Prepared for
Ampol Australia Petroleum Pty Ltd
ABN: 17 000 032 128

AECOM

Kurnell Terminal SSD-5544 MOD-7

Appendix G - Soils, Groundwater, and Contamination

12 May 2025

aecom.com

Delivering a better world

Kurnell Terminal SSD-5544 MOD-7

Appendix G - Technical report - Soils, Groundwater, and Contamination

Client: Ampol Australia Petroleum Pty Ltd

ABN: 17 000 032 128

Prepared by

AECOM Australia Pty Ltd
Gadigal Country, Level 21, 420 George Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia
T +61 1800 868 654 www.aecom.com
ABN 20 093 846 925

12-May-2025

AECOM in Australia and New Zealand is certified to ISO9001, ISO14001 and ISO45001.

Table of Contents

List of Tables

List of Figures

Glossary and abbreviations

Term	Description
ASC NEPM	National Environment Protection (Assessment of Site Contamination) Measure 2013
ASSMP	Acid sulfate soil management plan
ASSMAC	Acid Sulfate Soils Management Advisory Committee
AASS	Actual acid sulfate soils
AEC	Areas of environmental concern
ACS	Asbestos contaminated soil
ANZAST	Australian and New Zealand and Australian State and Territory Governments
BESS	Battery energy storage system
BTEXN	Benzene, toluene, ethylbenzene, xylenes and naphthalene
CLOR	Caltex Lubrication Oil Refinery
CSM	Conceptual site model
CEMP	Construction environmental management plan
COPC	Contaminants of potential concern
DCP	Development control plan
DECC	Department of Environment and Climate Change
DEC	Department of Environment and Conservation
DECCW	Department of Environment, Climate Change and Water
DUAP	Department of Urban Affairs and Planning
DGRs	Director Generals Requirements
ESA	Environmental site assessment
EIS	Environmental impact statement
EMP	Environmental management plan
EP&A	Environmental Planning & Assessment
FFTA	Former fire training area
GSW	General solid waste
GDE	Groundwater dependant ecosystem
GMP	Groundwater monitoring plan
GWMP	Groundwater management plan
HEPA	Heads of EPAs Australia and New Zealand
HDPE	High density polyethylene
LNAPL	Light non-aqueous phase liquid
mAHD	Metres Australia Height Datum
mbgl	Metres below ground level
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure

Term	Description
NOW	NSW Office of Water
OWS	Oily water sewer
OEMP	Operational environmental management plan
PFAS	Per- and polyfluoroalkyl substances
PHC	Petroleum related hydrocarbons
PAHs	Polycyclic aromatic hydrocarbons
PASS	Potential acid sulfate soils
POEO	Protection of the Environment Operations
RAP	Remedial Action Plan
RSW	Restricted soil waste
SWMS	Safe work method statements
SAQP	Sampling and analysis quality plan
SWS	Site stormwater system
SSD	State Significant Development
SSC	Sutherland Shire Council
TRH	Total recoverable hydrocarbons
UPSS	Underground petroleum storage systems
VENM	Virgin excavated natural material
WWTP	Waste water treatment plant
WH&S	Work, health and safety

Executive Summary

The Kurnell Terminal ('the Site') is located on the southern side of Botany Bay, in Kurnell, New South Wales (NSW) (Figure 1-1). In 2012, Ampol Refineries (NSW) Pty Ltd (Ampol) announced that the oil refinery and fuel terminal would be converted to a finished product terminal (the 'approved project'), ceasing refinery operations in 2014.

Development consent was received to complete the approved project under State Significant Development (SSD) application reference 5544 (SSD-5544). Ampol has modified SSD-5544 six times to complete the conversion and demolition works.

Currently, the operational infrastructure is primarily located in the northern part of the Site (Zones 1 and 1A, as shown in Figure 1-1). Other parts of Ampol's landholdings at Kurnell include largely vacant areas of previously developed land (Zones 2 and 3) and areas of undeveloped land containing extensive native vegetation (Zones 4 and 5).

Ampol intends to consolidate operational infrastructure, remove redundant assets, and undertake remediation and grading. Completion of these works (the 'proposed modification', MOD-7) would continue the safe, viable, and reliable operation of the Kurnell Terminal, whilst preparing the land for future uses. The location within the Site that these works would occur is referred to as the 'Project Area.'

A review of existing contamination reports and environmental data undertaken in preparing the Conceptual Remediation Action Plan (RAP) (refer to Appendix H of the Modification Report) has identified where remediation would be required and where further investigation is required to inform future refinement of remedial extents and methodologies. The key contaminants of potential concern (COPC) within the Project Area are petroleum related hydrocarbons (PHC), per- and polyfluoroalkyl substances (PFAS) and asbestos in soil for which appropriate remedial and management strategies would be applied in accordance with regulatory standards for commercial/ industrial land use. The areas of environmental concern (AEC) where these sources are present from historical activities at the Project Area have been outlined in this report and are detailed in the Conceptual RAP.

Soil remediation works for the proposed modification would comprise a mixture of biopiling, stabilisation, capping, and offsite disposal. As detailed in the Conceptual RAP, the remediation methodology would be refined following data gap investigations and documented in a Detailed RAP which would occur prior to commencement of remediation.

Temporary groundwater dewatering would be undertaken where groundwater accumulates in excavations. Dewatered groundwater from excavations would be collected, contained, tested for pollutants and, if suitable, sent to the Wastewater Treatment Plant (WWTP) for treatment and disposal under EPL-837 for the Site. If not suitable for treatment at the WWTP, this water would be disposed of offsite to an appropriately licensed waste facility. Active remediation of groundwater during the proposed modification is not anticipated to be required (other than as a contingency measure). Should it be warranted, changes to groundwater quality would be monitored as part of the Groundwater Management Plan (GWMP).

Potential acid sulfate soil (PASS) is known to be present at depths below 2 m below ground surface (mbgl) in parts of the Site. An Acid Sulfate Soil Management Plan (ASSMP) would be prepared to manage PASS disturbed during works. Data gap investigations would include sampling and analysis for PASS and the results would inform the preparation of the ASSMP.

Following soil remediation, ongoing management of contaminated groundwater would continue to be undertaken. The EMPs would include a Groundwater Monitoring Plan (GMP), where required, which would detail groundwater monitoring requirements within the Site Audit boundary to confirm that residual COPCs in groundwater are being appropriately managed.

The remediation works would mitigate the risk existing contamination poses by removing or reducing the concentrations of contamination in soils and eliminating exposure pathways. Provided mitigation measures for construction and operation are implemented, the risk posed by cumulative environmental impacts from other projects related to soil, groundwater, and contamination is considered to be low.

Mitigation measures to be implemented for the construction and operation would be as per the conditions of consent for SDD-5544. This would include preparation and implementation of a Construction Environmental Management Plan (CEMP) for construction and continued implementation of the Operational Environmental Management Plan (OEMP) following completion of the proposed modification works. The following additional specific measures would be undertaken for the proposed modification:

- Implementation of the Conceptual RAP (refer to Appendix H of the Modification Report), which would include undertaking data gap investigations within the Project Area and preparation of one or more Detailed RAP(s) following completion of detailed investigations for the proposed ongoing commercial/ industrial land use.
- One or more Detailed RAP(s), focussed on specific areas and/or contamination sources, would be prepared. Remediation works would be completed as per each Detailed RAP. The Detailed RAP(s) would be supported by a series of environmental management plans, including a GWMP. Validation report(s) would then be prepared following remediation.
- Following the remediation works, one or more Environmental Management Plan(s) (EMP) would be prepared to appropriately manage residual contaminated soil and/or groundwater. These EMP(s) would be included in the OEMP for the Site and may include one or more GMP(s).
- As stated in the Conceptual RAP (refer to Appendix H of the Modification Report), at the completion of the proposed modification, one or more Site Audit Statement(s) and Site Audit Report(s) would be prepared by the Site Auditor in accordance with the Guidelines for the NSW Site Auditor Scheme (3rd edition).

1.0 Introduction

1.1 Overview

The Kurnell Terminal ('the Site') is located on the southern side of Botany Bay, in Kurnell, New South Wales (NSW) (Figure 1-1). In 2012, Ampol Refineries (NSW) Pty Ltd (Ampol) announced that the oil refinery and fuel terminal would be converted to a finished product terminal (the 'approved project'), ceasing refinery operations in 2014.

Development consent was received to complete the approved project under State Significant Development (SSD) application reference 5544 (SSD-5544). Ampol has modified SSD-5544 six times to complete the conversion and demolition works.

Currently, the operational infrastructure is primarily located in the northern part of the Site (Zones 1 and 1A, as shown in Figure 1-1). Other parts of Ampol's landholdings at Kurnell include largely vacant areas of previously developed land (Zones 2 and 3) and areas of undeveloped land containing extensive native vegetation (Zones 4 and 5).

Ampol intends to consolidate operational infrastructure, remove redundant assets, and undertake remediation and grading. Completion of these works (the 'proposed modification', MOD-7) would continue the safe, viable, and reliable operation of the Kurnell Terminal, whilst preparing the land for future uses. The location within the Site that these works would occur is referred to as the 'Project Area.'

A Modification Report has been prepared to support a modification application to SSD-5544. This *Technical report – Soils, Groundwater and Contamination* is one of a number of technical documents that forms part of the Modification Report. In line with the requirements of Section 4.55 of the *Environmental Planning & Assessment Act 1979* (EP&A Act), the Modification Report provides the information required by Section 100 of the *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation).

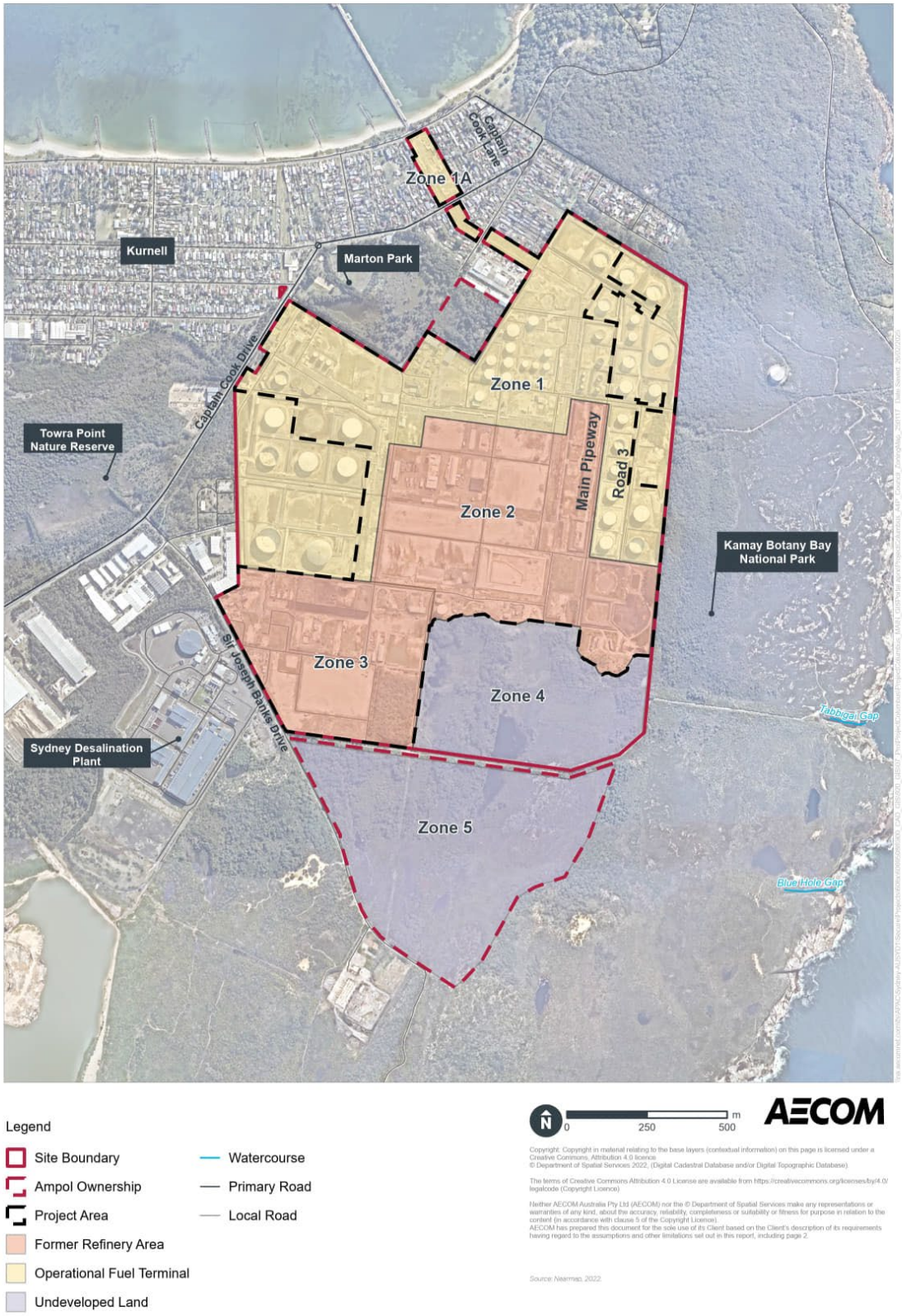

Figure 1-1 Ampol Kurnell Terminal (the Site)

1.2 The proposed modification

1.2.1 Key elements of the proposed modification

To support the continued safe, viable, and reliable operation of the Site and to facilitate the future use of the Site, the proposed modification works involve:

- **Stage 1 – Preparation works**: Preparing the Project Area for proposed modification works.
- **Stage 2 – Removal, relocation and/or augmentation of infrastructure**, including:
  - Relocation and/ or augmentation of firewater systems (FWS) and oily water sewer (OWS) systems and construction of new operational facilities, including replacement warehouses
  - Decommissioning and removal of non-operational assets, redundant structures and electrical assets
- **Stage 3 – Remediation**: Addressing legacy ground contamination, including asbestos-contaminated soil (ACS)
- **Stage 4 – Grading**: Landforming the Project Area following removal of infrastructure and ground remediation activities and preparing Zones 2 and 3 for future use
- **Stage 5 – Demobilisation**: Demobilisation of construction and remediation equipment.

These stages may occur sequentially or concurrently, depending on site requirements.

A summary of project elements requiring modification and how they relate to the approved project is provided in Table 1-1. The proposed modification works would be undertaken within the Project Area shown on Figure 1-2. All activities would adhere to the Kurnell Terminal permit to work system to ensure compliance with environmental and safety protocols.

Table 1-1 Modified project summary table

Stage	Element	Approved project	Modified project
Stage 1	Project Area	Project Area delineation	• Prepare the Project Area for the proposed modification works required under Stages 2, 3 and 4 and exclude other parts of the Site from proposed modification works..
Stage 2	Oily water sewer (OWS)	Maintain location in Zones 2 and 3	• Divert surface water runoff from potentially contaminated areas in Zone 2 to Zone 1 via new OWS interception pits/ lines until Stage 3 remediation is complete. • Divert potential leachate from ACS containment cell in Zone 2 to Zone 1 OWS system. • Remove all redundant OWS infrastructure.
	Fire-water systems (FWS)	Maintain location in Zone 2 and 3	• Augment or remove FWS infrastructure from Zones 2 and 3. • If removed from Zone 2, augment existing FWS in Zone 1 with a new firewater tank and pipework to service the terminal infrastructure. • Locate the new firewater tank and pumphouse within the FWS Relocation Area (specific siting selected during detailed design). Augment or remove FWS infrastructure from Zones 2 and 3.
	Electrical assets	Maintain location in Zone 2 and 3	• Remove redundant electrical assets in Zones 2 and 3, including five substations.

Stage	Element	Approved project	Modified project
	Structures	Maintain location in Zone 2 and 3	• Demolish remaining structures in Zones 2 and 3. • Construct new 'fit for purpose' warehouse and Oil Spill Equipment Storeroom within Zone 1. • Construct new storage shed in Zone 1A.
Stage 3	Remediation	Removal of ACS from pipeways and either containment onsite or offsite disposal	• Remediate land in Zones 2 and 3 as necessary. • Remediate land in Zone 1 where infrastructure is relocated and/ or augmented as necessary. • Conduct remediation to a commercial/ industrial land use under the ASC NEPM (2013).
Stage 4	OWS	Maintain location in Zones 2 and 3	• Disconnect and remove remaining underground OWS lines from Zones 2 and 3, except for lines connecting to the ACS Containment Cell. • Install a new pump adjacent to the ACS Containment Cell. Two site options have been identified (specific siting selected during detailed design).
Stage 4	Grading	Grading following demolition of structures and removal of infrastructure across the Site and relevant Project Areas	• Construct new onsite detention (OSD) basins in Zone 3 to attenuate runoff and maintain pre-construction surface water flow rates. • Grade Zone 2 following Stage 2 and Stage 3 activities to manage stormwater and prepare for future land uses. • Grade Zones 1 and 3 as necessary.
Stage 5	Demobilisation	Demobilisation of construction equipment.	• Demobilisation of construction equipment. Site continuing to operate as approved under SSD-5544.

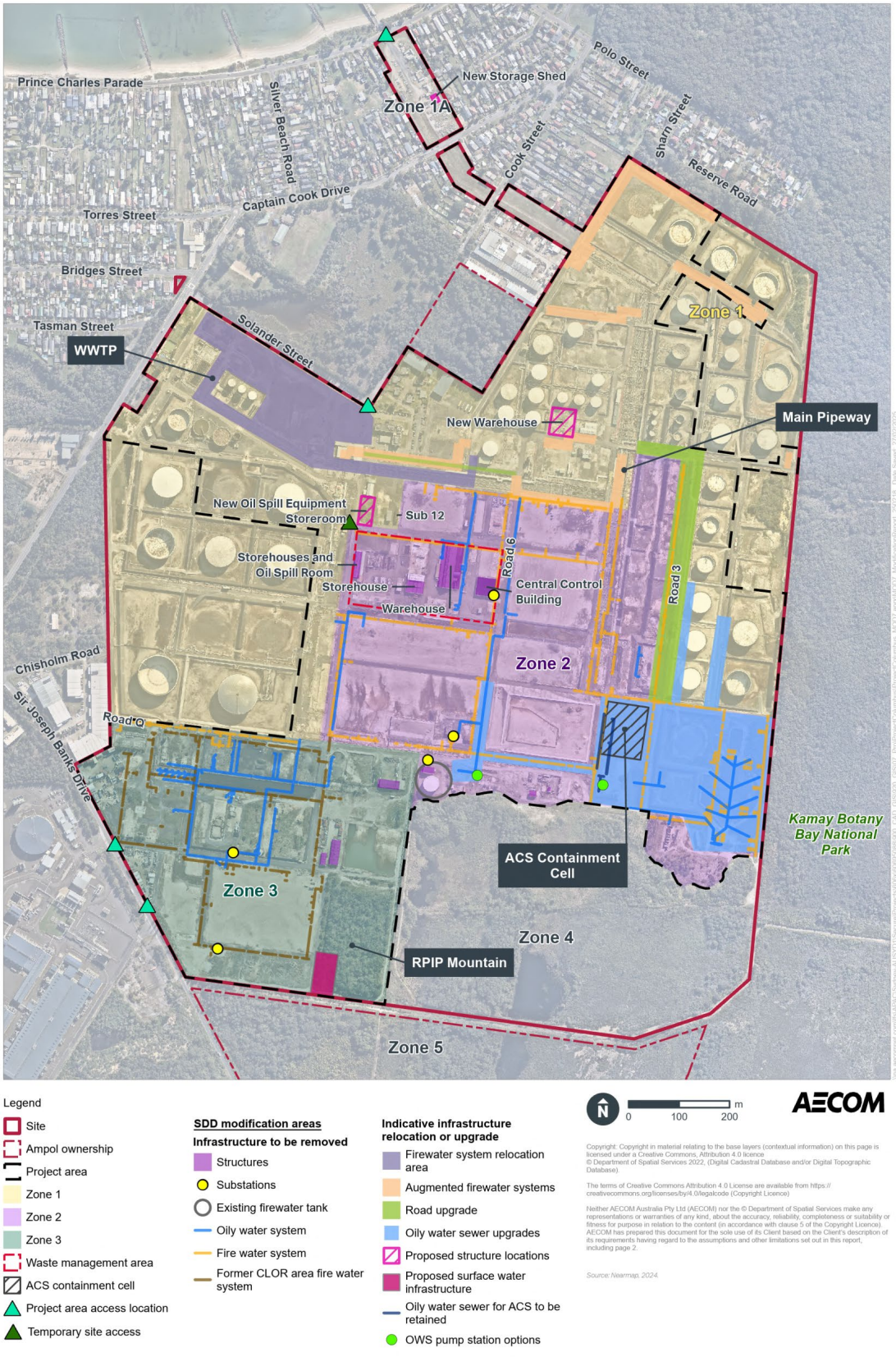

Figure 1-2 The proposed modification

Once the modification works are complete, the Site would continue to operate as described in the approval documentation for the approved project and would be consistent with the development consent for SSD-5544.

In line with Figure 1-2, relocated equipment would operate in their new locations.

1.2.2 Construction timelines and equipment

Works are planned to commence in August 2025 and would continue for about 12 months for infrastructure removal scopes and up to four years for remediation works in accordance with the schedule in Table 1-2.

In line with Condition C18 of SSD-5544, construction works would comply with following hours:

- Monday to Sunday – 7am to 10pm.

High noise generating construction works, including works within the Eastern Right of Way (Zone 1A), would be confined to less sensitive times of the day and not undertaken on Sundays, public holidays, or outside of the hours 7am and 6pm Monday to Saturday (in line with Condition C19).

Construction works outside of the work hours identified above would only be undertaken in the following circumstances (in line with Condition C20):

- Works that are inaudible at nearest sensitive land receivers
- Works that are consistent with Ampol's existing maintenance procedures and are in accordance with EPL 837
- Works agreed to in writing by the Environment Protection Authority (EPA) or the Department of Planning, Housing, and Infrastructure (DPHI)
- For the delivery of materials required outside these hours by the NSW Police Force or other authorities for safety reasons
- Where it is required in an emergency to avoid the loss of lives, property and/ or to prevent environmental harm.

Table 1-2 Proposed modification program

Stage	Timeframe
Stage 1 – Preparation works	August 2025
Stage 2 – Removal and/or relocation of infrastructure[1]	August 2025 – August 2026
Stage 3 – Remediation	August 2025 – July 2029
Stage 4 – Grading	Zone 2: August 2026 – December 2026 Zone 3: up to July 2029
Stage 5 – Demobilisation	September 2026 (for all works except remediation)
[1] Construction in Zone 1A expected to last 3 months.	

Plant and equipment that would be used to deliver the modification works is shown in Table 1-3

Table 1-3 Indicative plant and equipment

Plant/equipment	Maximum number required per day (all stages except Stage 3)	Maximum number required per day (Stage 3)
Front end loader	6	6
20 t excavator	6	6
Dump truck	6	6

Plant/equipment	Maximum number required per day (all stages except Stage 3)	Maximum number required per day (Stage 3)
Grader (up to 7 m blade)	-	4
Large crane (60 t)	4	-
Elevated work platform	6	-
Franna crane (30 t)	6	-
Cement truck	6	-
Bobcat	6	2
Water cart	6	6
Concrete crusher	2	-
Telehandler	6	-
Truck and dog (offsite disposal)	6	6
Truck and dog (imported fill)	-	12
Generator	2	2
Blowers	-	8

1.2.3 Other relevant elements of the proposed modification

Earthworks

The following earthworks would be required for the proposed modification during construction:

- Oily water sewer (OWS) – The removal of OWS infrastructure may require excavation work of up to 3 below ground surface (mbgl) for removal of below ground pipework and pits. Where complete removal is not feasible due to proximity to existing infrastructure or other considerations (e.g. geotechnical), existing pipes and/or pits would be cleaned, infilled, and left in-situ.
    - The new pump pit adjacent to the ACS Containment Cell would require excavations of up to 4.5 mbgl, composed of a 4 m deep pit, and an additional 0.5 m tall concrete slab, which would be installed at the base of the pit.
- Firewater systems – The FWS infrastructure in Zone 1 would be augmented with a new firewater tank and pipework to service the terminal infrastructure. The FWS infrastructure in Zones 2 and 3 would be augmented or removed. Where necessary, and excavations up to 1 mbgl would be required to remove the pipework, footings, and foundations. If required, construction of the relocated firewater tank and pumphouse into the FWS Relocation Area, including excavation and remediation, where necessary
- Electrical assets – Redundant electrical assets in Zones 2 and 3 would be decommissioned and removed. Belowground cables would be de-energized and either retained for potential future use or removed in accordance with AS/NZS 3000:2018
- Structures – Each structure proposed for demolition would be demolished to ground level and, where possible, their slab, foundations, and footings removed. In addition, the foundations of buildings and structures previously demolished as part of the approved project would be also excavated and removed where practicable. These works would excavation works up to 2 mbgl or deeper depending on the depth of footings (generally focused within 1 mbgl).

Remediation works

As described in Section 4 (Proposed modification) of the Modification Report, remediation is required to address the following key contaminants of potential concern (COPC) in the Project Area:

- Asbestos contaminated soils
- Petroleum related hydrocarbons (PHC)
- Per- and polyfluoroalkyl substances (PFAS).

As presented in the Conceptual RAP (Appendix H of the Modification Report), the volume of hydrocarbon, asbestos and/or PFAS impacted soil that would require excavation and either treatment or off-site disposal has been estimated at 83,000 cubic metres (m^3); however, for the purpose of the assessments within this Modification Report, an approximate contingency soil volume of 40,600 m^3 (50%) has also been included for assessment (i.e. a total of 123,600 m^3). The ground level of the Project Area, in the areas providing flood storage, would remain the same at the completion of the proposed modification.

To prevent loss of existing flood storage and to avoid offsite flooding impacts, earthworks and capping would be completed in a manner that does not significantly alter existing surface levels. For example, areas requiring up to 300 mm of capping that are within areas of flood storage would need to be initially excavated by 300 mm before the capping occurs. Additional excavation (approximately 183,130 m^3 of excavated soil, with 91,565 m^3 contingency) would be required in these areas to allow for the capping layer.

The estimate of 266,130 m^3 (with contingency allowance for 132,165 m^3) is comprised of the following excavation areas, soil volume estimates, and contingency volumes, as shown Figure 1-3:

- Zone 1 (Infrastructure construction works) – 13,000 m^3, with 6,500 m^3 contingency
- Zone 2 and 3 (Oily water sewer removal) – 11,800 m^3, with 5,000 m^3 contingency
- Excavation 1 (PHC) – 4,000 m^3, with 2,000 m^3 contingency
- Excavation 2 (PHC) – 15,550 m^3, with 7,775 m^3 contingency
- Excavation 3 (PHC) – 2,450 m^3, with 1,225 m^3 contingency
- Excavation 4 (PFAS) – 10,000 m^3, with 5,000 m^3 contingency
- Excavation 5 (PFAS) – 2,550 m^3, with 1,275 m^3 contingency
- Asbestos Excavation – 23,650 m^3, with 11,825 m^3 contingency
- Capping excavation – 183,130 m^3, with 91,565 m^3 contingency.

A further 535,000 m^3 of areas of capping with a 165,000 m^3 contingency are required for in-situ capsulation (Figure 1-4).

Where soil in the Project Area has been assessed as not requiring remediation, this is because the soil and groundwater quality either:

- Already meets the commercial/ industrial standard (refer to the Conceptual RAP [Appendix H of the Modification Report]); and/or
- The remaining contamination impacts either do not pose a risk to human health or the environment or can be managed and mitigated by implementation of existing environmental management procedures for the Site.

The proposed soil remediation methods include:

- Biopiling – The majority of soils (estimate of 10,000 m^3, with a 5,000 m^3 contingency) that are impacted by hydrocarbons, but not impacted by asbestos, would be remediated using biopiling. The nominated areas for biopiling would be remediated and/ or managed prior to being prepared with a clay or high density polyethylene (HDPE) liner. The soils would be placed on a compacted sand base within the biopiling area to enable adequate air exchange into the biopile. The soils would be mixed with nutrients or other soil amendments and placed in the biopile area. They would also be covered, and blowers used to enhance the bioremediation process by increasing the flow of oxygen through the soil.
- Stabilisation – Small quantities of soil impacted by PFAS would be disposed offsite; however, should larger volumes of contaminated soil be present in a specific location, or if the concentrations result in the soils being classified as Restricted Soil Waste (RSW) or higher, ex-situ stabilisation maybe required. The decision to either dispose of the contaminated soils offsite or to use stabilisation would be based on a cost benefit analysis. Once complete, the treated material would be validated for onsite reuse or classified for offsite disposal.
- Capping – Capping is proposed to create a physical barrier over contaminated soil in the areas shown on Figure 1-4. Capping of soil would be conducted sequentially in a staged manner, moving from one area to the next only once the validation process in the area being remediated has started. There would be two capping layer types:
    - Type 1 – A standard 300 mm clean fill cap underlain by a geotextile marker layer to delineate areas free from asbestos and areas which may still contain asbestos. Capping thickness may vary depending on the requirements of future land uses but would be a minimum of 150 mm and would be designed to meet the final landform grade
    - Type 2 – For areas where there is residual PFAS and/or hydrocarbon impacts. Designed both as a vapour barrier to prevent migration of volatile vapours and also as an impermeable barrier to mitigate further migration of PFAS into groundwater. This Type 2 cap would comprise 200 mm structural fill over a geotextile separation marker followed by 100 mm of clean soil/ structural fill followed by protection geofabric and impermeable HDPE layer.

Figure 1-3 Remediation excavation and waste management areas

Figure 1-4 Capping areas

Groundwater

Based on existing investigations (refer to Section 3.3 of the Conceptual RAP [Appendix H of the Modification Report]), in some areas, groundwater contaminants are present above commercial/ industrial criteria. However, the groundwater impacts are considered a secondary source and it is expected that soil remediation works would consequentially reduce residual groundwater concentrations. Where these residual risks are assessed to still be present above criteria after soil remediation activities, remediation capping works would be undertaken to address residual impacts in groundwater.

Active remediation of groundwater during the proposed modification is not anticipated to be required (other than as a contingency measure). Following soil remediation, ongoing management of contaminated groundwater would continue to be undertaken. As recommended by the Conceptual RAP, a Groundwater Monitoring Plan (GMP) would be prepared for Zones 2 and 3 to confirm that residual COPCs in groundwater are being appropriately managed.

Accumulated groundwater in excavated areas would be tested to confirm that it can be appropriately treated in the existing onsite Waste Water Treatment Plant (WWTP). The WWTP treats water that is, or may be, impacted primarily by petroleum products at the Site. Treated water effluent from the Site is discharged via outfall to the Tasman Sea at Yena Gap under the Environment Protection Licence (EPL) 837.

Operational activities

The FWS would be relocated within the FWS Relocation Area in Zone 1, including a new firewater tank and pipework to allow it to service the terminal infrastructure, with specific siting selected during detailed design.

For the purpose of assessment in this *Technical report – Soils, Groundwater and Contamination*, two indicative locations have been considered for the relocation of the FWS, which have been selected based on optioneering completed in the concept design phase in consultation with key stakeholders, including Firewater and Process Safety Subject Matter Experts. The location of each option is shown Figure 1-5.

Figure 1-5 Relocated FWS – Indicative locations

1.3 Purpose of this report

This *Technical report – Soils, Groundwater and Contamination* is one of a number of technical documents that forms part of the Modification Report. The purpose of this report is to understand potential impacts of the proposed modification upon soils, groundwater, and contamination.

2.0 Assessment methodology

2.1 Relevant legislation and guidelines

Applicable legislation, regulation and policy for this soil, groundwater and contamination assessment include:

- *Environmental Planning and Assessment Act 1979*
- *State Environmental Planning Policy (Resilience and Hazards) 2021*
- *National Environment Protection (Assessment of Site Contamination) Measure 2013 (the ASC NEPM)*
- *Contaminated Land Management Act 1997*
- *Protection of the Environment Operations Act 1997 (POEO Act)*
- *The POEO (Waste) Regulation 2014*
- *Sutherland Shire Local Environmental Plan 2015*
- *Water Management Act 2000*
- *Water Management (General) Regulation 2018*
- *NSW Aquifer Interference Policy 2012.*

Relevant guidelines for this soil, groundwater and contamination assessment are listed below:

- Australian and New Zealand and Australian State and Territory Governments (ANZAST), 2018, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*
- Heads of EPAs Australia and New Zealand (HEPA), 2020. *PFAS National Environmental Management Plan 2.0.*
- Landcom, 2004. *Managing Urban Stormwater: Soils and Construction*
- NSW Acid Sulfate Soils Management Advisory Committee (ASSMAC), 1998. *Acid Sulfate Soils Assessment Guidelines.* August 1998
- NSW Department of Land and Water Conservation, 2002. *Site Investigation for Urban Salinity*
- National Environment Protection Council (NEPC), 1999. *National Environment Protection (Assessment of Site Contamination) Measure 2013*
- NSW EPA, 2015. *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997*
- NSW EPA, 2017. *Guidelines for the NSW Site Auditor Scheme (3rd edition)*
- NSW EPA, 2019. *Assessment and management of hazardous ground gases: Contaminated Land Guidelines.*
- NSW Department of Environment and Conservation (DEC), 2007. *Guidelines for the Assessment and Management of Groundwater Contamination*
- NSW Department of Environment and Climate Change (DECC), 2009. *Guidelines for Implementing the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008*
- NSW Department of Environment, Climate Change and Water (DECCW), 2010. *UPSS Technical Note: Decommissioning, Abandonment and Removal of UPSS.*
- NSW DECCW, 2010. *UPSS Technical Note: Site Validation Reporting*
- NSW Department of Urban Affairs and Planning (DUAP) and NSW EPA, 1998. *Managing Land Contamination, Planning Guidelines SEPP 55-Remediation of Land*

- NSW EPA, 2020. *Guidelines for Consultants Reporting on Contaminated Sites*
- NSW EPA, 2014. *Waste Classification Guidelines Part 1 to 4*
- NSW EPA, 2016. *Addendum to the Waste Classification Guidelines* (2014, Part 1: Classifying Waste)
- NSW EPA, 2018. *Guidelines on resource recovery orders and exemptions for the land application of waste materials as fill.*

2.2 Methodology

The objective is to provide a desktop assessment to assess the potential impacts of the proposed modification on soils, groundwater, and contamination. The original Director Generals Requirements (DGRs) (now referred to a Secretary's Environmental Assessment Requirements (SEARs) have been utilised to guide this assessment. These include:

- *'An assessment of any potential site contamination and details of all potential contamination sources'*
- *'How ecological and human health risks posed by contaminants on the site would be mitigated and managed'*
- *'Identification of any contaminated soil likely to be impacted by the development'*
- *'Proposed measures to be implemented in the event that soil contamination is encountered'*
- *'Demonstration that the development will not impact on other remediation activities being undertaken in the vicinity'*
- *'How site contamination will be remediated and managed for potential future uses'*
- *'An assessment of the potential soil, groundwater and surface water impacts of the development'*
- *'A detailed description of the mitigation and management controls that would be put in place to manage erosion and sediment, stormwater, spills and acid sulphate soil (if present)'.*

A desktop assessment was undertaken which comprised the review of applicable existing reports for the Project Area. The reports reviewed are listed below:

- URS, 2013. Environmental Impact Statement, Kurnell Refinery Conversion, May 2013
- AECOM, 2024. The Conceptual RAP (Appendix H of the Modification Report).

The Conceptual RAP included review of the following previous contamination reports:

- AECOM, 2023a. DRAFT Expanded Asbestos in Soil Assessment Former LPG Area, Rev A, 29 May 2023
- AECOM, 2023b. Asbestos in Soil Investigation, Ampol Kurnell Terminal, 2 Solander Street, Kurnell NSW, RPIP Investigation, 31 July 2023
- AECOM, 2023c. Kurnell Stormwater Separation Improvement Project, Statement of Environmental Effects, 27 November 2023
- AECOM, 2024. Limited Detailed Site Investigation, Ampol Kurnell Terminal - Stormwater Separation Improvement Project (ref. DA 24/0008). 14 March 2024
- Ampol, 2021a. Operational Environmental Management Plan, Kurnell Terminal, Final Stage 2, 10 September 2021
- Ampol, 2021b. Kurnell Terminal – Remediation Action Strategy Update, 29 November 2021
- Ampol, 2022. Kurnell Terminal – Remediation Action Strategy Update, 30 November 2022
- Ampol, 2023. Kurnell Terminal – Remediation Action Strategy Update, 29 November 2023
- Enviropacific, 2022. Fire Training Area_Concrete Slab Assessment Report, November 2022

- GHD, 2018. Kurnell – Strategic Land Use Review, Contamination Constraints Assessment, November 2018
- WSP, 2018. Environmental Site Assessment, Data Gap Assessment, Caltex Kurnell Terminal (Caltex Site ID 535). 19 December 2018
- WSP, 2020. Kurnell Terminal – Calor Area, Pre-lease Assessment Reports and Lease Assessment report, April 2020
- WSP, 2021a. Kurnell Terminal – Former Calor. Pre-lease Assessment Report - Northern Area, February 2021
- WSP, 2021b. Skip Bin Lease Area Baseline ESA, Former Caltex Lubricating Oil Refinery, Solander St, Kurnell NSW, June 2021
- WSP, 2021c. GTS Earthworks lease assessment ESA, Former Caltex Lubricating Oil Refinery, Solander St, Kurnell, NSW, September 2021
- WSP, 2022. CBOX East Lease Assessment ESA, Former Caltex Lubricating Oil Refinery, Solander St, Kurnell, NSW, February 2022
- WSP, 2023a. Quarterly Groundwater Monitoring, Ampol Kurnell Terminal – Q1 February 2023, June 2023
- WSP, 2023b. Quarterly Groundwater Monitoring reports, Ampol Kurnell Terminal – Q2 May 2023, July 2023
- WSP, 2023c. Investigation of Soil Vapours at the Former CLOR Area, August 2023
- WSP, 2023d. BESS Ampol Terminal Kurnell Geotechnical Interpretative Report, December 2023
- WSP, 2024a. Soil Vapour Monitoring Program – November 2023, January 2024
- WSP, 2024b. Ampol Kurnell Terminal, PFAS SAQP 2022-2023 Investigation: Summary Report, March 2024
- WSP, 2024c. Quarterly Groundwater Monitoring, Ampol Kurnell Terminal Q4 November 2023, 4 March 2024.

3.0 Existing environment

3.1 Topography and drainage

The Site is situated on the Kurnell Peninsula, an elevated plateau of Hawkesbury Sandstone, approximately 18 km in length. The Kurnell landscape is described as gently undulating to rolling coastal dune-fields and relict dunes, with local relief to 15 m; slope gradients 1-10%. North-south oriented dunes with convex narrow crests, broad (1,000-2,000 m) gently inclined concave swales and isolated swamps, and extensive heathland (Port Hacking 9129-4N 1:25000 Topographic Map, 2022). Surface elevations across the Kurnell Township range from 0 metres Australian Height Datum (mAHD) within swamplands at Quibray Bay, to 55 mAHD within the Kamay Botany Bay National Park, south east of the Site. Elevations within the Site range from about 2 to 4 mAHD in Zone 1A and in the north west portions of Zone 1 and Zone 2, and up to ~30 mAHD along the eastern site boundary of Zone 1 (adjacent to the Kamay Botany Bay National Park). The elevation in Zone 3 is about 10 mAHD.

Stormwater generated on Site (from outside of bunded areas) is collected in the Site's stormwater system and discharged to the following receiving environments:

- Quibray Bay
- Botany Bay
- Marton Park Wetland.

Effluent from the WWTP at the Site is discharged via outfall to the Tasman Sea at Yena Gap under EPL 837.

3.2 Geology and soils

According to published geological information (Sydney 1:100,00 geological service sheet), the Site is underlain by Quaternary (Pleistocene), wind-blown, medium to fine grained, well-sorted, marine quartz sand. The sandstone is described as medium to coarse-grained, composed predominantly of quartz, with minor lithic fragments, feldspar, mica, and clay pellets. The Site lies on the aeolian Kurnell landscape unit, composed of gently undulating to rolling coastal dune field and relict dunes (NSW Soil Conservation Service Soil Landscape Series, Wollongong – Port Hacking).

From historical investigations at the Site, the bedrock surface elevation rises toward the east and south of the Site, with sandstone outcrops mapped at the northeast and southeast boundaries. Intrusive investigations have identified sandstone bedrock in Zone 3 to be generally shallower in the northern portion with depths ranging from 0.5 to 3.0 mbgl and deeper in the southern portion, generally from 5.5 to 10.50 mbgl. Bedrock depths in Zone 2 ranged from between 0.5 to 4.0 mbgl in the south east and increasing with depth towards the north west up to 20.7 mbgl (WSP, 2023d). Bedrock depths in Zone 1 and 1A would be expected to be typically between 10 and 20 mbgl,

3.3 Acid sulfate soils

Acid sulfate soils (ASS) is the common name given to a range of soil types containing iron sulfides, the most common being pyrite. ASS may be present as actual ASS (AASS) or potential ASS (PASS).

PASS are sulfidic soils formed in coastal lowlands subject to tidal inundation or saline groundwater that have not been oxidised. PASS form where conditions are conducive for accumulation of iron sulfides in soils (e.g. source of sulfate, source of iron, reducing conditions, and stable low energy environment). When exposed to air due to drainage (water table lowering/ dewatering) or disturbance during earthworks, they can cause heavy metals and acids to leach into soil and groundwater or impacted runoff can enter waterways and negatively impact aquatic ecosystems.

AASS occur where natural (e.g. groundwater level changes) or anthropogenic (e.g. land development, drainage works, etc.) activity has resulted in PASS to being exposed to air, resulting in releasing acidity and reaction products (iron, sulfate, calcium, magnesium, aluminium, etc.).

Review of the NSW ASS risk mapping indicates that the Project Area across Zone 1, Zone 2, and the northern portion of Zone 3 is mapped as disturbed terrain above 4 mAHD. The southern portion of Zone 3 is mapped as low probability above 3 mbgl (eSPADE, assessed on 16 May 2024) (Figure 3-1).

In the acid sulfate risk maps under the *Sutherland Shire LEP 2015* most of the Site is mapped as Class 4 risk, with areas of Class 3 being found in Zone 1, particularly in proximity to the FWS Relocation Area. Class 3 and 4 mapped areas require development consent where works would be more than 3 or 4 m below the natural ground surface, respectively.

A recent investigation within Zone 1 related to an upgrade of surface water infrastructure included an ASS assessment to support excavation and trenching works. Soil testing for ASS found potential PASS (PASS). The PASS was identified within grey stained sands with sulphurous odours at depths typically greater than 2 m bgl (AECOM, 2024).

3.4 Hydrogeology

Shallow groundwater at the Site is generally encountered at 2 mbgl, with depths ranging between 0.4 mbgl (perched water, overlying shallow rock) and 8.9 mbgl. Within Zone 2 groundwater is at an average of 1.4 mbgl, and within Zone 3 groundwater is at an average of 1.7 mbgl, within an unconfined aquifer in Quaternary sands (the Botany Sands Aquifer). Furthermore, groundwater in Zone 1 lies between 0.66 and 1.4 mbgl (Geo-Environmental Engineering, 2022a). No permanent perched groundwater has been identified, though temporary perched conditions could occur following rainfall events, until water has infiltrated into underlying units. Groundwater flow direction at the Site is influenced by an east-west groundwater divide that runs through the northern portion of Zone 3. To the north of the divide, groundwater flow direction is generally to the north west. To the south of the divide, groundwater flow direction is generally to the south west.

The Quaternary aquifer properties (mainly literature values) have been reported as follows (Coffey, 1996):

- Aquifer permeability is ~25 m/day
- Advective velocity is ~133 m/year
- Aquifer porosity is assumed to be 0.4.

The thickness of the Quaternary aquifer is controlled by the underlying Hawksbury sandstone profile, which predominantly acts as imperial flow boundary (aquitard) at the base of the Quaternary sands (Ampol, 2019).

Receiving water bodies for groundwater migrating offsite are Botany Bay to the north and Quibray Bay to the west. Quibray Bay is considered sensitive and parts of it comprise Towra Point Nature Reserve or Towra Pont Aquatic Reserve. Groundwater bores for garden irrigation are also present within the surrounding residential area. Additionally, Marton Park Wetland is located on the northern side of the Site (URS, 2013) and wetlands in Zone 4 and 5 located to the south of Zone 2.

3.5 Groundwater dependent ecosystems

Groundwater dependant ecosystems (GDE) rely on groundwater presence for maintenance of the ecosystem's health. GDEs can be impacted by changes in groundwater quality and water table changes from surrounding urban, agricultural, extractive or industrial land uses. The Marton Park Wetland, located on the northern boundary of Zone 1 is mapped as a GDE the Australian Government Bureau of Meteorology GDE Atlas[1]. The wetland is a Coastal Sand Forest and is mapped as a high potential GDE.

[1] Australian Government Bureau of Meteorology - Groundwater Dependent Ecosystems Atlas - http://www.bom.gov.au/water/groundwater/gde/map.shtml

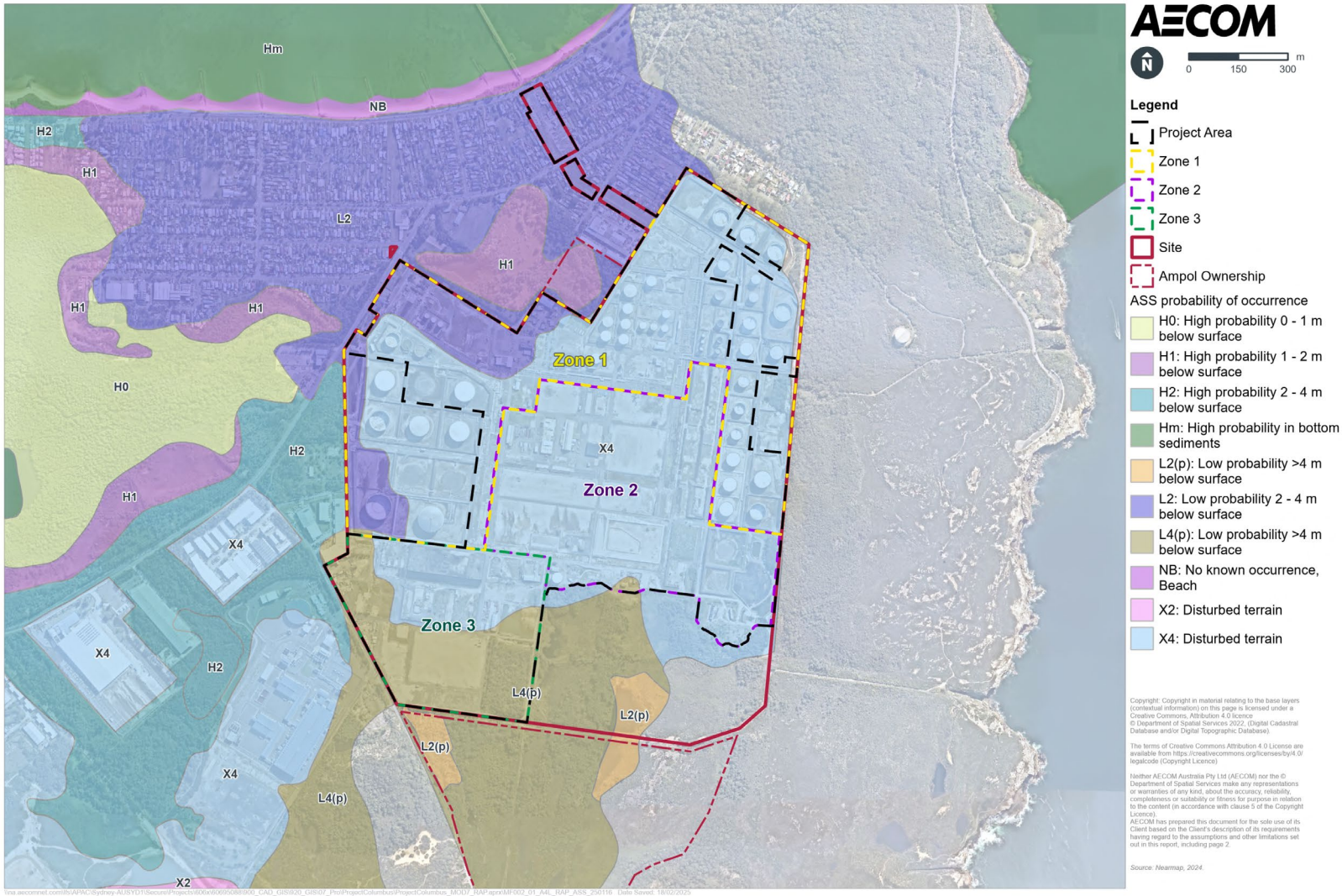

Figure 3-1 Acid sulfate soils

3.6 Contamination

The review of Site history, existing data and reports, and the conceptual site model (CSM) is detailed in the Conceptual RAP (Appendix H of the Modification Report) and summarised in the following sections. A CSM is a qualitative description of the mechanisms by which potential and/ or complete exposure pathways may exist between known or potential sources of contamination and human or environmental receptors. For a human or ecological receptor to be exposed to a contaminant derived from a site, a complete exposure pathway must exist.

3.6.1 Areas of environmental concern

Areas of environmental concern (AEC) where contamination is known or could be present from former potentially contaminating activities is detailed in the Conceptual RAP (Appendix H of the Modification Report) and summarised in Table 3-1.

Table 3-1 Areas of environmental concern

Zone	AEC	Description
1	Jet Remediation Area	There is ongoing groundwater remediation being undertaken in the Contractors Carpark area, which is being completed under Sutherland Shire Council (SSC) approval (DA 09/80) (Ampol, 2019). Primary contaminants (TRH F2 fraction based on jet fuel source) in groundwater at the down hydraulic gradient, northern Site boundary monitoring wells (PMW22, PMW45) are below the relevant industrial screening criteria and remain within historical concentration ranges (WSP, 2024c). This AEC is within the Project Area but not within the audit boundary.
	North Western Tank Farm	Quarterly groundwater monitoring within this area has identified contamination consistent with the historic fuel storage activities, however concentration trends are stable and there are no exceedances of relevant screening criteria at boundary wells for petroleum hydrocarbons (PHCs) (WSP, 2024c). This AEC is within the Project Area but not within the audit boundary
	Northern Tank Farm	Residual LNAPL and dissolved phase hydrocarbon contamination. There is a bioventing remediation system installed on the down hydraulic gradient boundary of the northern tank farm, treating groundwater prior to offsite migration. The sentinel monitoring wells in this area confirm that the remediation system is reducing PHC mass flux in groundwater to levels below relevant criteria (WSP, 2024c). This AEC is within the Project Area but not within the audit boundary.
	Former LPG Area	Whilst there are no PHC impacts of concern within this area (WSP, 2018), investigations into the presence of asbestos have identified impacts within surface soils which require management or remediation (AECOM, 2023a). This AEC is within the Project Area but not within the audit boundary.
	Eastern Tank Farm	There is LNAPL present within this AEC which is the result of a historic spill of product within the tank farm in the early 1990s. The LNAPL plume was remediated through hydraulic removal, however residual LNAPL is still present within the area, which presents as an ongoing secondary source of dissolved phase groundwater impacts (WSP, 2018). Based on the age and lack of primary source for the LNAPL, the contamination is not considered to be expanding (Ampol, 2019).
2	Former Fire Training Area (FFTA)	Assessments into the FFTA concrete slab have been completed (Enviropacific, 2022) and have confirmed the presence of PFAS within the concrete but below the General Solid Waste (GSW) classification (NSW EPA, 2014). Soil and groundwater investigations into the nature of PFAS in this area are ongoing.

Zone	AEC	Description
	Tank 282, Tank 331, and Flare Compound Geobag Areas	Geobags containing tank sludge removed from bases of tanks during the decommissioning process were removed from all three compounds between 2019 and 2023. Subsequent validation sampling has confirmed that the areas are suitable for ongoing industrial use. These areas have been validated as suitable for the current Site use but further evaluation is required in the context of future development of the Site.
	Former Limestone Pits	This area is located in the southeastern corner of Zone 2. The remedial works were completed in 2012, with remediation completed through containment on Site, and managed through an EMP. Groundwater management is ongoing through a phytoremediation system. It is noted in the Quarterly GME report (November 2023) that the Limestone pits area of the site is monitored on a biannual basis. A 2018 review of groundwater data (GHD, 2018) found no exceedances of assessment criteria. Containment of this area is completed, and is managed through a separate groundwater monitoring program; as such, this AEC is not considered further in this assessment.
3	Caltex Lubrication Oil Refinery (CLOR) Tank Farm	This area has been used to store hydrocarbon impacted soil waste temporarily. Removal of this waste commenced in 2023 and will continue into 2024. Following removal of the remaining soil waste, validation sampling would be undertaken to confirm the condition of soils in this area (Ampol, 2023).
	CLOR Landfarm	Formerly contained hydrocarbon and asbestos waste and was remediated as part of DA 20/0104, commencing in 2021. As part of this work, the former landfarm material was excavated and disposed offsite. This was followed by validation and backfilling of excavated areas with Virgin Excavated Natural Material (VENM). The area is understood to have been remediated but not yet reported and reviewed by AECOM, hence further investigation and/or remediation has not been discounted at this time.
	CLOR Process Unit Area	LNAPL was remediated in 2021 through the removal of a redundant stormwater basin, as well as two areas of asbestos impacted soils. Subsequent groundwater monitoring at this AEC has found that LNAPL is no longer present and PHC contamination in groundwater did not exceed tier 1 screening criteria (WSP, 2024c).
	Refining Process Improvement Project (RPIP) Mountain	Historical storage of stockpiles of unknown origin containing asbestos and other contaminants. Over time the stockpiles have been naturally revegetated in low to regenerating condition (refer to the Biodiversity Development Assessment Report (BDAR) (Appendix Q of the Modification Report)). Sampling completed by AECOM in 2022 identified asbestos impacts from surface to 2 mbgl. Other analytes test (PFAS, metals, PHC) were below human health criteria (commercial / industrial) (AECOM, 2023c).
1-3	Uncontrolled fill of uncertain quality across Zone 2 and Zone 3, and Zone 1 within Project Area	It is considered that fill within the Project Area has been uncontrolled at periods of time in the Site's operational history, which might have resulted in the presence of asbestos along with other contaminants of potential concern (COPCs) related to Site activities within the fill across the Site.

3.6.2 Contaminants of potential concern

Contaminants of potential concern (COPC) are listed in Table 3-2.

Table 3-2 Contaminants of potential concern (COPC)

Source type	Contaminants of potential concern (COPC)
Primary sources – Includes current and historic infrastructure, containers used for the bulk storage or transport of chemicals, and current and historic site activities (e.g. refuelling, or firefighting training).	• Asbestos • Petroleum hydrocarbons comprising - Total recoverable hydrocarbons (TRH) - Benzene, toluene, ethylbenzene, xylenes and naphthalene (BTEXN) - Polycyclic aromatic hydrocarbons (PAHs) • PFAS
Secondary sources – Includes soil (including fill of unknown origin) and groundwater (including LNAPL) impacted by petroleum hydrocarbons, chemical solvents, and other chemicals.	• Heavy metals (As, Ni, Cu, Zn, Pb, Hg, Cd, Cr) • Organochlorine and Organophosphorus (OCP and OPP) Pesticides • Phenols • Polychlorinated Biphenyls (PCBs) • Volatile Organic Contaminants (VOCs) and • Semi Volatile Organic Contaminants (SVOCs)

3.6.3 Receptors and exposure pathway linkages

Potential receptors include:

- Onsite workers (current and future occupants)
- Onsite maintenance workers
- Onsite ecological receptors (wetlands in south of Site)
- Offsite residents (north west of the Site)
- Offsite commercial workers (north west and south west of the Site)
- Offsite ecological receptors (surrounding Site).

Contamination transport pathways include:

- Leaching of soil contaminants into groundwater
- Lateral and vertical migration of contaminants in groundwater
- Dust and sediment from wind and erosion
- Vapour intrusion and migration into underground services and pits, and buildings
- Physical transport during earthworks and vehicle movements.

The following exposure pathways may apply for onsite human receptors:

i. Dermal contact and incidental ingestion of soil, groundwater, and/ or surface water

ii. Inhalation of soil derived dust (or fibres) in indoor and/ or outdoor air

iii. Inhalation of soil vapours within a trench

iv. Inhalation of soil vapours within indoor air.

Based on the physical and chemical parameters of the COPC identified exposure pathways that may be relevant to each COPC for human receptors are presented in Table 3-3. A potentially complete pathway occurs where there is a complete exposure pathway between the contamination source and the receptor.

Table 3-3 COPC and Relevant Pathways (onsite human receptors)

COPC	Relevant pathways	Pathway linkage
PFAS	i	Potentially complete
TRH, BTEXN, VOCs	i, ii, iii, iv	Potentially complete
PAHs, SVOCs, metals, OCPs/OPPs, PCBs	i, ii	Potentially complete
Asbestos	ii	Potentially complete

3.6.4 Data gaps

A data gap assessment was undertaken in the Conceptual RAP (Appendix H of the Modification Report) to identify where more field and analytical data is required to inform a Detailed RAP. The data gaps where further investigations are proposed are listed in Table 3-4. The data gap investigations would be undertaken prior to finalisation of a Detailed RAP to fill in the data gaps.

Table 3-4 Focus areas for additional assessment

#	Focus areas
1	**Former process areas with no documentation to confirm capping**: Within Zones 2 and 3, there are areas that have been remediated by Ampol through the removal of surficial asbestos and capped with what appears to be crushed sandstone (around 2017, during the decommissioning and demolition works). These areas need further verification to confirm the extent and quality of capping which has been completed.
2	**Hydrocarbon dataset**: At present, the sample set is not yet comprehensive enough in order to fully characterise the lateral and vertical extent of impact in all areas of Zone 2 and Zone 3. Currently, building structures occupy the central portion of Zone 2, and detailed characterisation has not been conducted at these locations.
3	**PFAS data set**: Limited PFAS data is present for certain areas of Zones 2 and 3. The FFTA (Zone 2) and the CLOR area (temporary foam storage trailer in Zone 3) would be characterised to further inform remedial options.
4	**Other COPCs**: Specific process chemicals that may have been used for which testing has been limited/ not completed at the Site.
5	**RPIP**: Further geotechnical assessment, cut and fill modelling, and/ or cost-benefit analysis would need to be considered to confirm remedial options in this area.
6	**Services removal and relocation condition**: As part of the proposed modification, the removal and/ or relocation of services, such as the oil water sewer, firewater, and electrical assets, would be undertaken. The condition of material at these locations would be further investigated as historical targeted investigations are limited. This is of particular importance for oily water sewer (OWS), which present as a source for PHC contamination to surrounding materials in the event of a break in containment. This includes the areas within Zone 1 where some infrastructure would be relocated.
7	**Natural Source Zone Depletion (NSZD)/ Natural Attenuation**: Soil and groundwater impacts have been identified within Zone 1 which do not present a risk to current terminal receptors, further opportunities to characterise the potential role of NSZD (*in lieu* of active remediation) may be undertaken to support the management of the existing operational area.
8	**Final land condition and end land uses**: The required extent and thickness of any potential future capping system would be dependent on residual contaminant concentrations following remediation and also potentially the final land use of each area.

#	Focus areas
9	**Soil – Historic characterisation**: The condition of soils across the Project Area have been historically investigated to varying extents. These soil conditions may have also be subject to change through ongoing site maintenance and management activities such as levelling, capping, natural attenuation processes, and/or remediation. Additionally, it is recognised that the fill in parts of the Site (RPIP) is generally of unknown origin, and these activities could further influence the character and heterogeneity of these materials. The relevance and reliability of historic results should consider these factors when being utilised.
10	**Deep groundwater impacts**: Within the unconfined aquifer underlying the Site, there is potential that contamination within the shallow groundwater could migrate down vertically through diffusive forces driven by concentration gradients. From the data review completed in the Conceptual RAP (Appendix H of the Modification Report), it is noted that there is a lack of deep groundwater wells across the Site. The condition of deep groundwater, particularly where significant shallow groundwater impacts are present should be considered.

4.0 Assessment of construction impacts

This section provides an assessment of the potential construction impacts related to the disturbance of contaminated soil, acid sulfate soil and groundwater, waste generation and importation of spoil as well as spills and leaks from construction activities.

4.1 Disturbance of existing contamination

As described in Section 3.6, existing contamination poses a potential risk to human and ecological receptors located on and off the Site.

The construction works would include disturbance of contaminated and uncontaminated soils during excavation works undertaken as part of remediation, demolition, and grading works. Potential negative impacts that could occur (if mitigation measures were not implemented) include:

- Potential exposure of the Site and construction workers to contamination present in the soil and groundwater during the works
- Generation of nuisance odours
- Potential for cross-contamination of clean soils with contaminated spoil during construction works from earthmoving and stockpiling activities
- Soil erosion and sedimentation during construction causing contaminated stormwater and/ or sediment to discharge and impact surrounding land and waterways.

However, the completion of remediation works undertaken as part of the modification works would overall have a positive environmental impact by reducing the risk the existing contamination poses to these receptors.

Contamination would be managed through implementation of the Conceptual RAP (Appendix H of the Modification Report). Data gap investigations, proposed in Table 3-4, would inform the Detailed RAP to refine remediation extents and methodologies. The contamination would either be reduced to a concentration that is acceptable for the future proposed industrial redevelopment or capped, depending on the location and nature of the contamination. Mitigation measures for impacts related to disturbance of existing contamination are listed in Section 7.0.

4.2 Acid sulfate soils

PASS could potentially be disturbed in areas where excavations exceed 2 m below the natural ground surface or where groundwater is lowered below the depth of PASS. Most excavations are anticipated to be less than 1 mbgl but deeper excavations, between 2 and 4.5 mbgl could occur. Temporary dewatering of excavations may be required during construction; however, this is considered to be localised to temporary excavations and not anticipated to result in groundwater table lowering in the surrounding aquifer beyond more than 2 m below the natural ground surface.

Based on the estimated remediation volumes, there is potential for greater than 1,000 tonnes of PASS to be excavated. Acid sulfate soil investigations would be required to inform the preparation of treatment methodology in an Acid Sulfate Soil Management Plan (ASSMP). Treatment of ASS requires construction of treatment pads and the addition of lime to neutralise the acid generated when the pyrite in the soil is oxidised from exposure to oxygen.

4.3 Groundwater

Temporary groundwater dewatering would be required during construction when groundwater accumulates in trenches and excavations. Testing for COPCs would be undertaken to confirm that this water can be appropriately treated in the WWTP. It is anticipated that the system, including the WWTP, would have sufficient capacity during remediation activities as the WWTP was originally designed to service the refinery which is no longer in operation. It is understood that on a flow and contaminant concentration basis the current loading is well below the WWTP design capacity. Groundwater that that cannot be treated at the WWTP would either be pre-treated by another method or disposed to an appropriately licenced liquid waste facility.

Remediation and the associated dewatering works are not anticipated to change groundwater levels or have a negative impact on groundwater quality within the GDE at Marton Park and to the wetlands south of Zone 2. A Groundwater Management Plan (GWMP) would include dewatering management measures to check whether groundwater level changes near the north/ northwest boundary have an adverse impact the Marton Park GDE.

A quarterly groundwater monitoring program is implemented by Ampol at the Site as a protection measure to identify the potential for migration of hydrocarbon contaminated groundwater before it leaves the Site. The monitoring program includes monitoring wells in the central part of the Site, and various boundary monitoring wells along the northern and western boundaries, corresponding to the down gradient direction of groundwater flow. This monitoring program would continue throughout the construction period of the proposed modification to verify the works are not impacting groundwater quality. Procedures for preventing adverse groundwater impacts from dewatering activities would be included in the CEMP.

In-situ treatment of groundwater with injection of chemical oxidants (chemox) or colloidal carbon would be considered if warranted based on a Tier 1 risk assessment. Any amendments added or injected into the subsurface would be either be inert (colloidal carbon) or if oxidative (chemox) are not anticipated have an impact on groundwater quality (other than reduction in COPC concentrations). This would be monitored and confirmed as part of the GWMP.

4.4 Waste

The remediation and construction works would also require some disposal of contaminated soil to landfill where soil cannot be capped and contained or treated for onsite re-use. Disposal to landfill has negative environmental impacts associated with landfilling and transporting the spoil (emissions, noise, and traffic). As part of the remedial options assessment in the Conceptual RAP (Appendix H of the Modification Report), the hierarchy of remedial options was considered in terms of sustainability and reducing the volume offsite treatment and disposal where possible. Where practical, the first option would be to treat and re-use onsite, or cap and contain, with offsite disposal to landfill being the last option. Mitigation measures to reduce landfill waste would be included in the detailed remedial action plan and CEMP. Further assessment of waste impacts is included in Section 7.12 (Other issues) of the Modification Report.

4.5 Importation of spoil

Soil would be required to be imported to the Site to backfill excavations and level areas of the Site. Soil imported to the Site could have negative human health and ecological impacts if it is contaminated with chemicals or asbestos, or has unsuitable physical properties (e.g. pH, salinity). As stated in the Conceptual RAP (Appendix H of the Modification Report), imported materials would only be accepted to the Site if they meet the definition of:

- VENM as defined in the *Protection of the Environment Operations Act (1997) (POEO Act), Schedule 1*
- Excavated natural material (ENM) as defined by the Resource Recovery Order under Part 9, Clause 93 of the *POEO (Waste) Regulation 2014*
- Any other suitable material granted an applicable exemption or order under the NSW Environment Protection Authority (EPA) resource recovery framework.

The material imported to the Site would be accompanied by appropriate documentation that has been verified by the appointed environmental consultant. A validation report would include materials tracking and inspection and test results for validation sampling of imported materials.

4.6 Spills and leaks

Potential contamination of soil and groundwater could occur during construction works from:

- Spills from removal of pipes and tanks
- Hydraulic fluid leaks from excavators and other mobile plant
- Spills during plant refuelling
- Spills or leaks of other materials stored and used onsite, including oil and fuel for site plant and vehicles, stored liquid wastes from remediation works, and dewatering activities.

Spills or leaks on unsealed and unbunded surfaces can contaminate underlaying soils and migrate into groundwater or stormwater. The CEMP would include spill and leak prevention measures and spill response and reporting procedures.

5.0 Assessment of operational impacts

This section provides an assessment of the potential impacts related to soils and groundwater, and fuel and chemical storage during operation. The management plans discussed in this assessment are detailed further in Section 7.0.

5.1 Soils and groundwater

One or more Environmental Management Plan(s) (EMP) would be prepared, where required, for implementation across the Project Area to appropriately manage residual contaminated soil and/ or groundwater impacts that do not meet commercial/ industrial standards.

Following soil remediation, and during the ongoing operation of the Site, ongoing management of contaminated groundwater would continue to be undertaken. The EMP(s) may include GMP(s), to confirm that residual COPCs in groundwater are being appropriately managed. The GMP(s) would determine appropriate locations for groundwater monitoring.

The majority of Zones 2 and 3 would remain vacant and would be maintained until redevelopment (subject to future approvals). In the interim, surface treatments, such as grassing or temporary pavement, would be maintained to help mitigate soil erosion and limit the amount of sediment discharging into the existing drainage network. Stormwater flows across Zones 2 and 3 would be directed to the existing stormwater system (SWS) at the Site, and flows in Zone 1 would be managed by either the SWS or the OWS as required. As such, the proposed modification is not expected to result in adverse impacts relating to soils and erosion during operation.

5.2 Fuel and chemical storage and handling

Once the modification works are complete, the Site would continue to operate as described in the approval documentation for the approved project and would be consistent with the development consent for SSD-5544. Potential adverse impacts associated with ongoing operations may occur due to loss of containment during storage and transfer activities onsite, if prevention mitigation measures fail. Along with ongoing implementation of the existing Kurnell Terminal Operational Management Plan (OEMP), planned upgrades to parts of the OWS as part of the proposed modification should further reduce the risk of future impacts.

Continued operation of the Site, including relocated infrastructure, would be subject to environmental conditions of approvals in SSD-5544. As stated in the EIS (URS, 2013), operations would be carried out with applicable federal, state, and local permits, approvals, and regulatory requirements, as managed through the existing environmental management system at the Site.

6.0 Assessment of cumulative impacts

Cumulative impacts have the potential to occur when benefits or impacts from a project overlap or interact with those of other projects, potentially resulting in a larger overall effect (positive or negative) on the environment or local communities. Cumulative impacts may occur when projects are constructed or operated concurrently or consecutively.

Projects were reviewed against the following screening criteria for this cumulative impact assessment:

- Spatially relevant (i.e., the development or activity overlaps with, is adjacent to or within two kilometres of the Project Area)
- Scale (i.e., large-scale major development or infrastructure projects that have the potential to result in cumulative impacts with the proposed modification, as listed on the NSW Government Major Projects website and on the relevant council websites)
- Timing (i.e. the expected timing of its construction and/or operation overlaps or occurs consecutively to construction and/or operation of the proposed modification)
- Status (i.e., projects in development with sufficient publicly available information to inform this environmental impact statement and with an adequate level of detail to assess the potential cumulative impacts).

The following projects were considered to have met the above criteria, with the potential to have cumulative impacts with the proposed modification:

- The following project lies within the Project Area:
  - Kurnell Stormwater Separation Improvement Project
- The following offsite projects:
  - Kamay Ferry Wharves (350 m north of the Project Area)
  - Breen Resource Recovery Facility (2 km west of the Project Area)
  - Woolooware to Kurnell Tower Replacement Project (120 m south west of the Project Area).
  - Kurnell Planning Proposal (800 m south west of the Project Area).

The location of the projects are shown on Figure 6-1.

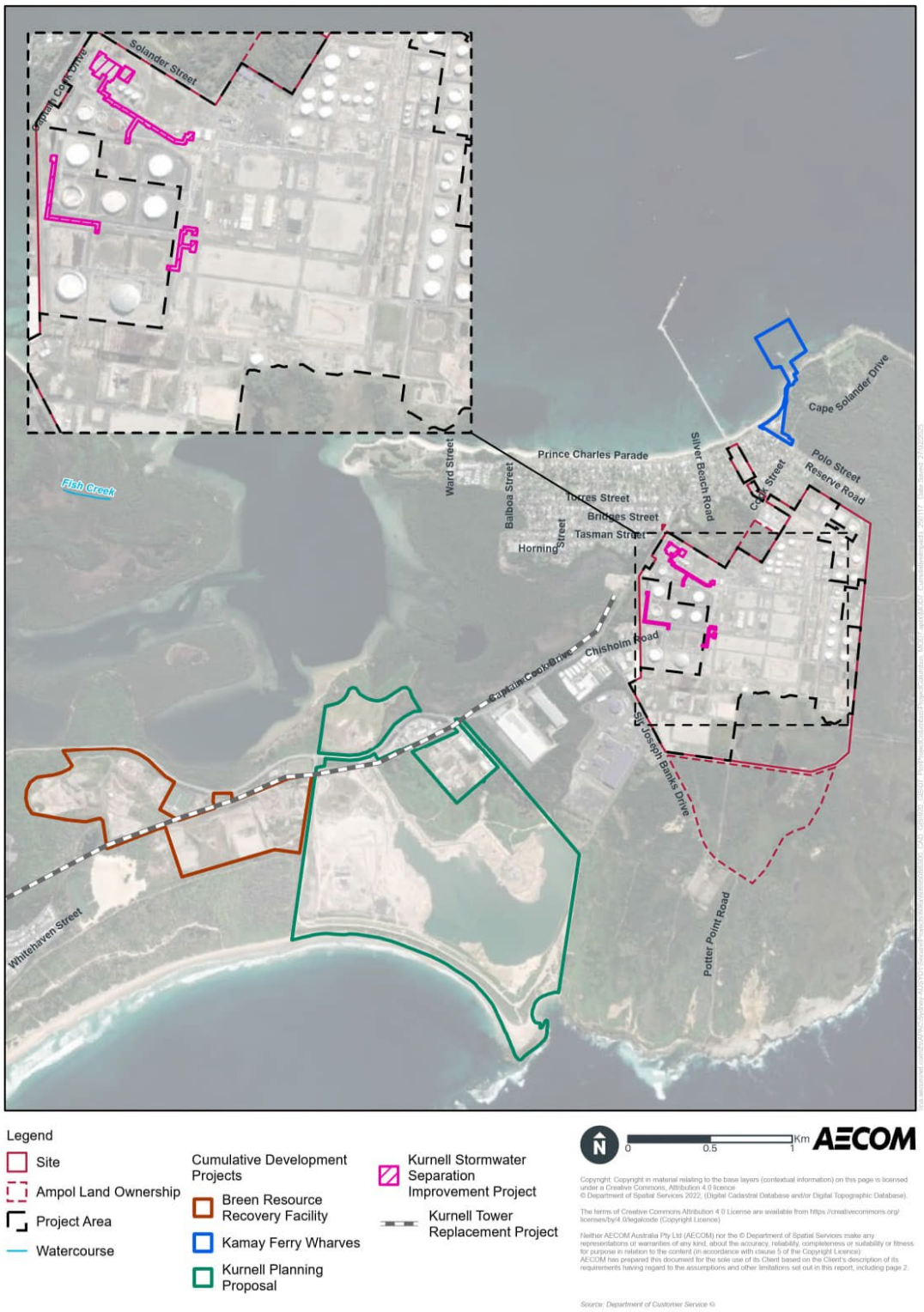

Figure 6-1 Cumulative development projects

6.1 Construction

Construction of the proposed modification is anticipated to commence in 2025 and be completed in 2029. A comparison of the construction timing of the identified cumulative development projects and the potential impacts related to soil, contamination, and groundwater for the projects are described in Table 6-1.

Table 6-1 Cumulative assessment – Construction

Project	Construction timing	Potential impacts
Onsite projects		
Kurnell Stormwater Separation Improvement Project (DA24/0008)	Due to be completed mid-2025.	The construction footprint of the Kurnell Stormwater Separation Improvement Project (KSSIP) is located within Zone 1 of the Project Area. The project includes installation of new pump stations, additional stormwater retention capabilities, and the construction of a levee wall around the WWTP, to ensure the OWS and SWS operate independently and minimise the risk of hydrocarbon contaminated floodwater leaving the Site. As the works are expected to be complete before the proposed modification commences, the potential cumulative impacts from construction activities are expected to be minimal. The improved stormwater mitigation measures should further reduce the construction impacts of works undertaken for the proposed modification.
Offsite projects		
Kamay Ferry Wharves (SSI-10049)	Due to be completed late 2024.	The project includes the construction of a new ferry wharf and associated infrastructure (waiting area, pathways and landscaping) at Kurnell headland. An EIS (ARUP, 2021) was completed for the project which identified potential sources of contamination as potential historical uncontrolled filling, use of hazardous building materials and a nearby UXO area. ACM was identified in soil in some areas of the construction footprint. Environmental management measures for construction included implementation of a soil and water management plan (SWMP) in the CEMP and an erosion and sediment control plan (ESCP). Given the likely limited contamination within the construction footprint, cumulative negative impacts related to contamination and groundwater are not expected. Soil erosion and subsequent increased sedimentation into Botany Bay could be a potential negative cumulative impact, if appropriate controls not implemented.

Project	Construction timing	Potential impacts
Breen Resource Recovery Facility (SSD-10412)	Currently under assessment and expected to be completed in 2028.	An EIS (Ethos Urban, 2021) was prepared for the construction and continued operation of a resource management facility including resource recovery facility and redevelopment of completed landfill areas into recreational parklands/ community space. The Breen Resource Recovery Facility was a former sand mining operation which was converted into a solid waste landfill in 1990 for VENM and PASS disposal (PASS disposal below water level) and operates under an EPL. According to the EIS, the leachate within groundwater in the landfill area has concentrations of ammonia, heavy metals, and petroleum hydrocarbons typical of an inert landfill and do not appear to be migrating offsite at concentrations greater than background levels typical of the area. Landfill gases also were reported to not be migrating offsite (Ethos Urban, 2021). Soil erosion and subsequent increased sedimentation into Quibray Bay could be a potential negative cumulative impact if appropriate controls not implemented.
Woolooware to Kurnell Tower Replacement Project	Expected to commence in late 2024 and continue into 2028	A Review of Environmental Factors (REF) was prepared by Ausgrid for the tower replacement project[2]. The replacement of transmission towers could potentially result in localised disturbance of soils within the construction footprint of each tower replacement. The contamination status of soils within the construction footprint is not known. Soil erosion and subsequent increased erosion into Quibray Bay could be a potential negative cumulative impact if appropriate controls not implemented.
Kurnell Planning Proposal	Currently under assessment with construction anticipated to occur over 10 to 20 years	The Planning Proposal is for a 210 hectare area for rezoning for a mixture of residential, commercial, tourism, recreational and cultural land uses. A Stage 1 – Preliminary Site Investigation (PSI) (Coffey, 2023) was prepared for the Kurnell Planning Proposal. The PSI identified limited and low risk of contamination sources from historical activities and concluded further detailed investigation was not required. Given the likely limited contamination within the Kurnell Planning Proposal area, cumulative negative impacts related to contamination are not anticipated. Soil erosion and subsequent increased erosion into Quibray Bay could be a potential negative cumulative impact if appropriate controls not implemented.

Kurnell Stormwater Separation Improvement Project would result in larger cumulative volumes of both contaminated and uncontaminated soil being disturbed during the construction period. Groundwater dewatering for the Kurnell Stormwater Separation Improvement Project would be limited to temporary management of excavations. All the works would be subject to implementation of RAPs and ASSMPs that would mitigate the risk to identified human and ecological receptors.

Given the likely limited contamination associated with the offsite projects, cumulative negative impacts related to contamination and groundwater quality are not expected. Measures included as part of the Breen Resource Recovery Facility project CEMP should help reduce risk associated with existing soil and groundwater contamination, where present. The other projects have relatively smaller construction footprints and may encounter isolated areas of contamination which could be readily managed through implementation of a CEMP.

[2] https://cdn.ausgrid.com.au/In-your-community/Construction-projects/Woolooware-to-Kurnell-Tower-Replacement - accessed 24 June 2024

Soil erosion and subsequent increased sedimentation into Quibray Bay and Botany Bay, as well as dust generation, could be a potential negative cumulative impact if appropriate controls were not implemented across all projects. All projects would require implementation of a CEMP in accordance with conditions of approvals and therefore would minimise negative impacts associated with sedimentation on surrounding waterways.

Overall, negative cumulative impacts related to soil, groundwater, and contamination are not anticipated for these projects. This assumes the implementation of environmental mitigation measures in the respective environmental management plans for the projects.

6.2 Operation

The operations and potential associated impacts for the cumulative development projects related to soil, groundwater and contamination are described in Table 6-2.

Table 6-2 Cumulative assessment – Operation

Project	Operations	Potential impacts
Onsite projects		
Kurnell Stormwater Separation Improvement Project (DA24/0008)	Stormwater drainage system	The stormwater system would manage site runoff and be managed under the OEMP for the Site. The improved system is expected to reduce adverse impacts to the offsite receiving environment.
Offsite projects		
Kamay Ferry Wharves	Kurnell Ferry Wharf	The EIS (ARUP, 2021) identified that there would be potential for spills from ferries and other vessels which would be managed with an Emergency Spill Management Plan. Other potential operational impacts relating to groundwater and contamination were not considered low risk.
Breen Resource Recovery Facility	Resource Recovery Facility, landfill, and park	The Breen Resource Recovery Facility would continue to operate under EPL-4608, including requirements for groundwater, surface water and landfill gas monitoring. Post-closure and redevelopment into recreational parkland/ community land use would require implantation of a landfill closure plan to manage ongoing risk of leachate and landfill gas.
Woolooware to Kurnell Tower Replacement Project	Transmission towers	There are not expected to be additional operational impacts from the replacement of the existing towers relating to soil, contamination and groundwater.
Kurnell Planning Proposal	Future residential, commercial and open space land use	The project if completed would be a significant urban development. The urban design report and development control plan (DCP) proposes development of an integrated green infrastructure system with integrated water management to minimise impacts from the development. There would be commercial and retail development for the town centre, however given the development is largely a residential area, contaminating land uses are not expected.

Overall, there is a low risk of negative cumulative environmental impacts related to soil, groundwater and contamination. Existing contamination would be remediated where required during the construction of the projects, and therefore residual contamination risk would be low. Some of the projects would have ongoing environmental management measures through either implementation of OEMPs, landfill closure plans (Breen Resource Recovery Facility), and EMP (the Site).

7.0 Management of impacts

Mitigation measures to manage potential contamination, soils, and groundwater impacts of the proposed modification are outlined in Table 7-1. Additional and/ or modified environmental safeguards and management measures to those presented in the approved SSD-5544 are shown in **bold**. Deleted measures, or parts of measures, have been ~~struck out~~. Where approved measures have been consolidated to reduce duplication, previously agreed text that has been brought into existing or new measures has been underlined.

Table 7-1 Management and mitigation measures – Soils, groundwater, and contamination

ID	Issue	Mitigation measure
C1	Soils, groundwater and contamination	A Soils ~~and Erosion~~ **and Water** Management Plan **(SWMP)** would be developed as part of the Construction Environmental Management Plan (CEMP) to manage the excavation, testing, stockpiling, reuse, and rehabilitation of soils **as well as water management requirements**. This plan would be developed in accordance with 'The Blue Book' Managing Urban Stormwater – Soils and Construction Volume 1 and 2 (Landcom, 2004) and would outline: • The areas where soil disturbance is likely • Soil testing procedures • Soil handling procedures • Locations where soil would be stockpiled on-site for either removal, treatment, or reuse • Locations of potentially contaminated areas • Procedures to reduce erosion and the spread of dust • Restricting traffic to defined roads or tracks where necessary • Measures to manage vehicles leaving the Site to reduce soil on public roads • ~~The rehabilitation of bare soil following completion of the construction works~~ • Inspection program for any erosion control structures and bunded areas • How excavations would be staged so that the length of time that excavations are left open and temporary stockpiles are required is minimised • **Remediated soils and validated crushed clean concrete slabs would be used as backfill where practicable. Imported material would be classified as virgin excavated natural material (VENM), excavated natural material (ENM) as defined by the ENM Order, 2014, or material covered under an NSW EPA specific Resource Recovery Order (RRO)** • Measures to protect excavations from increased stormwater runoff (e.g. by using bunds or similar structures where required) • That equipment is to be maintained and operated in a proper and efficient condition to reduce the likelihood of spills or leaks • How the rehabilitation of bare soil would be managed across the Site once areas are returned to grade

ID	Issue	Mitigation measure
C2	Soils	All materials would be stockpiled in accordance with 'The Blue Book' *Managing Urban Stormwater – Soils and Construction Volume 1 and 2* (Landcom, 2004). Principal controls would include the following: • Silt fences would be installed around stockpiles to reduce erosion and protect vegetation or Site infrastructure as necessary • Silt and sediment traps would be installed across stormwater drains in proximity to excavation areas • Stockpiles would be restricted to cleared areas and not impact any vegetation • **Contaminated s**~~S~~tockpiles would be placed on impermeable ~~sheeting~~ **surface** • Stockpiles would be covered and wetted down in order to reduce dust creation • Stockpiles would not be located in close proximity to any stormwater drainage systems **(where possible)** • ~~Caltex~~ **Ampol** would not stockpile in areas that are prone to flooding as identified in ~~Figure 4-10 of Appendix D of the Demolition Works SEE~~ in **the Surface water, wastewater, and flooding report (Appendix I of the MOD-7 Modification Report**) • Stockpile locations and erosion and sediment control requirements associated with the ~~Project~~ **proposed modification** would be reviewed by a suitably qualified person to ensure that the recommended measures achieve the environmental outcomes for the Site.
C4	Contamination	Excavated soils would be **inspected and if necessary,** tested for both contaminants and odour using standard practices **Should elevated levels of contamination or odour (i.e. levels above those expected or planned for in the relevant location) be present in the soils or excavations, work related to the excavation would be suspended until a suitably qualified environmental consultant can instruct on how best to proceed to manage contamination, or vapour, or odour risks to deliver the works and achieve work health and safety and environmental compliance requirements.**
C5	Contamination	Clean materials would be separated from contaminated materials for reuse as backfill where required. **A Material Tracking Plan would be implemented to track materials to be reused or removed from the Site.**
C7	Contamination	Suspected contaminated materials would be assessed and classified in accordance with Environment Protection Licence (No. 837) (EPL) requirements and NSW (~~2009~~ **2014**) *Waste Classification Guidelines: Part 1: Classifying Waste*, batched, further tested (where required) and disposed by a licenced contractor.

ID	Issue	Mitigation measure
C8	Contamination	Disposal of any contaminated soils or groundwater would be in accordance with EPL requirements and NSW DECCW's *Waste Classification Guidelines* and the Contamination Management Plan (CMP) for the ~~Project~~ **proposed modification**. Contaminated materials **to be disposed offsite** would be sent to appropriately licensed facilities in accordance with the *Contaminated Land Management Act 1997*.
C9	Acid sulfate soils	If Acid Sulfate Soils (ASS) are encountered during construction ~~or the ACS Modification works,~~ an ASS Management Plan **(ASSMP)** would be prepared in accordance with the ASS Manual (*ASS Management Advisory Committee 1998*).
C10	Groundwater	A Groundwater Management Plan (GWMP) would be developed and included within the CEMP. This plan would outline the measures that would be used to manage the testing, dewatering, storage, movement and treatment of any groundwater intercepted during the construction phase. Measures would include: • Measures for the dewatering, storage, movement and treatment of groundwater encountered in excavations. Dewatered groundwater would be collected and sent to the on-site Wastewater Treatment Plant in accordance with the established Site wastewater management procedures, unless it is tested and is of suitable quality to be directed to stormwater • The use of appropriate drip trays and interception techniques for any construction specific liquids stored on the Site • Bunding of any fuel or chemical storage area at the construction Site • Regular inspection of construction equipment to ensure any leaks are minimised and rectified • Management of vehicles leaving the Site to reduce soil on roads, production of dust and the introduction of contamination to the groundwater and/or stormwater system • Appropriate and timely disposal of any contaminated soil, water or waste generated during construction • ~~Regular inspection of erosion control structures and bunded areas~~ • Regular inspection and testing of containment areas~~, drainage lines and process pipe work~~ • A plan for corrective action should an unexpected **find** ~~increase in contaminants of potential concern (COPC)~~ be observed ~~in the groundwater monitoring~~ **during the proposed modification**. • **Management and monitoring of dewatering activities adjacent to Marton Park and the wetlands in Zone 4** • **Management and monitoring of groundwater quality should in-situ treatment of groundwater be warranted.**
C11	Contamination	Any runoff that may accumulate in excavations would be periodically tested for elevated levels of contamination. Water that is found to have elevated levels of contaminants would be collected and sent to the onsite Waste **W**~~w~~ater Treatment Plant in accordance with the established refinery wastewater management procedures.

ID	Issue	Mitigation measure
C15	Contamination	Permits would be required to work in the areas where potential soil and groundwater contamination exists. The work permit includes requirements such as monitoring and **personal protective equipment (**PPE**)**. No unauthorised entry into these areas ~~is~~ **would be** permitted, without a permit.
C16	Contamination	Appropriate inspection, assessment, maintenance and repair programmes that would be implemented as part of the operation of the ~~Project~~ **terminal (as modified)**. These safeguards would be incorporated into the updated management plans for the proposed terminal. The ~~Project~~ **terminal (as modified)** would be appropriately licenced under the *Protection of the Environment Operations Act 1997* and would be managed in accordance with EPL requirements.
C17	Contamination	A Contamination Management Plan would be developed to outline measures for monitoring, handling, storing and managing contaminated soils and contaminated groundwater. It would include the following: • Excavated soils would be **inspected and if necessary,** tested for both contaminants and odour using standard practices • **Should elevated levels of contamination or odour (i.e. levels above those expected or planned for in the relevant location) be present in the soils or excavations, work related to the excavation would be suspended until a suitably qualified environmental consultant can instruct on how best to proceed to manage contamination, or vapour, or odour risks to deliver the works and achieve work health and safety and environmental compliance requirements.** • ~~During excavation visual and olfactory indicators of impact would be monitored. Where there is potential for volatile organic contaminants (based on known ground conditions) or where hydrocarbons are seen or smelt during excavations, soils would be inspected for hydrocarbon impacts using a PID and/or testing.~~ • ~~Excavated soils would not be used for backfill if they are impacted at levels exceeding commercial/ industrial as defined by Schedule B1 Guidelines, *Investigation Levels for Soil and Groundwater, National Environment Protection Measure (Assessment of Site Contamination) Amendment Measure 2013*.~~ • **Where the risk of presence of asbestos has been identified,** ~~All~~ excavations would be sampled ~~for asbestos~~. Asbestos assessment would be undertaken in accordance with Schedule B1 Guidelines, *Investigation Levels for Soil and Groundwater, National Environment Protection Measure (Assessment of Site Contamination) Amendment Measure 2013.* • ~~Asbestos impacted soil not found in the pipeways would be disposed of at the ACS containment cell or removed from the Site as soon as practicable if excavated. If these soils need to be temporarily stockpiled they would be stored at a defined location at the former CLOR site, covered and labelled as asbestos waste.~~ Asbestos impacted soil would be classified in accordance with NSW EPA guidelines for transport and disposal at ~~either the ACS Containment Cell or~~ a licensed

ID	Issue	Mitigation measure
		landfill ~~(~~and in accordance with the Site waste management system and the ~~Demolition~~ Waste and Resource Management Plan (~~D~~WRMP) ~~for the demolition works~~ **or capped and contained onsite in accordance with the Detailed RAP(s)**. The excavation, transport and disposal of asbestos impacted soil would be undertaken by a licenced contractor and comply with NSW ~~WorkCover~~ **SafeWork** requirements. • Hydrocarbon impacted soil would not be temporarily stockpiled adjacent to the excavation. If these soils need to be temporarily stockpiled**,** they would be stored at a defined location ~~at the former CLOR site~~ **in accordance with the Detailed RAP(s).** • Excavated soils would be separated into stockpiles according to odours, staining and other environmental indicators. Soils that are potentially contaminated (following visual and olfactory inspection and or use of monitoring equipment) would be placed on impermeable ~~sheeting~~ surfaces into uniquely identified stockpiles and appropriately bunded and managed. The bunds would be impermeable and of sufficient capacity to ensure that runoff from these stockpiles is contained prior to being sent to the WWTP. ~~• Works in the vicinity of the contaminated water would be suspended until the environmental consultant can further assess the impacted groundwater and the associated risks.~~ ~~• Where no contamination issues are identified, excavated material would be used as backfill to bring the excavated area back to grade as soon as practicable. If required, certified VENM, ENM or appropriated remediated material would be used to provide additional backfill material.~~ • If excavated material cannot be re-used or managed onsite then it would be removed off-site as waste to an appropriately licensed facility. • Further, excavated material; would be classified in accordance with EPL condition O5.1 which requires “any liquid and/or non-liquid waste generated and/or stored [at the Site] is assessed and classified in accordance with the ~~NSW (2009) *Waste Classification Guidelines: Part 1: Classifying Waste*, batched and further tested (where required, for example Toxicity Characteristics Leaching Procedure (TCLP) testing)~~ **NSW EPA Waste Classification Guidelines as in force from time to time**.” • **Where contaminants exceed General and/or Restricted Solid Waste, and/or Hazardous Waste classification, the toxicity characteristics leaching procedure (TCLP) would be conducted to assess the leachable concentration and classification of waste can be reduced.** • The method of disposal or reuse would be in line with the materials’ classification in accordance with specifications set out in a ~~D~~WRMP. • Where soils are reused on Site (i.e. are not considered to be impacted at levels exceeding commercial/ industrial as defined by *Schedule B1 Guidelines, Investigation Levels for Soil and Groundwater, National Environment Protection Measure (Assessment of Site Contamination) Amendment Measure 2013)* a record would be kept ~~(in the Waste Management Database)~~ of where these soils are reused, the volumes

ID	Issue	Mitigation measure
		reused; the type and levels of contaminants present in the soils and the soil classification.
C20	Contamination	An Asbestos Management Plan would be developed in accordance with the relevant guidelines. ~~Caltex~~ **Ampol** would utilise existing registers, procedures and plans in place for the Site for the preparation of an Asbestos Management Plan.
C33	**Contamination**	**The Conceptual Remediation Action Plan (RAP) for MOD-7 works would be implemented, which would include:** **a. Data gap investigations within the Project Area** b. **Preparation of one or more Detailed RAP(s).** **c. The Detailed RAP(s) would be prepared in accordance with NSW EPA *Contaminated Land Guidelines for Consultants Reporting on Contaminated Sites* (NSW EPA, 2020) and be reviewed by the Site Auditor.**
C34	**Acid Sulfate Soils**	**Detailed investigations within the Project Area would include targeted sampling to identify the presence of Potential Acid Sulfate Soil (PASS) within remediation areas where excavations are anticipated to be greater than 2 metres below ground level (mbgl). The results would be used to inform preparation of the ASSMP for the proposed modification if required.**
C35	**Contamination**	**One or more Validation Report(s) would be prepared in accordance with the NSW EPA *Contaminated Land Guidelines for Consultants Reporting on Contaminated Sites* (NSW EPA, 2020) and reviewed and approved by the Site Auditor, confirming that the area(s) are suitable for future commercial/ industrial land uses.** **Where Validation Report(s) are required for land within the audit boundary (see Figure 1, Appendix A of the Concept RAP), these would be subject to Site Audit Statements (SAS) and Site Audit Reports (SAR).**
C36	**Contamination**	**Where relevant, one or more Environmental Management Plan(s) (EMP) would be prepared where residual contaminated soil and/ or groundwater impacts that do not meet commercial/ industrial standards and further monitoring or management is required. The EMP(s) may include Groundwater Monitoring Plan(s), which would detail groundwater monitoring requirements. The EMP(s) would be provided to the Site Auditor for endorsement.**
C37	**Contamination**	**The requirement for a licence and/or approval from the relevant agencies for the extraction of groundwater during excavation works would be determined during detailed design.**
C38	**Contamination and groundwater**	Construction personnel would be made aware of the potential presence of Non Aqueous Phase Liquids (NAPL) and would be shown how to identify its presence. The GWMP would include management measures to appropriately deal with any NAPL found onsite.

8.0 Conclusion

A review of existing contamination reports and environmental data undertaken in preparing the Conceptual RAP (Appendix H of the Modification Report) has identified where remediation would be required and where further investigation is required to inform refinement of remedial extents and methodologies. The key COPC are PHC, PFAS, and asbestos in soil for which appropriate remedial and management strategies would be applied in accordance with regulatory standards for commercial/ industrial land use. The AECs where these sources are present from historical activities at the Site have been outlined in this report and detailed in the Conceptual RAP (Appendix H of the Modification Report).

The remediation works would mitigate the risk existing contamination poses by removing or reducing the concentrations of contamination in soils and eliminating exposure pathways. Mitigation measures to be implemented for the construction and operation would be as per the conditions of consent for SDD-5544. This would include preparation and implementation of a Construction Environmental Management Plan (CEMP) for construction and continued implementation of the Operational Environmental Management Plan (OEMP) following completion of the proposed modification works. The following additional specific measures would be undertaken for the proposed modification:

- Implementation of the Conceptual RAP (refer to Appendix H of the Modification Report), which would include undertaking data gap investigations within the Project Area and preparation of one or more Detailed RAP(s) following completion of detailed investigations for the proposed ongoing commercial/ industrial land use.
- One or more Detailed RAP(s), focussed on specific areas and/or contamination sources, would be prepared. Remediation works would be completed as per each Detailed RAP. The Detailed RAP(s) would be supported by a series of environmental management plans, including a GWMP. Validation report(s) would then be prepared following remediation.
- Following the remediation works, one or more Environmental Management Plan(s) (EMP) would be prepared to appropriately manage residual contaminated soil and/or groundwater. These EMP(s) would be included in the OEMP for the Site and may include one or more GMP(s).
- As stated in the Conceptual RAP (refer to Appendix H of the Modification Report), at the completion of the proposed modification, one or more Site Audit Statement(s) and Site Audit Report(s) would be prepared by the Site Auditor in accordance with the Guidelines for the NSW Site Auditor Scheme (3rd edition).

9.0 References

AECOM (2020). Kurnell Terminal Asbestos Remediation Project, Remedial Action Plan. 10 August 2020.

AECOM (2023a). DRAFT Expanded Asbestos in Soil Assessment Former LPG Area, Rev A, 29 May 2023.

AECOM (2023b). Asbestos in Soil Investigation, Ampol Kurnell Terminal, 2 Solander Street, Kurnell NSW, RPIP Investigation, 31 July 2023.

AECOM (2023c). Kurnell Stormwater Separation Improvement Project, Statement of Environmental Effects, 27 November 2023.

AECOM (2024). Limited Detailed Site Investigation, Ampol Kurnell Terminal - Stormwater Separation Improvement Project (ref. DA 24/0008), 14 March 2024.

Ampol (2021a). Operational Environmental Management Plan, Kurnell Terminal, Final Stage 2, 10 September 2021.

Ampol (2021b). Kurnell Terminal - Remediation Action Strategy Update, 29 November 2021.

Ampol (2022). Kurnell Terminal - Remediation Action Strategy Update, 30 November 2022.

Ampol (2023). Kurnell Terminal - Remediation Action Strategy Update, 29 November 2023.

ARUP (2021). Kamay Ferry Wharves, Environmental Impact Statement. June 2021.

Coffey (2023). Stage 1 – Preliminary Site Investigation, 251 and 280-282 Captain Cook Drive, Kurnell Peninsula, NSW, 2 November 2023.

Enviropacific (2022). Fire Training Area_Concrete Slab Assessment Report, November 2022.

GHD (2018). Kurnell - Strategic Land Use Review, Contamination Constraints Assessment, November 2018

Ethos Urban (2021). Environmental Impact Statement, Breen Resource Management Facility, Captain Cook Drive, Kurnell. 8 July 2021.

WSP (2018). Environmental Site Assessment, Data Gap Assessment, Caltex Kurnell Terminal (Caltex Site ID 535). 19 December 2018

WSP (2020). Kurnell Terminal - Calor Area, Pre-lease Assessment Reports and Lease Assessment report, April 2020.

WSP (2021a). Kurnell Terminal - Former Calor. Pre-lease Assessment Report - Northern Area, February 2021.

WSP (2021b). Skip Bin Lease Area Baseline ESA, Former Caltex Lubricating Oil Refinery, Solander St, Kurnell NSW, June 2021.

WSP (2021c). GTS Earthworks lease assessment ESA, Former Caltex Lubricating Oil Refinery, Solander St, Kurnell, NSW, September 2021.

WSP (2022). CBOX East Lease Assessment ESA, Former Caltex Lubricating Oil Refinery, Solander St, Kurnell, NSW, February 2022.

WSP (2023a). Quarterly Groundwater Monitoring, Ampol Kurnell Terminal – Q1 February 2023, June 2023.

WSP (2023b). Quarterly Groundwater Monitoring reports, Ampol Kurnell Terminal – Q2 May 2023, July 2023.

WSP (2023c). Investigation of Soil Vapours at the Former CLOR Area, August 2023.

WSP (2023d). BESS Ampol Terminal Kurnell Geotechnical Interpretative Report, December 2023.

WSP (2023e). Remediation Action Plan (RAP) – Scrapyard, Ampol Kurnell Terminal, November 2023.

WSP (2023f). Construction and Environment Management Plan (CEMP) – Scrapyard, Ampol Kurnell Terminal, November 2023.

WSP (2023g). Acid Generating Material Management Plan (AGMMP) – Scrapyard, Ampol Kurnell Terminal, November 2023.

WSP (2024a). Soil Vapour Monitoring Program - November 2023, January 2024.

WSP (2024b). Ampol Kurnell Terminal, PFAS SAQP 2022-2023 Investigation: Summary Report, March 2024.

WSP (2024c). Quarterly Groundwater Monitoring, Ampol Kurnell Terminal Q4 November 2023, 4 March 2024.