sediment and Erosion Control plan for the potential proposed demolition zone between Hospital Rd and Grose St. This report will address the following: -

- Existing site conditions including existing stormwater infrastructure drainage strategy;
- Proposed sediment and erosion control.

1.1 BACKGROUND

The development site is located between Hospital Rd and Grose St, approximately 5 km south-west of the Sydney CBD. The site is bound by Hospital Rd to the south-west, Grose St to the north-east and NSW Health Statewide Biobank on the north, and Naamuru Parent and Baby Unit RPAH to the south. Refer to **Figure 1.1** for an aerial view of the development and the proposed works zone.



Figure 1.1 : Aerial View of Development Site (Source: ANZ)

2. EXISTING STORMWATER DRAINAGE

A site visit was undertaken on 8 October 2024 to identify the existing site's stormwater drainage strategy and overland flow paths. Upon inspection, the site's topography was predominately grading from east to west, with the high point near the main entry (east) and the low end at the corner of Hospital Rd and the through road of the neighbouring 25 Lucas St site. Refer to Figure 2.1 below for the site's high and low points.

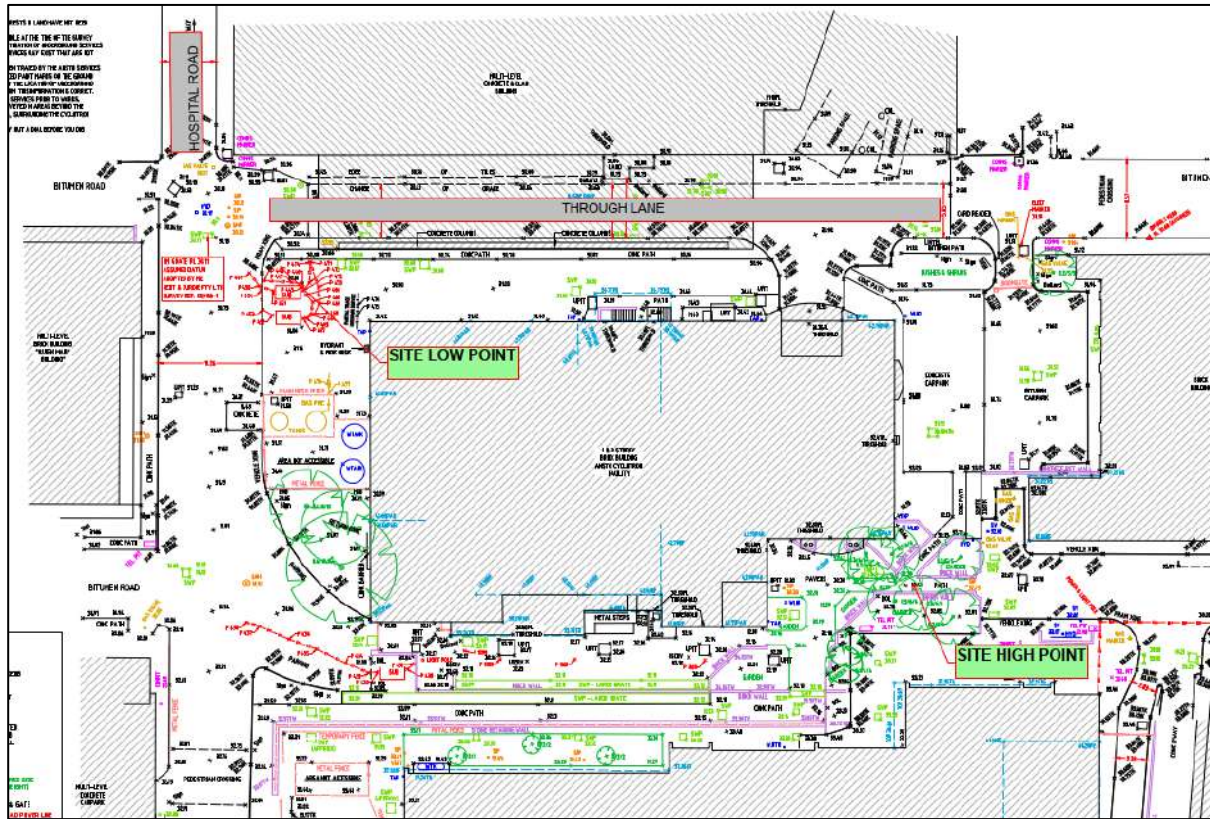


Figure 2.1: Existing Stormwater Infrastructure

The in-ground stormwater pit and pipe network followed a similar connection strategy. However, almost all inspected pits had varying levels of ponding / trapped water. The degree of ponding within the pits implies a major blockage within the site's network or at the downstream connections into the Council's system. Without access to CCTV footage of the pipes, it is not possible to determine where the blockage is. However, the blockage is likely a combination of the internal site system and the council's network being filled with debris. We recommend jetting and clearing all the stormwater pipes at a minimum. If the blockage persists, a CCTV inspection may be required. Refer to Figure 2.2 below for an example of the degree of ponding within the stormwater pits within dry weather.



Figure 2.2: Ponding/ Trapped water in pit

The pedestrian thoroughfare along the south of the site appears to be a concentrated sag zone with minimal surface grade to convey overland flow. The existing large, grated trench drain appears to be in place to manage with the localised sag. Given the relatively small catchment area and the large, grated inlet capacity, it is possible that the system is sized to cater for the 1% AEP major storm event. A detailed DRAINS model analysis will be required to confirm this. The system was holding stormwater at the time of inspection, which further supports the possibility of a major blockage within the existing pit and pipe network. Refer to Figure 2.3 and images below of the concentrated sag zone.

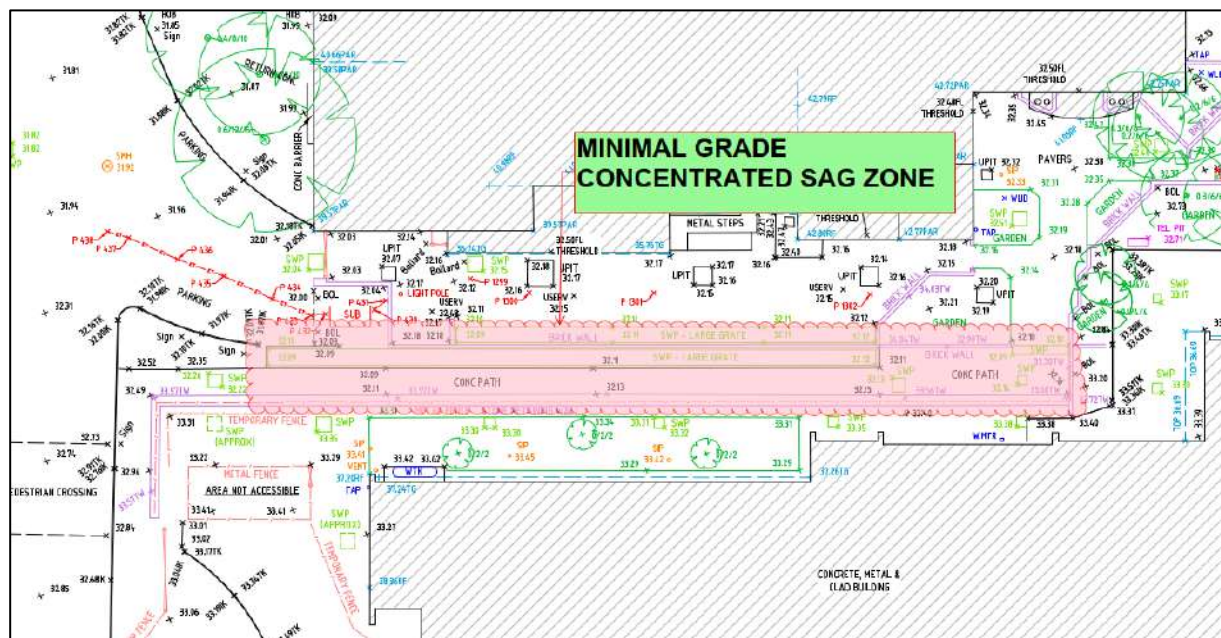


Figure 2.3: Concentrated Sag Zone



The natural low point of the site is at the corner of Hospital Rd and the through road of the neighbouring 25 Lucas St site. Existing electrical substations are also located at this point. Considering sediment and erosion control measures, the proposed above-ground sediment basin is to be positioned near the site's low point to allow gravity drainage of the surface flows from the wider site catchment. The sediment basin is to ensure adequate clearance and no impacts to the below-ground utilities servicing the substation. Refer to Figure 2.4 below for the site's low point.



Figure 2.4: Site Low point

3. SEDIMENT AND EROSION CONTROL

The Contractor for the works is required to provide Sedimentation and Erosion Control in accordance with the general requirements outlined below.

3.1 SITE PROTECTION MEASURES

It is proposed to provide the following in order to inhibit the movement of sediment off the site during the demolition and construction phases.

3.1.1 SITE ACCESS

Construction vehicles leaving the site shall be required to pass over a Temporary Construction Vehicle Entry consisting of a 1.5m long by 3m wide 'cattle rack'.

3.1.2 SEDIMENT CONTROL

All exposed earth areas where it may be possible for runoff to transport silt down slope shall be protected with a sediment and erosion control silt fence generally installed along the boundaries of the site.

The fence will be constructed in accordance with details provided by the Department of Conservation and Land Management incorporating geotextile fabric which will not allow suspended particles greater than 50mg/L non-filterable solids to pass through, and as such comply with the appropriate provisions of the Clean Waters Act 1970.

The construction of the silt fence will include the following:-

- Geotextile fabric buried to a maximum of 100mm below the surface;
- Overlapping any joins in the fabric, and;
- Turning up on the ends for a length of 1 metre in order to prevent volumes of suspended solids escaping in a storm event.

Refer to **Figure 3.1** for details.

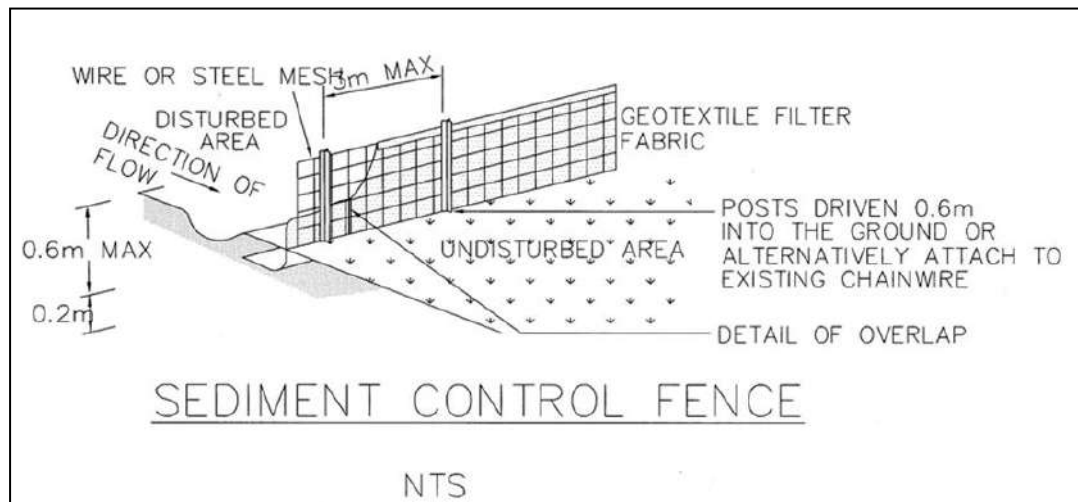


Figure 3.1: Sediment Control Fence Illustration

Existing stormwater infrastructure is also required to be protected from incoming sediment using the following methods:-

- Any Council owned road kerb entry and/or gully pits will be protected by Filter Bales and EcoSocks. Additional protection will be provided by inserting Water Clean Filter Cartridges into the gully opening, and;
- Internal site drainage pits shall be protected by Sediment Traps consisting of hay bales.

Please refer to **Figure 3.2**, **Figure 3.3** and **Figure 3.4** for details.

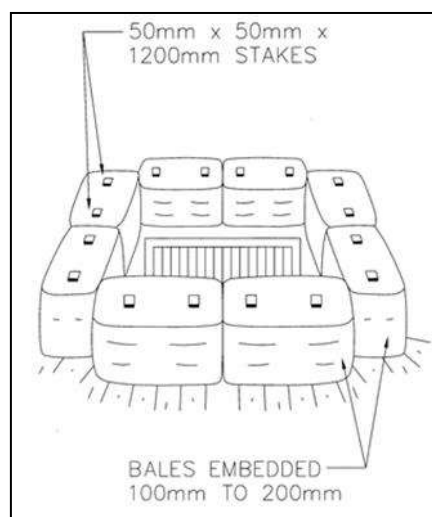


Figure 3.2: Stormwater Pit Sediment Trap (NTS)

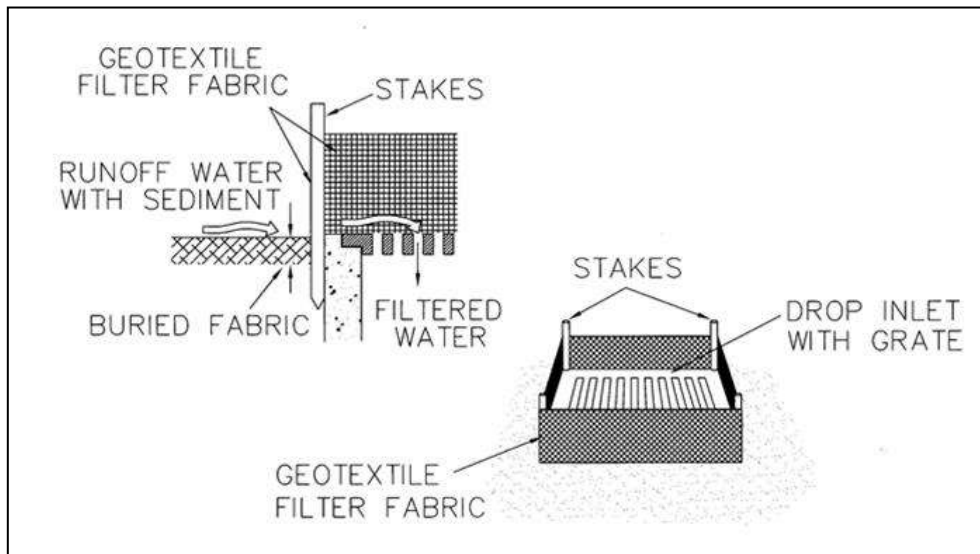


Figure 3.3: Geotextile Filter Fabric Drop Inlet Sediment Trap (NTS)



What are FilterBales?

Water Clean FilterBales are a unique new patented 7 stage sediment filter device developed to substantially reduce the migration of sediment and contaminants into drainage systems while allowing filtered water to easily pass through. FilterBales reduce customers' time and money by providing solutions to comply with environmental and regulatory requirements.

Durable, Dependable, Reusable. Replacing hay bales and other inadequate attempts to stop sediment run-off, FilterBales are durable and re-useable, effectively stopping your money from "pouring down the drain". They are also lightweight and easy to handle. Replaceable Water Clean Filter Cartridges guarantee peak performance is maintained.

Ask your local FilterBales stockist about replacement frequencies in your area. Cartridges and filter covers should be changed when the infiltration rate decreases. Water Clean FilterBales are suitable for a wide range of sediment and water management situations and can be easily secured in place for long term use. The unique multi-directional filter system allows you to position Water Clean FilterBales in any direction without reducing performance. Water Clean FilterBales can be fixed to concrete or bitumen surfaces using an epoxy mortar-binder or fixed to earth surfaces using 6-10 mm pegs or stakes. When positioning, the side with the red reflective marker should be facing traffic.



1. **FilterBales frames** are a perforated plastic structure made from recycled wheelie bins, battery cases, milk bottles etc.

2. **Filter medium** (bio engineered soil media) used in the filter cartridges is made from a special blend of recycled organic (RO) materials from kerbside and vegetation drop off centres. The RO hosts enhanced naturally occurring micro-organisms. The blend also contains natural minerals to capture nutrients. The filter medium is as safe as normal soil.

3. **FilterBales** have a seven (7) stage filtration system:

1. In through the filter bag
2. Through the perforated plastic structure wall
3. In through the filter cartridge bag
4. Through the bio engineered filter medium
5. Out through the filter cartridge bag
6. Out through the perforated plastic structure wall
7. Out through the filter bag

4. **The filter bag** is made from 300-micron (one third of a millimetre) pore size geotextile. This is the first stage that filters much of the sediment and other suspended solids from the run-off water. The geotextile is designed to stop sediment and reduce clogging but allow water to pass through easily. The filter cartridge bags are made from a similar geotextile.

5. **FilterBales** work effectively up to a one-in-one-year 48 hours, 100 mm "storm events". This is the largest storm event experienced since the commercialisation of FilterBales. Having handled this easily, Filter Bales are considered capable of handling much greater "storm events". During these storm events FilterBales were used inside gully pits in one application and on the ground surrounding the gully pit in another application.

6. **EcoSocks** are made from a similar geotextile to the filter cartridge bags and contain the same bio engineered soil media as the FilterBales. They appear able to stand up to as much wear and tear as a sandbag.

7. **FilterBales** are much lighter (at around 15 kgs dry weight) than hay bales. This reduces exposure to Occupational Health and Safety problems.

Product Range

Item No.	Description	
HFB001	High FilterBale , suitable for high flow situations and higher retention time applications. Contains two standard size WaterClean Filter Cartridges in upright formation to treat contaminated waters. (605mm x 485mm x 450mm)	
LFB002	Low FilterBale , suitable for low flow situations and kerb & gutter applications. Multi-directional module containing two standard size WaterClean Filter Cartridges. (605mm x 485mm x 220mm)	
ESF004	Directional EcoSock , can be used in conjunction with FilterBales to direct water. Will also provide some sediment filtration from seepage through bio-remediating media contained within the EcoSock (1135mm x 160mm x 30mm)	

Accessories

Item No.	Description	
FCR004	WaterClean Filter Cartridges contain a unique blend of fixating and bio-remediating products that treat common pollutants. To achieve maximum performance, each FilterBale uses two WaterClean Filter Cartridges. (440mm x 400mm x 100mm)	
HBC005 (High bale)	Replaceable FilterBale covers , made from specially designed geotextile. FilterBale covers have a standard aperture of 300 microns.	
HBC006 (Low bale)	Replaceable FilterBale covers , made from specially designed geotextile. FilterBale covers have a standard aperture of 300 microns.	

Figure 3.4: Erosion Control Filter Products

3.1.3 SEDIMENT BASINS

As the total disturbed development area is greater than 2500 m², a calculation has been undertaken in line with the 'Managing Urban Stormwater: Soils and construction' Blue Book requirements to determine whether a sediment basin is required for the site.

The sediment basin has been sized in accordance with the Blue Book, as follows:

Sediment Basin Calculation

- Total catchment area: Approx. 0.973 ha
- Disturbed catchment area: Approx. 0.973 ha
- RUSLE R-factor: 2,370
- Slope gradient: 1.5%

$$\text{Basin volume} = \text{settling zone volume} + \text{sediment storage volume}$$

Settling Zone Volume

The settling zone volume for Type D soils is calculated to contain all runoff expected from the 80th percentile, 5-day rainfall depth:

$$\text{Settling Zone Volume} = 10 \times CV \times A \times R_{(85\text{thile, 5 day})}$$

- $CV = 0.42$
- $A = \text{area (ha)}$
- $R = 29.7 \text{ mm}$

$$\text{Settling Zone Volume} = 10 \times 0.42 \times 0.973 \times 29.7 = 122 \text{ m}^3$$

Sediment Storage Zone Volume

The sediment storage volume is normally taken as 50% of the capacity of the settling zone or as two months soil loss as calculated by the RUSLE, whichever is the larger. The settling zone volumes are as above, giving a potential sediment storage volume of the below:

$$\text{Sediment Storage} = 122/2 = 61 \text{ m}^3$$

However, two months (0.17 years) soil loss is:

Sediment storage zone Type D volume = $0.17 A (R \times K \times LS \times P \times C)/1.3 \text{ m}^3$

- 0.17 is a factor to convert the annual calculated soil loss to the 2-month soil loss
- A: is the disturbed area
- R: Rainfall Erosivity Factor = 2,290
- K: Soil Erodibility Factor = 0.03
- LS: Slope Length/Gradient Factor = 0.3
- P: Erosion Control Practice Factor = 1.3
- C: Cover Factor = 1.0 for bare soil
- 1.3 is a factor to convert tonnes to cubic metres, assuming a typical density of saturated sediment of 1.3

Storage zone volume = $0.17 \times 0.973 \times (2,290 \times 0.03 \times 0.3 \times 1.3 \times 1.0)/1.3 = 3.4 \text{ m}^3$

Total Basin Volume

Total basin volume = settling zone volume + storage volume

Total basin volume = $122+61= 183 \text{ m}^3$

Refer to Erosion and Sediment Control Plans within Appendix A.

The following works are required to be carried out during installation of the sediment basins:

- Installation of a fence around the perimeter of the basin;
- Removal of existing reeds;
- Installation of rip rap to allow for bobcat access for periodic removal of sediment;
- Installation of a perforated riser outlet pipe as per the detail shown in Figure and;
- Connection of the riser pipe to an existing pit.

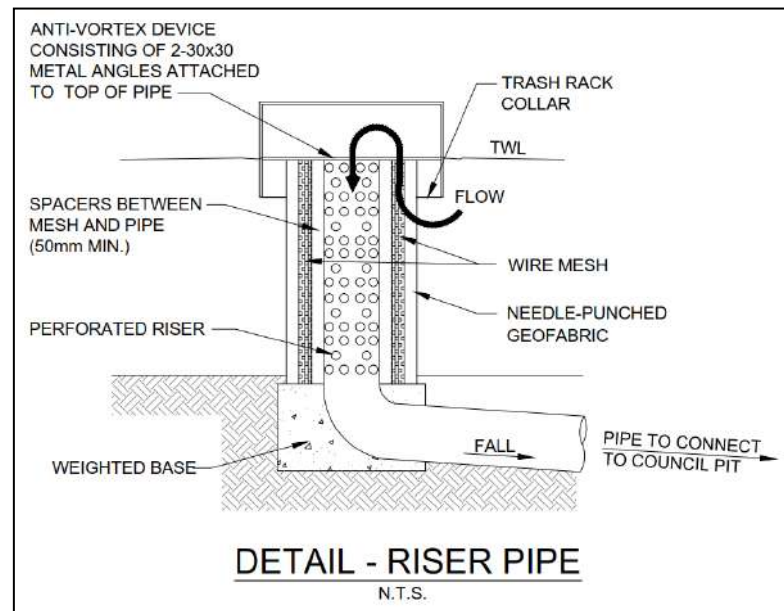


Figure 3.5: Sediment Basin Outlet Pipe Detail

3.2 TEMPORARY STORMWATER SYSTEM (WHERE REQUIRED)

Site runoff within the zones of the excavation will be drained into a central holding well within the excavation. Runoff will be allowed to settle out suspended particles and debris, and an acceptable water of 50mg per litre of Non Filterable Residues (NFR) is required to be achieved prior to discharge.

3.2.1 DUST CONTROL

The following dust control procedures will be adhered to:

- Loose loads entering or leaving the site will be securely covered by a tarpaulin or like material in accordance with RMS and local Council Guideline;
- Soil transport vehicles will use the single main access to the site;
- There will be no burning of any materials on site;
- Water sprays will be used across the site to suppress dust. The water will be applied either by water sprinklers or water carts across ground surfaces whenever the surface has dried out and has the potential to generate visible levels of dust either by the operation of equipment over the surface or by wind. The watercraft will be equipped with a pump and sprays;
- Spraying water at the rate of not less than three (3) L/s and not less than 700kPa pressure. The area covered will be small enough that surfaces are maintained in a damp condition and large enough that runoff is not generated. The water spray equipment will be kept on site during the construction of the works;
- During excavation all trucks/machinery leaving the site will have their wheels washed and/or agitated prior to travelling on Council Roads, and;
- Fences will have shade cloth or similar fabric fixed to the inside of the fence.

3.2.2 MAINTENANCE

- It will be the responsibility of the contractor to ensure sediment and erosion control devices on site are maintained. The devices shall be checked daily and the appropriate maintenance undertaken as necessary;
- Prior to the closing of the site each day, the road shall be swept and materials deposited back onto the site.;
- Gutters and roadways will be kept clean regularly to maintain them free of sediment;
- Appropriate covering techniques, such as the use of plastic sheeting will be used to cover excavation faces, stockpiles and any unsealed surfaces;
- The area of soils exposed at any one time will be minimised wherever possible by excavating in a localised progressive manner over the site; and,
- Materials processing equipment suitably comply with regulatory requirements. The protection will include the covering of feed openings with rubber curtains or socks.

It is considered that by complying with the above, appropriate levels of protection are afforded to the site, the adjacent public roads, footpaths and environment.

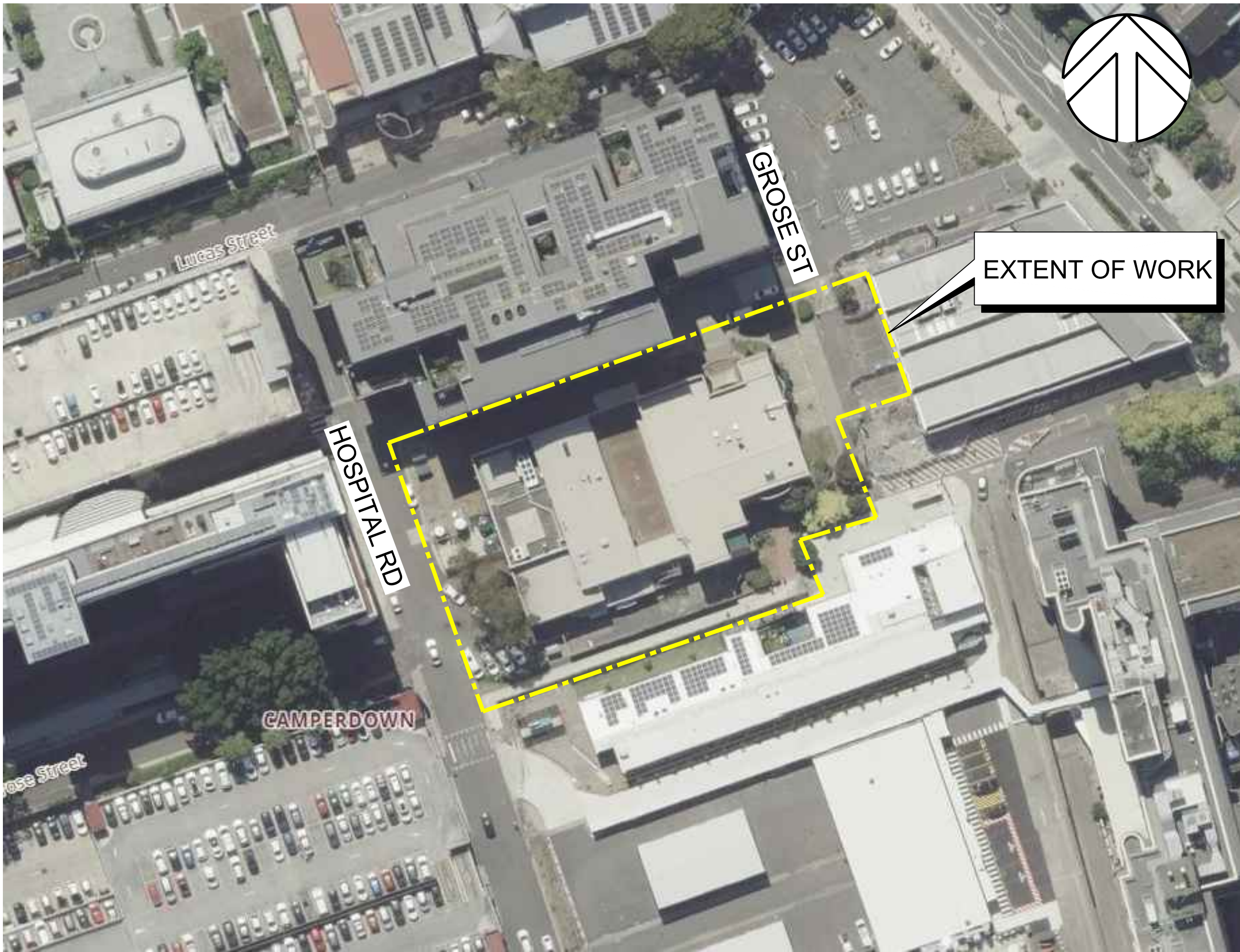
APPENDIX A – EROSION AND SEDIMENT CONTROL PLANS

ANSTO BUILDING 81 - NRCF CAMPERDOWN

81 MISSENDEN ROAD, CAMPERDOWN

EROSION AND SEDIMENT CONTROL

ISSUE FOR INFORMATION



LOCALITY AERIAL
NOT TO SCALE

SOURCE : ANZ

Sheet List Table		
DWG No	DRAWING TITLE	REV
C1.00 Cover Sheet & Specification Notes		
C1.01	Cover Sheet & Specification Notes	1
C2.00 Sediment and Erosion Control		
C2.01	Sediment & Erosion Control Plan	1
C2.02	Sediment & Erosion Control Details	1

GENERAL		RESTORATION:
G1.	DESIGN HEREIN HAS BEEN PREPARED BY WARREN SMITH CONSULTING CIVIL ENGINEERS PTY LTD, LEVEL 20, 66 GOULBURN ST, SYDNEY NSW 2000. TEL:- (02) 9299 1312, FAX:- (02) 9290 1295.	RES1. RESTORE ALL TRAFFIC AREAS TO PRE EXISTING CONDITION.
G2.	ALL DIMENSIONS IN MILLIMETRES UNO. REDUCED LEVELS AND CHAINAGES ARE IN METRES. DO NOT SCALE DRAWINGS. USE FIGURED DIMENSIONS.	RES2. FOR ALL SURFACES OTHER THAN IN TRAFFIC AREAS RESTORE DISTURBED SURFACES TO PRE-EXISTING CONDITIONS AND COMPACT AS SPECIFIED.
G3.	THE PROPOSED WORKS DETAILED HEREIN SHALL BE CONSTRUCTED TO THE REQUIREMENTS OF COUNCIL GENERALLY AS DETAILED HEREUNDER.	RES3. RESTORE ALL AUTHORITY OWNED AREAS TO COUNCIL STANDARDS
G4.	ALL EXISTING SERVICES SHALL BE VERIFIED FOR DEPTH AND HORIZONTAL POSITION BY PHYSICAL MEANS PRIOR TO EXCAVATION. ANY DISCREPANCIES SHALL BE BROUGHT FORTHWITH TO THE PROJECT MANAGERS ATTENTION.	PROTECTION OF FLORA - REFER SPECIFICATION
G5.	REFERENCE SHALL BE MADE TO THE CONSTRUCTION MANAGEMENT PLAN FOR ALL SITE WORKS DETAILED HEREIN.	1. ANY TRENCHES WITHIN 3m OF TREES SHALL BE HAND DUG TO AVOID DAMAGE TO TREE ROOTS.
G6.	CIVIL PLANS IN THIS PACKAGE ADOPT THE ORIGINAL SITE SURVEY COORDINATE SYSTEM. REFER TO SURVEY 1736 PROVIDED BY S.M. DATED DEC 2022.	2. IF IT IS CONSIDERED NECESSARY TO PERFORM ANY WORK ON TREES, INCLUDING TRIMMING, LOPPING, ROOT CUTTING, REPAIR AND REMOVAL, APPLICATION IN WRITING SHALL BE MADE BY THE CONTRACTOR TO THE SUPERINTENDENT. ANY WORK PERMITTED TO BE DONE ON TREES TO BE RETAINED SHALL BE PERFORMED IN ACCORDANCE WITH THE ARBORISTS REPORT.
G7.	ALL 3D/TIN/DWG FILES ARE FOR INFORMATION ONLY AND ARE TO BE USED AS A SUPPLEMENT TO THE ISSUED DRAWINGS. IN THE CASE OF ANY DISCREPANCIES, THE INFORMATION WITHIN THE ISSUED DRAWINGS TAKES PRECEDENCE OVER THE MODEL. ANY CHANGES OR MODIFICATIONS MADE TO THE MODELLING FILES BY THE RECIPIENT, OR A THIRD PARTY, ARE AT THEIR DISCRETION.	3. MATURE TREES AND SHRUBS ARE TO BE REMOVED IN ACCORDANCE WITH THE ARBORISTS REPORT.
	0.5% FOR 225 mm DIA 0.5% FOR 300 mm DIA 0.4% FOR 375 mm DIA	AUTHORITY STANDARDS
		LGA 1. THE DRAWINGS HEREIN SHALL BE READ IN CONJUNCTION WITH --- COUNCIL STANDARDS & SPECIFICATIONS WHICH SHALL OVERRIDE SPECIAL DETAILS SHOWN ON THE DRAWINGS.
		PROTECTION OF TREES
		T1. WHERE STORMWATER DRAINAGE IS LAID WITHIN THE VICINITY OF TREES / CANOPIES OF TREES, WORK IS TO BE COMPLETED TO THE PROJECT ARBORISTS REQUIREMENTS AND SPECIFICATIONS.

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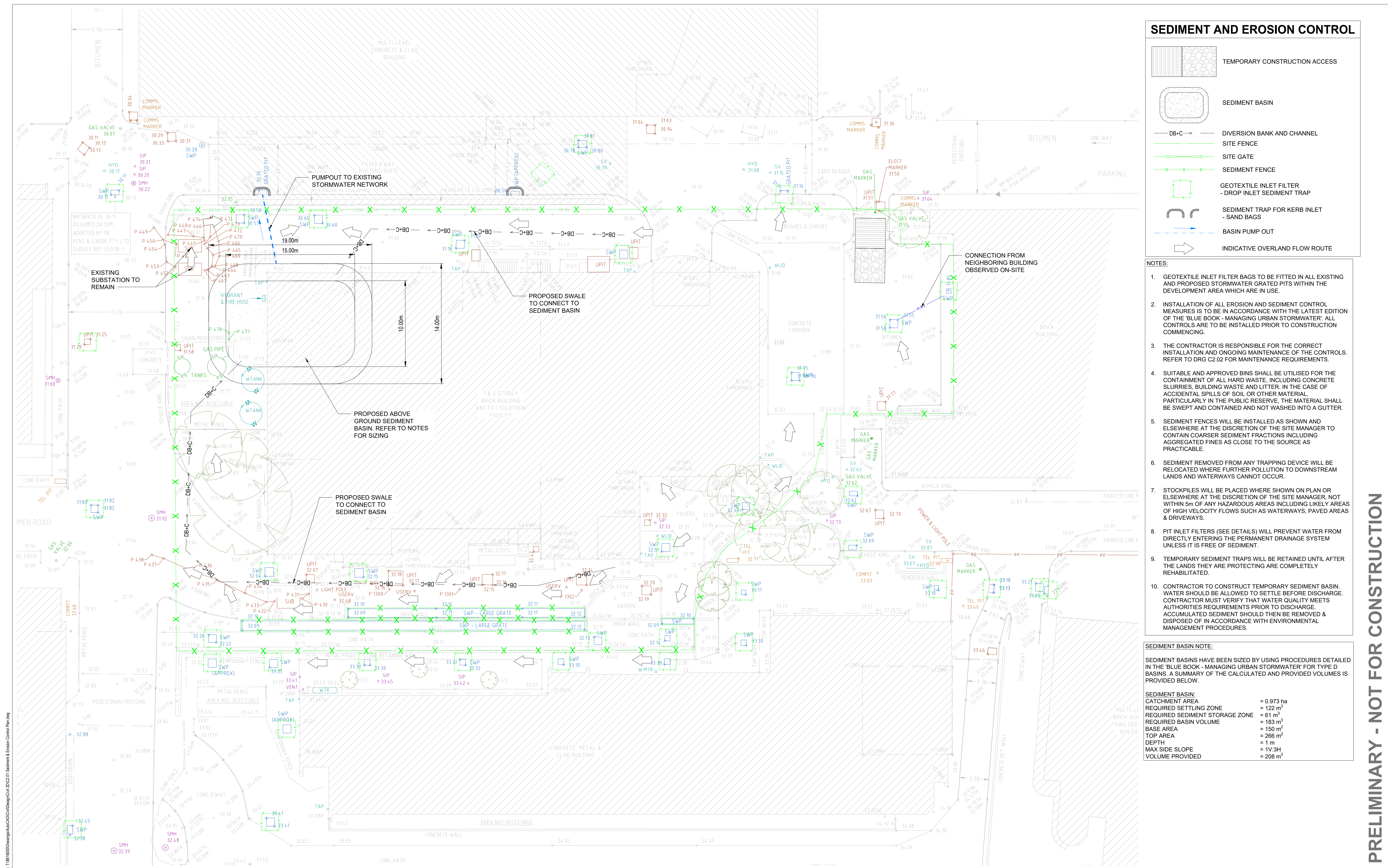
CLIENT	
PROJECT MANAGER	
ARCHITECT	



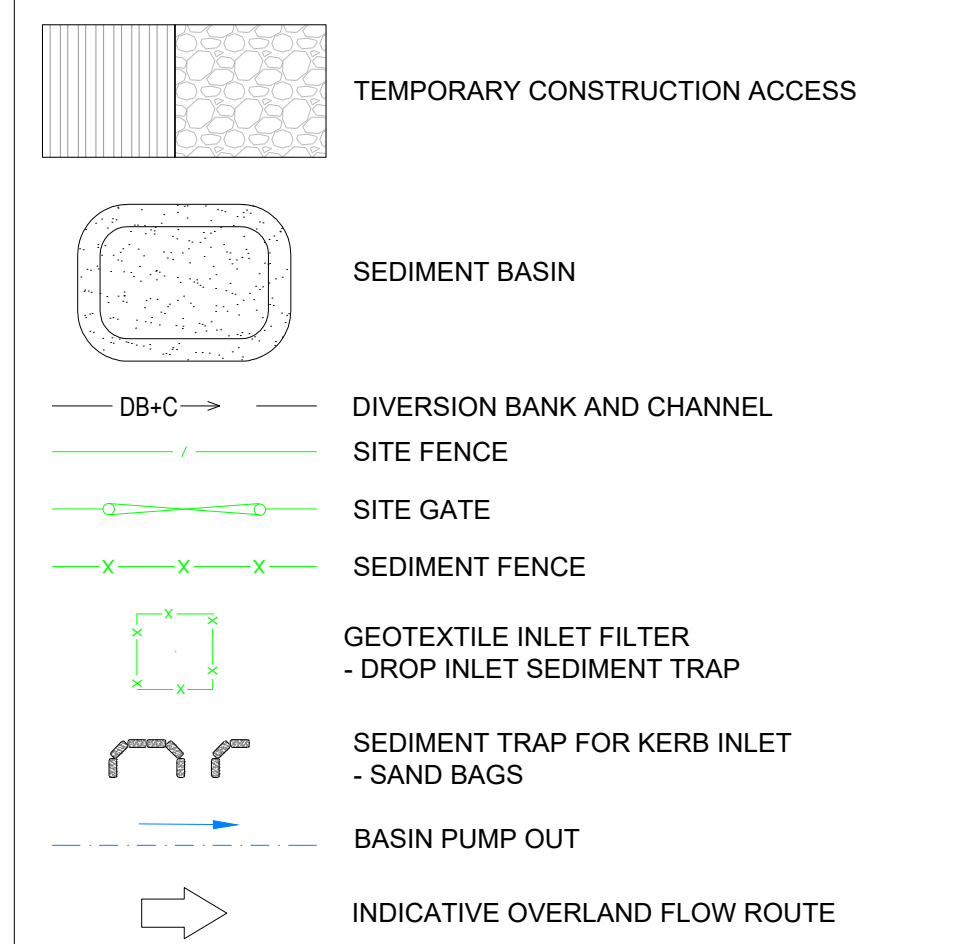
WSce Pty Ltd
ACN 668 655 141
ABN 75 668 655 141
info@wsce.com.au
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COVER SHEET & SPECIFICATION NOTES				
SCALE AS SHOWN	DRAWN R.H.	DESIGNED I.S.	CHECKED J.G.	APPROVED —
JOB No. 8816000		DRAWING No. C1.01	ISSUE 1	
DATE OCTOBER 2024	STATUS ISSUE FOR INFORMATION			



SEDIMENT AND EROSION CONTROL



- NOTES:
- GEOTEXTILE INLET FILTER BAGS TO BE FITTED IN ALL EXISTING AND PROPOSED STORMWATER GRATED PITS WITHIN THE DEVELOPMENT AREA WHICH ARE IN USE.
 - INSTALLATION OF ALL EROSION AND SEDIMENT CONTROL MEASURES IS TO BE IN ACCORDANCE WITH THE LATEST EDITION OF THE 'BLUE BOOK - MANAGING URBAN STORMWATER'. ALL CONTROLS ARE TO BE INSTALLED PRIOR TO CONSTRUCTION COMMENCING.
 - THE CONTRACTOR IS RESPONSIBLE FOR THE CORRECT INSTALLATION AND ONGOING MAINTENANCE OF THE CONTROLS. REFER TO DRG C2.02 FOR MAINTENANCE REQUIREMENTS.
 - SUITABLE AND APPROVED BINS SHALL BE UTILISED FOR THE CONTAINMENT OF ALL HARD WASTE, INCLUDING CONCRETE SLURRIES, BUILDING WASTE AND LITTER. IN THE CASE OF ACCIDENTAL SPILLS OF SOIL OR OTHER MATERIAL, PARTICULARLY IN THE PUBLIC RESERVE, THE MATERIAL SHALL BE SWEEPED AND CONTAINED AND NOT WASHED INTO A GUTTER.
 - SEDIMENT FENCES WILL BE INSTALLED AS SHOWN AND ELSEWHERE AT THE DISCRETION OF THE SITE MANAGER TO CONTAIN COARSER SEDIMENT FRACTIONS INCLUDING AGGREGATED FINES AS CLOSE TO THE SOURCE AS PRACTICABLE.
 - SEDIMENT REMOVED FROM ANY TRAPPING DEVICE WILL BE RELOCATED WHERE FURTHER POLLUTION TO DOWNSTREAM LANDS AND WATERWAYS CANNOT OCCUR.
 - STOCKPILES WILL BE PLACED WHERE SHOWN ON PLAN OR ELSEWHERE AT THE DISCRETION OF THE SITE MANAGER, NOT WITHIN 5m OF ANY HAZARDOUS AREAS INCLUDING LIKELY AREAS OF HIGH VELOCITY FLOWS SUCH AS WATERWAYS, PAVED AREAS & DRIVEWAYS.
 - PIT INLET FILTERS (SEE DETAILS) WILL PREVENT WATER FROM DIRECTLY ENTERING THE PERMANENT DRAINAGE SYSTEM UNLESS IT IS FREE OF SEDIMENT.
 - TEMPORARY SEDIMENT TRAPS WILL BE RETAINED UNTIL AFTER THE LANDS THEY ARE PROTECTING ARE COMPLETELY REHABILITATED.
 - CONTRACTOR TO CONSTRUCT TEMPORARY SEDIMENT BASIN. WATER SHOULD BE ALLOWED TO SETTLE BEFORE DISCHARGE. CONTRACTOR MUST VERIFY THAT WATER QUALITY MEETS AUTHORITIES REQUIREMENTS PRIOR TO DISCHARGE. ACCUMULATED SEDIMENT SHOULD THEN BE REMOVED & DISPOSED OF IN ACCORDANCE WITH ENVIRONMENTAL MANAGEMENT PROCEDURES.

SEDIMENT BASIN NOTE:

SEDIMENT BASINS HAVE BEEN SIZED BY USING PROCEDURES DETAILED IN THE 'BLUE BOOK - MANAGING URBAN STORMWATER' FOR TYPE D BASINS. A SUMMARY OF THE CALCULATED AND PROVIDED VOLUMES IS PROVIDED BELOW.

SEDIMENT BASIN:	
CATCHMENT AREA	= 0.973 ha
REQUIRED SETTLING ZONE	= 122 m ³
REQUIRED SEDIMENT STORAGE ZONE	= 61 m ³
REQUIRED BASIN VOLUME	= 183 m ³
BASE AREA	= 150 m ²
TOP AREA	= 266 m ²
DEPTH	= 1 m
MAX SIDE SLOPE	= 1V:3H
VOLUME PROVIDED	= 208 m ³

DO NOT SCALE FROM DRAWINGS, CHECK & VERIFY ALL DIMENSIONS & LEVELS BEFORE COMMENCEMENT OF ANY WORK.

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REVISION	AMENDMENT	DATE	REVISION	AMENDMENT	DATE
1	ISSUE FOR APPROVAL	21/01/24			

CLIENT

ANSTO

PROJECT

ANSTO BUILDING 81 - NRCF CAMPERDOWN
81 MISSENDEN ROAD, CAMPERDOWN

PREPARED BY

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WSce

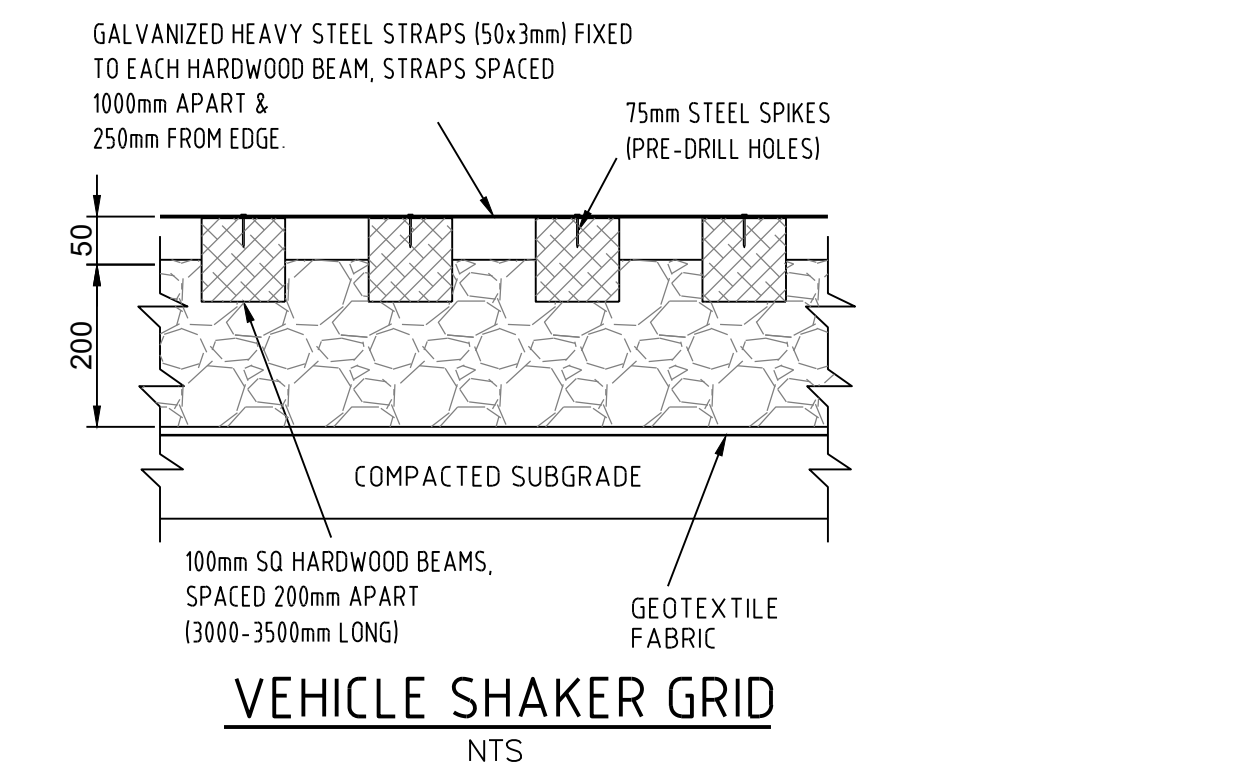
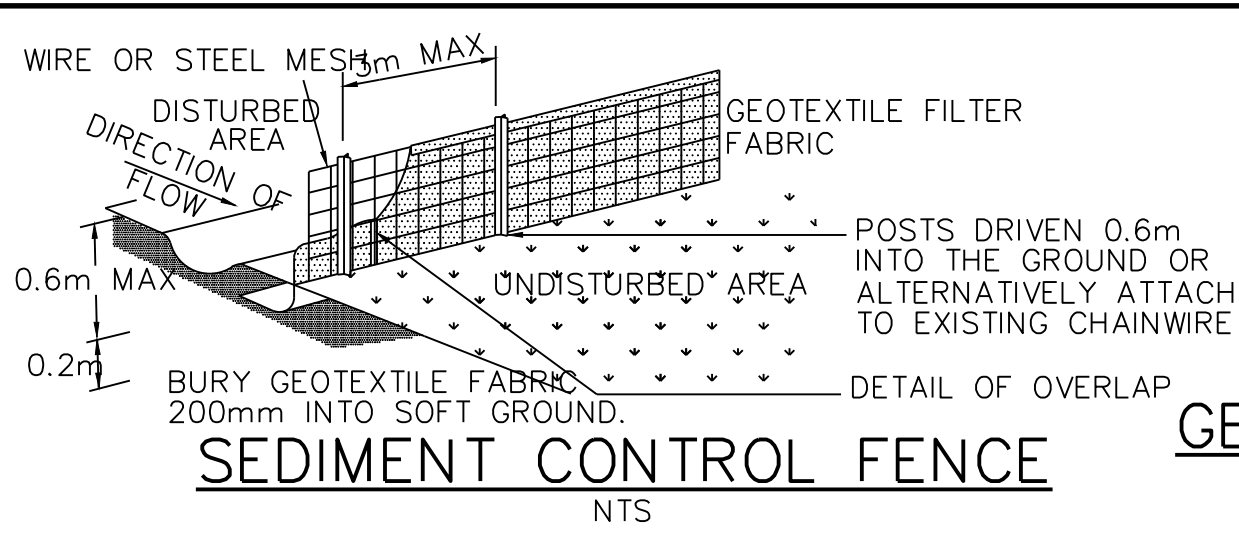
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TITLE				
SEDIMENT & EROSION CONTROL PLAN				
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AS SHOWN	R.H.	I.S.	J.G.	--
JOB No.	DRAWING No.		ISSUE	
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DATE	STATUS			
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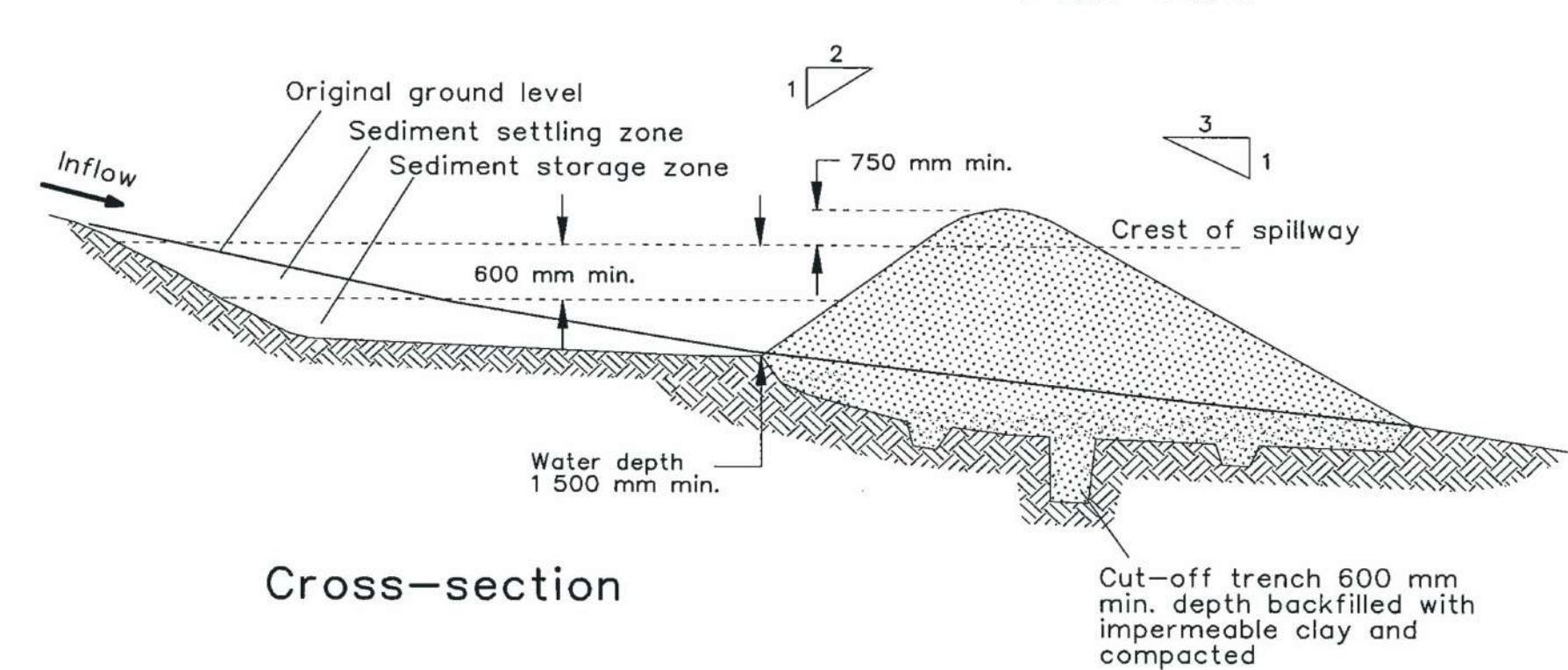
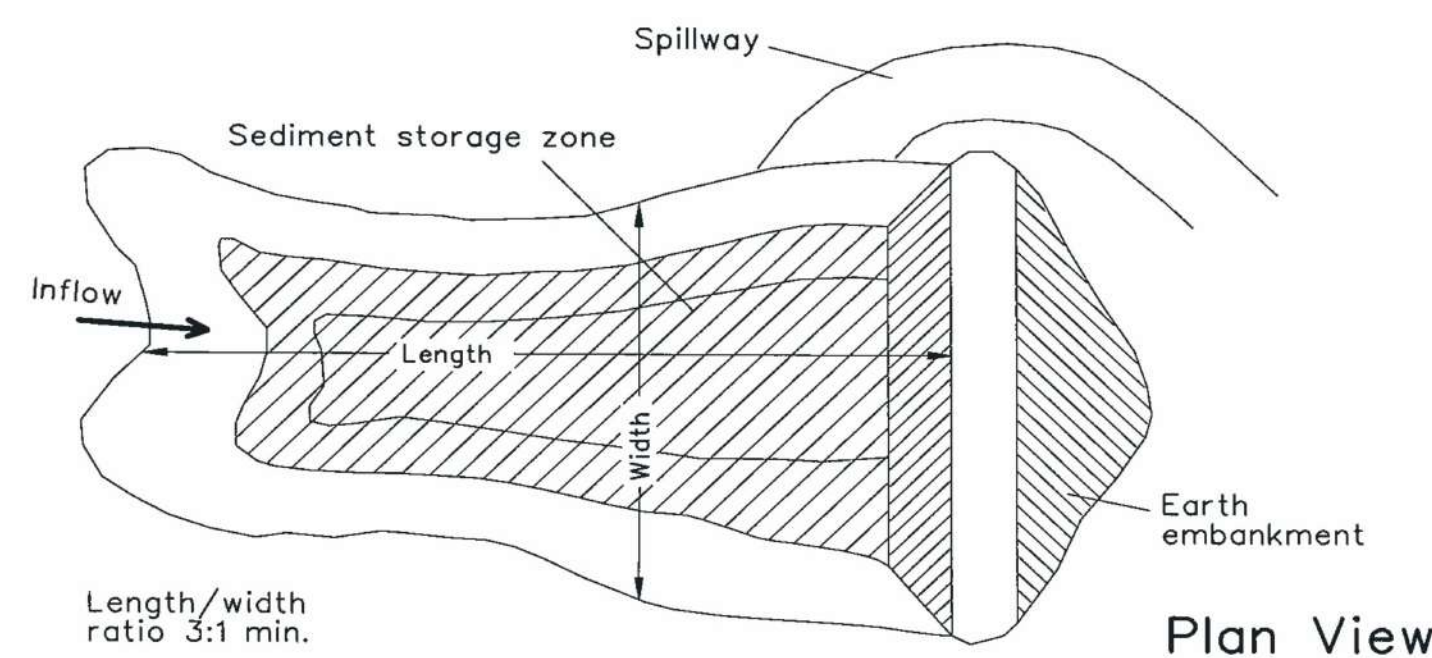
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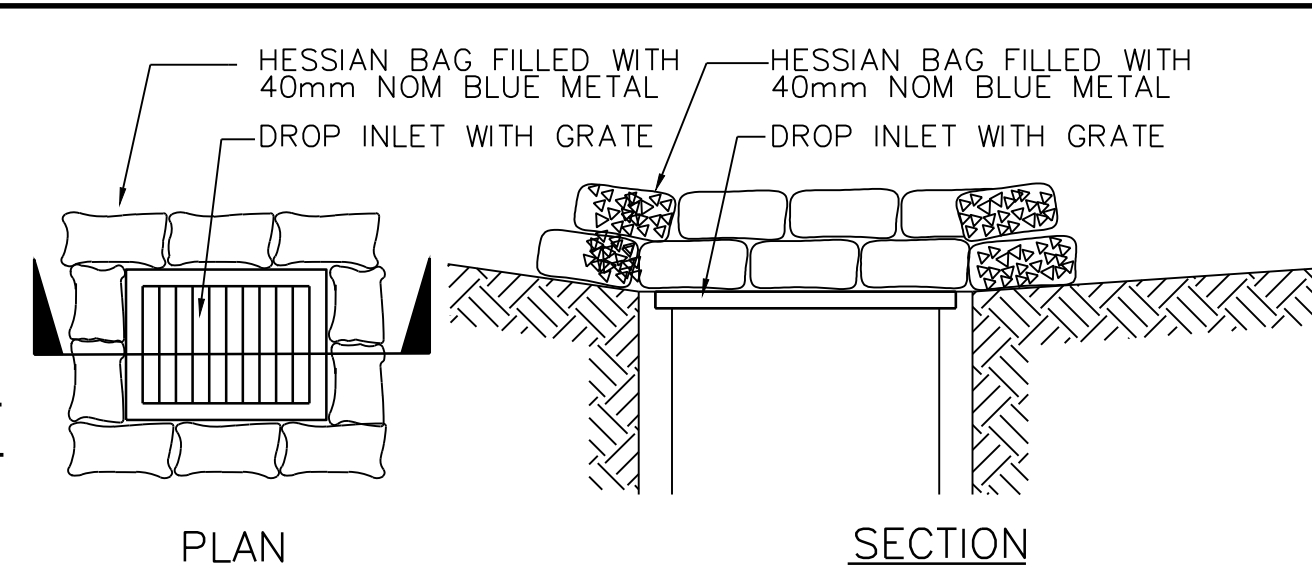
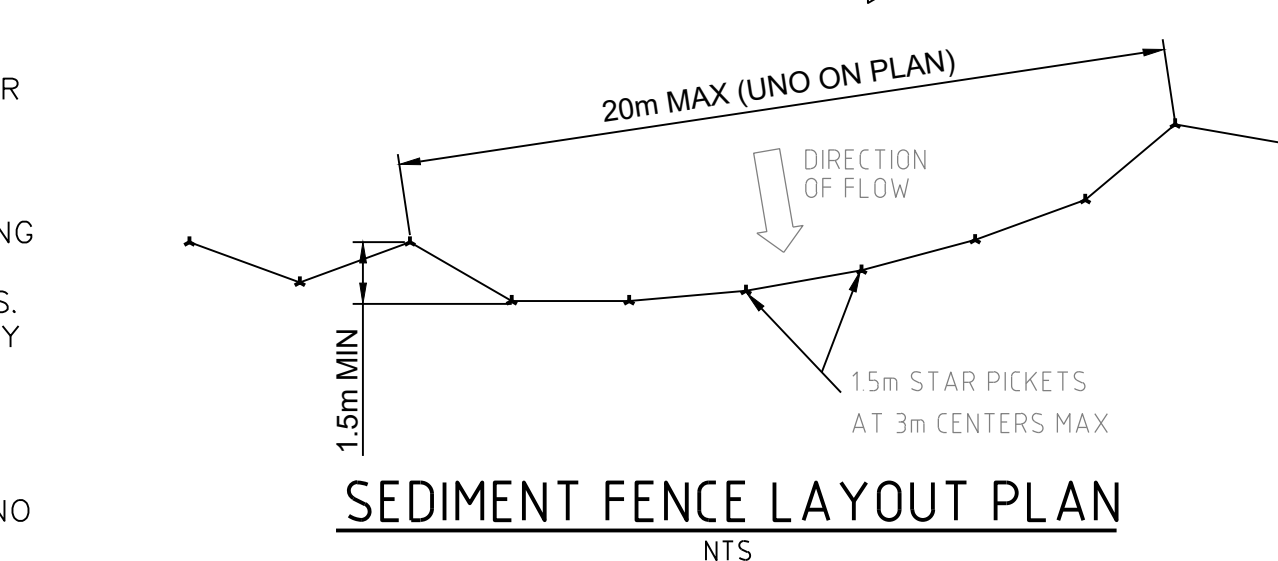
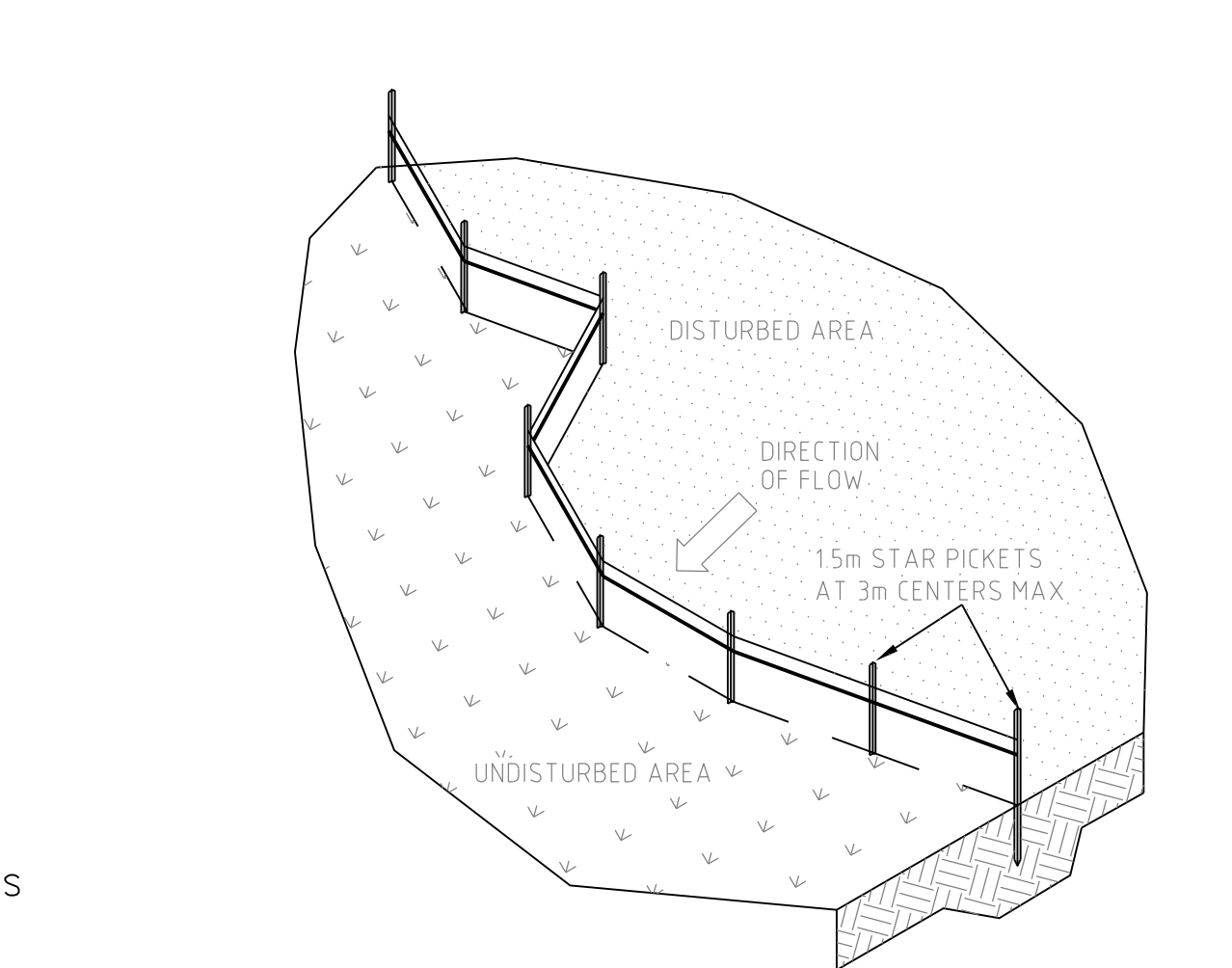
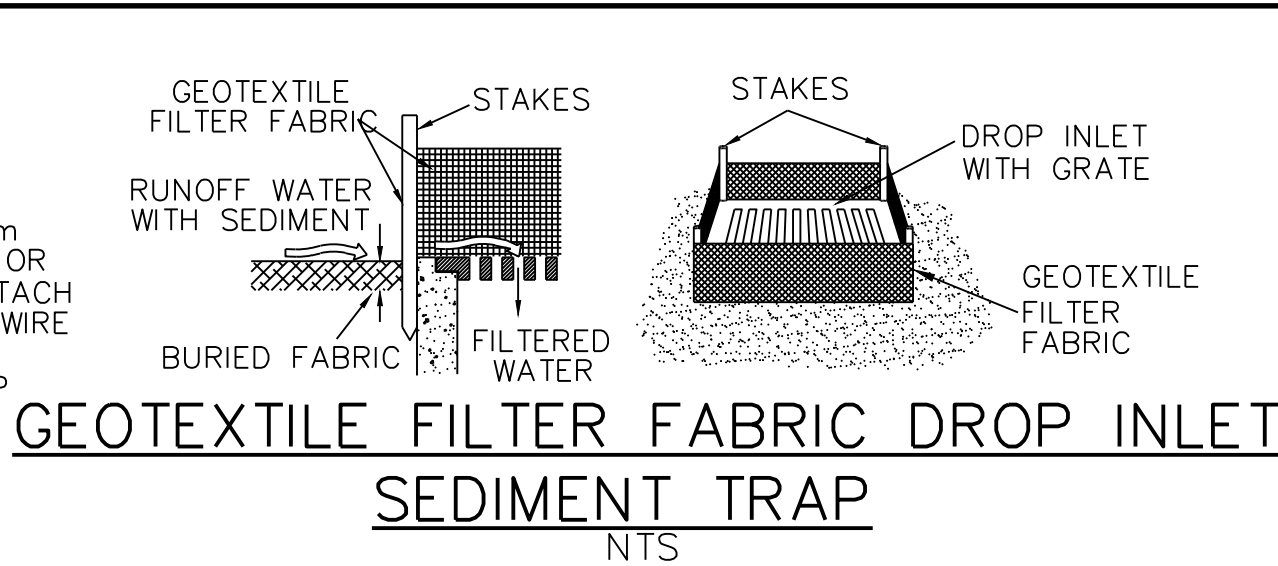


- SITE ENTRY/EXIT CONSTRUCTION NOTES: –**
1. STRIP TOP SOIL & LEVEL SITE. PROVIDE CATCH DRAIN AT SIDES TO DIRECT RUNOFF WATER TO SEDIMENT TRAPS.
 2. COMPACT SUBGRADE AND REMOVE ANY HIGH POINTS.
 3. COVER AREA WITH GEOTEXTILE FABRIC. THIS MAY BE WOVEN OR NEEDLE PUNCHED PRODUCT WITH A MINIMUM CBR BURST STRENGTH (AS3706.4–90) OF 2500 N.
 4. CONSTRUCT 200mm THICK RUBBLE PAD OVER GEOTEXTILE USING ROAD BASE OR 30–40mm AGGREGATE. MINIMUM LENGTH 15 METRES OR TO BUILDING ALIGNMENT. MINIMUM WIDTH 3 METRES. CONSTRUCT 300mm HIGH HUMPS IMMEDIATELY WITHIN BOUNDARY TO DIVERT WATER TO A SEDIMENT TRAP.
 5. WHERE GRIDS ARE USED FIRST CONSTRUCT A 150 THICK PAD OVER GEOTEXTILE FABRIC. LEVEL THIS IN BOTH DIRECTIONS. LOWER GRID ON TO THE PREPARED BASE AND ENSURE THAT NO PART IS SITTING ON ANY HIGH POINTS. BACKFILL THE SPACES BETWEEN THE GRIDS TO WITHIN 50mm OF THE TOP.

PROVIDE RAMPS AT ENDS AND SIDE OF GRIDS. IF DEPRESSIONS OCCUR IN THE RAMPS DURING USE. ADD ADDITIONAL MATERIAL.



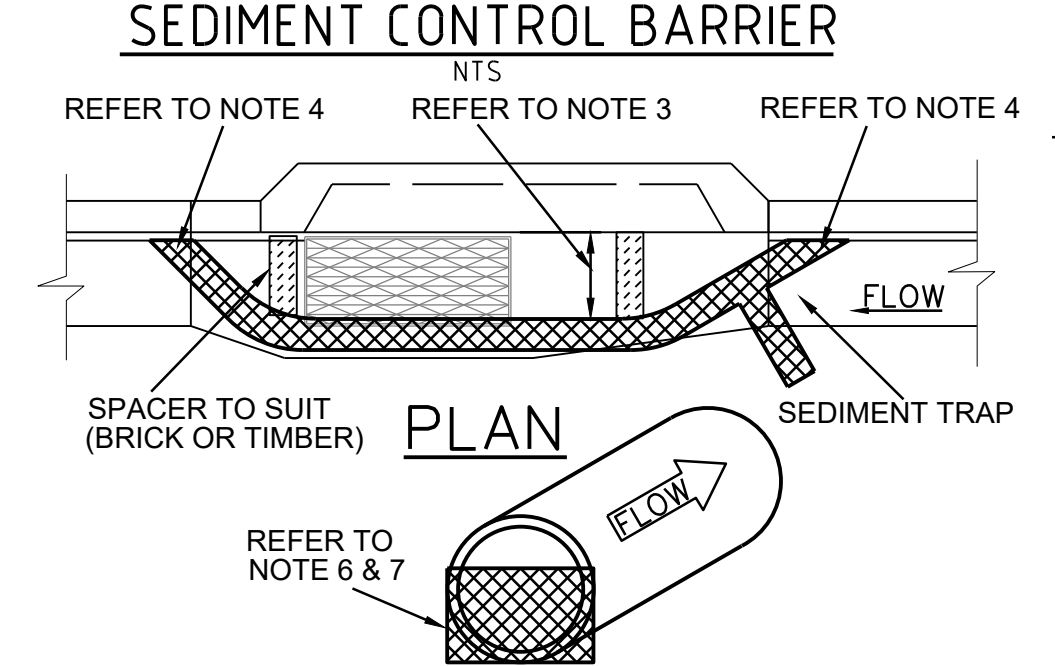
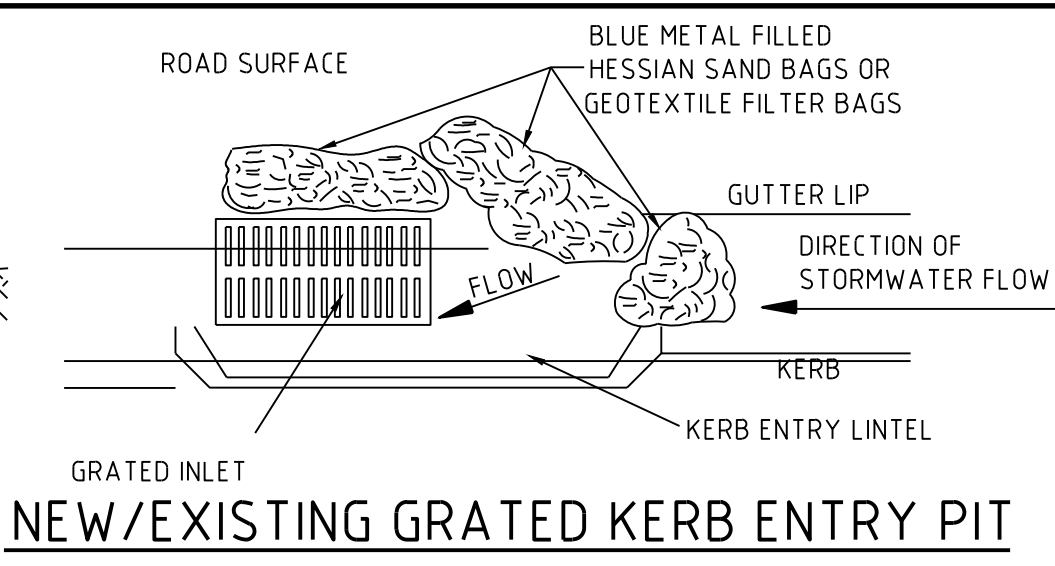
SEDIMENT BASIN (TYPE D SOILS) - MANAGING URBAN STORMWATER - SD-4



EXCAVATED SEDIMENT TRAP

EXCAVATED SEDIMENT TRAP NOTES: –

1. REMOVE THE SEDIMENT WHEN IT HAS ACCUMULATED TO HALF THE DESIGN DEPTH OF THE TRAP AND RESTORE THE TRAP TO ITS ORIGINAL DIMENSIONS.
2. PROVIDE 50 cu.m/Ha OF SEDIMENT STORAGE VOLUME.
3. REFER TO THE MAINTENANCE REQUIREMENTS.

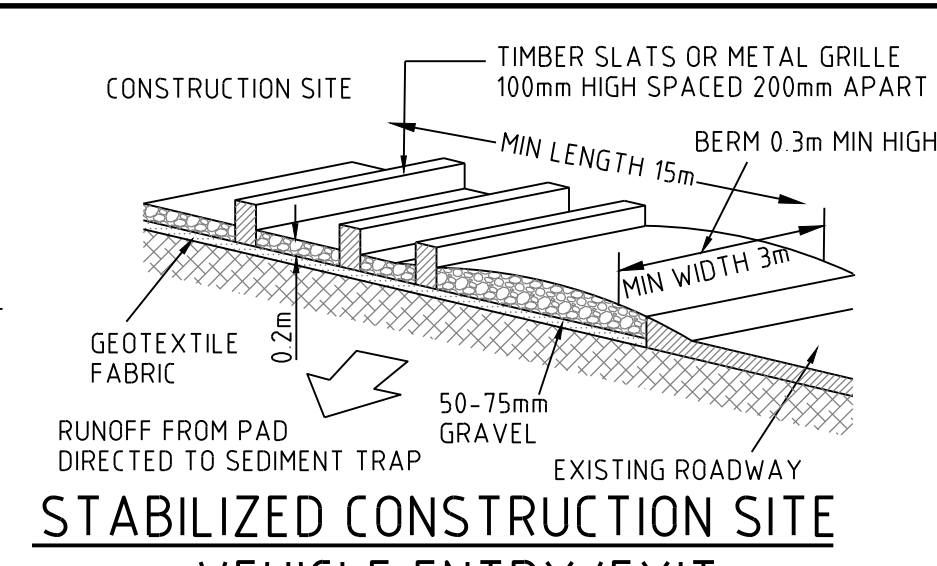


GEOTEXTILE FILTER BAGS

SEDIMENT BARRIER FOR PITS & PIPES, NOTES: –

1. SLEEVES ARE TO BE MADE FROM GEOTEXTILE FABRIC LONGER THEN THE LENGTH OF THE INLET PIT.
2. FILL SLEEVE WITH 5 OR 10mm CLEAN GRAVEL.
3. PLACE THE SLEEVE AT THE OPENING OF THE KERB INLET LEAVING A 100mm GAP TO ACT AS AN EMERGENCY OVERFLOW.
4. SLEEVE MUST BE PLACED AGAINST THE KERB TO PREVENT BYPASS.
5. FIT SLEEVE TO ALL INLETS DOWNSTREAM OF THE WORKS.
6. FOR DRAINAGE WORKS FIT GEOTEXTILE FABRIC OR GEO BAGS TO UPSTREAM FACE OF ALL OPEN PIPES.
7. MAINTAIN AN OPENING AT THE TOP OF THE PIPE OF 1/3 OF THE PIPE DIAMETER.
8. THE FILTERS ARE TO BE CLEANED AND MAINTAINED DAILY.

ALL CARE SHOULD BE TAKEN TO MINIMIZE SEDIMENT REACHING THE STORMWATER SYSTEM BY MINIMIZING EXCAVATION WORKS AND PREVENTING EXCESS WATER FLOW THROUGH WORKS.



SITE ENTRY/EXIT NOTES: –

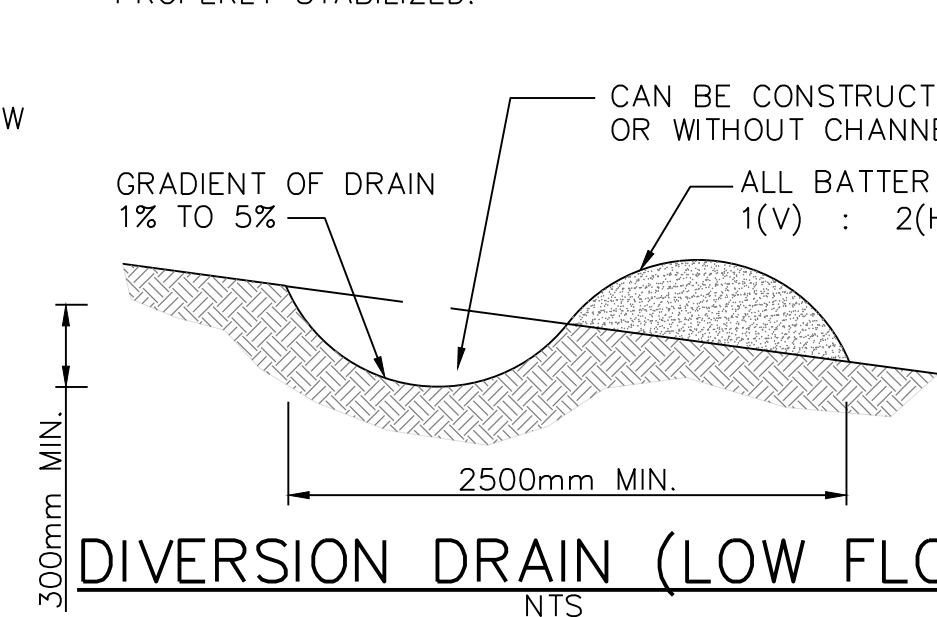
1. ALL VEHICLE ENTRANCES & EXITS TO THE CONSTRUCTION SITE MUST BE STABILIZED TO PREVENT THEM BECOMING A SOURCE OF SEDIMENT, BY PROVIDING A VEHICLE SHAKE AREA. THIS MAY CONSIST OF A TIMBER, CONCRETE OR STEEL SHAKER GRID OR RUBBLE AREA.
2. THE VEHICLE EXIT AREA IS TO BE MAINTAINED IN A CLEAN & SERVICEABLE CONDITION DURING THE TOTAL TIME OF USAGE.
3. ANY UNSEALED ROAD BETWEEN THE DEVICE AND COUNCILS ROADWAY IS TO BE TOPPED WITH 100mm THICK, 40mm NOMINAL SIZE AGGREGATE.
4. PUBLIC ROADS MUST BE KEPT FREE OF DIRT AND MUD. SEDIMENT TRACKED ONTO THE PUBLIC ROADWAY BY VEHICLES LEAVING THE CONSTRUCTION SITE IS TO BE SWEEPED UP IMMEDIATELY.

FENCES SHOULD BE ERECTED TO ENSURE VEHICLES CAN NOT BYPASS THE STABILIZED ACCESS POINTS, UNLESS COMING FROM A STABILIZED AREA.

MAINTENANCE REQUIREMENTS: –

1. ACCUMULATED SILT & SEDIMENT MUST BE REMOVED AT REGULAR INTERVALS AND AFTER EACH MAJOR STORM.
2. SILT & SEDIMENT MUST BE REMOVED FROM OFF THE SITE OR TO A COUNCIL APPROVED LOCATION WITHIN THE SITE, WHERE IT WILL NOT ERODE.
3. THE SEDIMENT FENCES, BALES & TRAPS SHALL BE REGULARLY INSPECTED, ESPECIALLY AFTER RAIN AND KEPT IN GOOD REPAIR AND FUNCTIONING CONDITION AT ALL TIMES.
4. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT SEDIMENT, EROSION & WATER POLLUTION SHALL BE MINIMIZED.

THE SEDIMENT TRAPS SHALL BE REMOVED AND THE AREA STABILIZED WHEN THE CONSTRUCTION AREA HAS BEEN PROPERLY STABILIZED.



DIVERSION DRAIN NOTES: –

1. CONSTRUCT WITH GRADIENT OF 1 PER CENT TO 5 PER CENT.
2. AVOID REMOVING TREES AND SHRUBS IF POSSIBLE.
3. DRAINS TO BE OF CIRCULAR, PARABOLIC OR TRAPEZOIDAL CROSS SECTION NOT V-SHAPED.
4. EARTH BANKS TO BE ADEQUATELY COMPACTED IN ORDER TO PREVENT FAILURE.
5. PERMANENT OR TEMPORARY STABILIZATION OF THE EARTH BANK TO BE COMPLETED WITHIN 10 DAYS OF CONSTRUCTION.
6. ALL OUTLETS FROM DISTURBED LANDS ARE TO FEED INTO A SEDIMENT BASIN OR SIMILAR.
7. DISCHARGE RUN OFF COLLECTED FROM UNDISTURBED LANDS ONTO EITHER A STABILIZED OR AN UNDISTURBED DISPOSAL SITE WITHIN THE SAME SUBCATCHMENT AREA FROM WHICH THE WATER ORIGINATED.
8. COMPACT BANK WITH A SUITABLE IMPELMENT IN SITUATIONS WHERE THEY ARE REQUIRED TO FUNCTION FOR MORE THAN FIVE DAYS.

Construction Notes

1. Remove all vegetation and topsoil from under the dam wall and from within the storage area.
2. Construct a cut-off trench 500 mm deep and 1,200 mm wide along the centreline of the embankment extending to a point on the gully wall level with the riser crest.
3. Maintain the trench free of water and recompact the materials with equipment as specified in the SWMP to 95 per cent Standard Proctor Density.
4. Select fill following the SWMP that is free of roots, wood, rock, large stone or foreign material.
5. Prepare the site under the embankment by ripping to at least 100 mm to help bond compacted fill to the existing substrate.
6. Spread the fill in 100 mm to 150 mm layers and compact it at optimum moisture content following the SWMP.
7. Construct the emergency spillway.
8. Rehabilitate the structure following the SWMP.

DO NOT SCALE FROM DRAWINGS. CHECK & VERIFY ALL DIMENSIONS & LEVELS BEFORE COMMENCEMENT OF ANY WORK. THIS DRAWING IS NOT TO BE COPIED IN PART OR WHOLE WITHOUT WRITTEN PERMISSION FROM WARREN SMITH CONSULTING ENGINEERS.	DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR	NOT TO SCALE	REVISION	AMENDMENT	DATE	REVISION	AMENDMENT	DATE	 PROJECT ANSTO BUILDING 81 - NRCF CAMPERDOWN 81 MISSENDEN ROAD, CAMPERDOWN	PREPARED BY WSce Pty Ltd ACN 648 655 141 ABN 75 648 655 141 info@wsce.com.au wsce.com.au  Driven by excellence, built on experience.	TITLE SEDIMENT & EROSION CONTROL DETAILS							
			1	ISSUE FOR INFORMATION	21/10/24									SCALE AS SHOWN	DRAWN R.H.	DESIGNED I.S.	CHECKED J.G.	APPROVED —
														JOB No.	DRAWING No.		ISSUE	
														8816000		C2.02		1
														DATE OCTOBER 2024	STATUS ISSUE FOR INFORMATION			

PRELIMINARY - NOT FOR CONSTRUCTION