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

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AECOM

Kurnell Terminal SSD-5544-MOD-7

Appendix E2 - Draft Acid Sulfate Soils Management Plan

16 Mar 2026

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Client: Ampol Australia Petroleum Pty Ltd

ABN: 17 000 032 128

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1.0 Introduction

AECOM Australia Pty Ltd (AECOM) was engaged by Ampol Australia Pty Ltd (Ampol) to develop this Acid Sulfate Soils Management Plan (ASSMP) for management of soils excavated as part of the works to be completed under modification application number 7 (MOD-7) to SSD-554 (the proposed modification). The proposed modification is being undertaken at the Kurnell Terminal (the Site), located at 2 Solander Street, Kurnell, NSW. A NSW Site Auditor has been engaged to review and endorse associated documentation including this ASSMP, once finalised.

As shown in **Annexure A Figure F1**, the proposed modification is presented within the Project Area boundary and the Audit Boundary is located within this area. This ASSMP is applicable to MOD-7 works undertaken within the Project Area boundary. It is noted that further investigation is required (which will have commenced at the time of drafting this ASSMP) in order to assess ASS within the extents of proposed MOD-7 ground disturbance works. As such this document is designed to serve as a framework for the final ASSMP, which will be developed following the additional investigations and included within the MOD-7 Remedial Work Plans (RWPs). This document has been included as Appendix E2 of the SSD-554 MOD-7 Submissions Report, alongside the Remedial Action Plan (RAP), which has been included as Appendix E.

1.1 Project background

In 2012, Ampol decided that the oil refinery and fuel terminal would be converted to a finished product terminal (the approved project). The refinery ceased operations in 2014. Development consent was received to complete the approved project under State Significant Development (SSD) application reference 5544 (SSD-5544). The objective of SSD-5544 was and remains "*to establish a viable, safe, reliable, and sustainable finished product import terminal at Kurnell.*" Ampol has modified SSD-5544 six times to facilitate the conversion and demolition works.

Under the proposed modification (MOD-7), to support the continued viable, safe, reliable, and sustainable operation of the Kurnell Terminal, Ampol intends to consolidate operational infrastructure, remove redundant assets, and undertake targeted remediation of legacy ground contamination.

This ASSMP has been developed following review of agency and community submissions to manage ASS encountered during the ground disturbance works required by the proposed modification. It has been developed as a precaution, as ASS has been historically identified at the Site (discussed in **Section 4.6**). From the RAP (Appendix E of the MOD-7 Submissions Report) the extent of ground disturbance proposed includes excavation of ~ 95,000 m^3 of soil as part of remedial excavation and infrastructure removal and relocation works.

The Site overview figure is presented as **Annexure A Figure F1**.

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2.0 Objective and scope

2.1 Objective

The objective of this ASSMP is to:

- Minimise the risk to the environment resulting from ASS
- Provide detailed management techniques and operational methodologies that will be employed to mitigate potential environmental impacts associated with actual acid sulfate soil (AASS)/potential acid sulfate soil (PASS) disturbance
- Document monitoring and contingency methods/ actions for implementation during the proposed modification.

This ASSMP is a live document. It will be subject to periodic review/ audit to confirm that its contents and above stated objectives are updated to remain relevant and applicable.

2.2 Scope of ASSMP

This ASSMP is applicable to the MOD-7 ground disturbance works within the Project Area, which will encounter PASS or AASS. Based on ASS investigations (discussed in **Section 4.6.3**) this ASSMP applies to all excavation activities within the Project Area as part of the proposed modification.

To achieve the objectives, the scope of work consists of:

- Summary of the extent of PASS within the Project Area.
- Development of management measures to minimise PASS impacts.
- Development of environmental compliance monitoring and reporting requirements.
- Outline potential contingency measures.
- Outline for the ASS reporting requirements and periodic auditing of the ASSMP.

This ASSMP must be used in conjunction with the Construction Environmental Management Plan (CEMP) developed for the proposed modification to support management of all environmental aspects applicable to the proposed modification.

This ASSMP is a live document, and the procedures contained within will be updated and revised to address site conditions following the additional investigations, or where alternative excavation and earthwork methodologies are adopted.

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3.0 ASS information and guidelines

3.1 General information

ASS is a common name given to naturally occurring sediments and soils containing iron sulphides. These soil profiles are typically located in coastal, low-lying alluvial or estuarine areas such as mangroves, salt marshes, coastal rivers, creeks, estuaries, tidal lakes and coastal floodplains. They form in areas where iron rich sediments have been deposited in the presence of a sulfate source (commonly marine water), organic matter and microbial action. ASS is predominantly encountered in coastal areas and where the soil profile has an elevation of less than 5 m Australian Height Datum (m AHD) and may be found close to the surface or at depth in the soil profile where continued deposition actions have resulted in raising of the ground levels.

The terms PASS and AASS are referred to as acid sulfate soils or ASS within this ASSMP, unless there is a specific need for differentiation.

Changes in environmental conditions which result in the exposure of these materials to air, via excavation or drainage of subsurface soils, can lead to the reaction of the iron sulphides with oxygen causing oxidation and generation of sulfuric acid. This may result in significant environmental and infrastructure damage if the acid produced is spread by groundwater or surface water.

ASS can be classified into two categories:

- AASS contain highly acidic soil horizons or layers resulting from the aeration of soil materials that are rich in sulfides, primarily iron sulfide. This oxidation produces more hydrogen ions than the sediment is able to neutralise, resulting in soils with a pH of 5.5 or less when measured in dry season conditions. These soils can usually be identified by the presence of pale yellow mottles and coatings of jarosite.
- PASS are soils that contain iron sulfides or sulfidic materials that have not been exposed to air and thus are not oxidised. The pH of these soils in their undisturbed state is 5.5 or more, making them neutral or slightly alkaline. If not managed appropriately, potential ASS pose a considerable environmental risk: disturbance and exposure to air may render them severely acidic.

ASS planning maps are included in the Local Environment Plan (LEP) for each local council, and in information contained within the online Australian Soil Resource Information System (ASRIS) database and eSpade and provide an indication of the relative potential for disturbance of ASS to occur at locations within an investigation area. Details relating to the ASS planning maps for the Council are presented in **Section 4.3**. These maps do not provide actual occurrences of ASS at a site or the severity of the conditions. However, they do provide some indication of depth and severity of ASS which was considered when developing this ASSMP. The maps are divided into five classes depending on the type of activities/works that if undertaken, may represent an environmental risk through the development of acidic conditions associated with ASS:

- Class 1: All works.
- Class 2: All works below existing ground level and works by which the water table is likely to be lowered.
- Class 3: Works at depths beyond 1 m below existing ground level or works by which the water table is likely to be lowered beyond 1 m below existing ground level.
- Class 4: Works at depths beyond 2 m below existing ground level or works by which the water table is likely to be lowered beyond 2 m below existing ground level.
- Class 5: Works within 500 m of adjacent Class 1, 2, 3, 4 land which are likely to lower the water table below 1 m below existing ground level on the adjacent land.

Review of the Project Area against the LEP ASS Map finds the Project to reside within Class 4 areas. Given the Class 4 conditions above, the proposed modification represents a potential risk for encountering ASS given the depth of planned excavation. Historically, environmental investigations have been carried at the Site to inform the presence of PASS/AASS. The results of these historical investigations are presented in **Section 4.6.**

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3.2 Action criteria

3.2.1 Field indicators and tests

Field indicators and tests can be used to guide which areas should be sampled and which samples should be selected for analysis. The guidelines note that field indicators and tests should not be used as a substitute for laboratory analysis.

Field indicators of PASS include:

- Sulfurous odour (rotten eggs)
- Field pH (pH_{Fox}) reading of < 4
- Iron staining on drainage surfaces
- Unusual milky green water discharges
- Jarositic horizons (pale yellow mineral deposits)
- Iron mottling of subsurface soils
- Corrosion of concrete or steel structures

A combination of factors can be used when assessing field tests:

- A visual reaction with hydrogen peroxide
- A field oxidised pH (pH_{FOX}) value at least one unit below the field pH (pH_{F}) (known as pH_{delta})
- The actual value of the pH_{FOX} (i.e., if the pH_{FOX} is < 3)

3.2.2 Laboratory analysis

The assessment of site soil conditions for ASS occurrence is undertaken in accordance with the NSW ASSMAC (1998) Acid Sulfate Soil Manual and the Water Quality Australia National Acid Sulfate Soils Guidance on: soil sampling and identification methods (2018a), identification and laboratory methods (2018b) and dewatering in shallow groundwater environments (2018c). The requirement to manage soils for ASS is evaluated by comparison of laboratory analytical results with Site Action Criteria (SAC). The SAC is based on three broad soil texture categories and summarised in **Table 1**. When determining whether the management controls detailed in this ASSMP should be implemented, sampling results must be screened against these criteria. Information on how to complete soil sample, and perform soil field tests is provided in Section 6 and Appendix A (respectively) of the 2018 ASS Guidance.

Table 1 ASSMAC Site Action Criteria

Type of Material		Action Criteria 1 1000 tonnes disturbed		Action Criteria >1000 tonnes disturbed	
Texture Range (McDonald et al 1990)	Approx. clay content (%<0.002 mm)	Sulfur trail %S oxidisable (S_{cr} or S_{pos})	Acid trail Mol H^{+}/tonne (TPA or TSA)	Sulfur trail %S oxidisable (S_{cr}or S_{pos})	Acid trail Mol H^{+}/tonne (TPA or TSA)
Coarse texture sands to loamy sands		0.03	18	0.03	18
Medium texture sandy loams to light	5-40	0.06	36	0.03	18
Fine texture Medium to heavy clays and silty clays	0	0.1	62	0.03	18

Note: coarse texture has been highlighted as it is the predominant soil type at the Site (refer to the RAP).

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3.3 Other guidelines

This ASSMP has been prepared with reference to the following:

- Government of Western Australia Department of Environment Regulation (2015), Identification and investigation of acid sulfate soils and acidic landscapes.
- NSW Acid Sulfate Soils Management Advisory Committee (ASSMAC) (1998), Acid Sulfate Soils Assessment Guidelines Updated in 2014.
- NSW Environment Protection Authority (NSW EPA) (2014a) Waste Classification Guidelines, Part 1: Classifying Waste.
- NSW EPA (2014b) Waste Classification Guidelines, Part 4: Acid Sulfate Soils.
- NSW EPA (2017) Contaminated Land Management, Guidelines for the NSW Site Auditor Scheme (3rd edition).
- NSW Government, Protection of the Environment Operations Act 1997 (POEO Act) and associated regulations.
- National Working Party on Acid Sulfate Soils (2000) National Strategy for the Management of Coastal Acid Sulfate Soils.
- Queensland Government (2024), Department of Resources and the Department of Environment, Science and Innovation, Queensland Acid Sulfate Soil Technical Manual, Soil Management Guidelines Version 5.1. May 2024.
- Water Quality Australia (2018a) National Acid Sulfate Soils Guidance, National acid sulfate soils sampling and identification methods manual.
- Water Quality Australia (2018b) National Acid Sulfate Soils Guidance, National acid sulfate soils identification and laboratory methods manual.
- Water Quality Australia (2018c) National Acid Sulfate Soils Guidance, Guidance for the dewatering of acid sulfate soils in shallow groundwater environments.

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4.0 Environmental setting

4.1 Site identification

The Site identification features are summarised in **Table 2**.

Table 2 Site identification summary

Items	Details
Property Address	2 Solander Street, Kurnell NSW.
Title Identification (Lot & DP)	Part of Lot 25, Deposited Plan 776328.
Developed Area of the terminal	159.8 ha
Local Govt. Authority:	Sutherland Shire Council
Zoning of Property Surrounding the terminal	• Site: IN3 – Heavy Industrial • North: RE1 – Public Recreation • South: IN3 – Heavy Industrial • East: IN3 – Heavy Industrial • West: C4 – Environmental Living
Site Details	The Ampol Terminal includes the following areas: • Zone 1: The operational portions of the fuel Terminal, in addition to supporting administration buildings. • Zone 2: The footprint of the Caltex Fuel refinery, Decommissioned in the 2010's, it is now predominantly vacant land, with some legacy services (water, oily water sewer, power) and buildings (workshops, storage) that remain operational within the area. • Zone 3: The footprint of the former Caltex Lubricating Oils (CLOR) refinery. Decommissioned in the 2010's, it is now predominantly vacant land. These areas are shown on **Annexure A, Figure F1**.
MOD-7 Project Area	The MOD-7 Project Area includes parts of Zone 1, and all of Zone 2 and Zone 3. MOD-7 works relevant to this ASSMP are as follow: • Zone 1 relate to the relocation of services. • Zone 2 and Zone 3 relate to the removal of services, and the targeted remediation of chemical contaminants in soil (via excavation). Excavation areas are shown on **Annexure A, Figure F2**, and areas of service relocation and removal are shown on **Annexure A, Figure F3**.
LEP (2015) ASS Map Class	• Class 4
ASS Probability of occurrence (Acid Sulfate Soil Risk, NSW Department of Climate Change, Energy, the Environment and Water, 2024).	• X4: Disturbed terrain • L2: Low probability 2-4 m below surface • L2(p) Low probability >4 m below surface • L4(p): Low probability >4 m below surface
Current Property Use	Fuel terminal
Adjacent Property Uses	• North: Public reserve then single dwelling residential (60 m) • East: Public reserve (250 m) • South: Public reserve • West: Single dwelling residential

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Items	Details
Sensitive Ecological Receptors	The Site operates as a fuel terminal and has historically been used an oil refinery. As such the Site is highly disturbed, The proximity of the Project to these sensitive ecological receptors are considered by the Updated Biodiversity Development Assessment Report (Appendix I of the Submissions Report)

4.2 Soils and Geology

The regional geology of the Site according to the published geological information (Sydney 1:100,000 geological service sheet), the Site is underlain by Quaternary (Pleistocene) wind-blown medium to fine grained well-sorted marine quartz sand. The Site has also been subject to backfilling and grading over time as part of ongoing use as a commercial industrial setting. Available bore log information from recent investigations support the presence of both these fill materials and the natural lithology unit within the Project Area (AECOM, 2024a, AECOM, 2024b, AECOM, 2025b).It is important to note that there is potential the occurrence of ASS has changed as a result of these historic earthworks. Further information about the Site geology can be found in the Kurnell Geotechnical Factual Report (AECOM, 2025c) and Kurnell Geotechnical Interpretive Report (AECOM, 2025d), developed to support the MOD-7 project strategy.

4.3 Acid sulfate soils

Review of the NSW ASS risk mapping indicates that the Project Area is listed as both X4 disturbed rra a , L2 low probability between 1 – 3 mbgs and L4 low probability > 4 mbgl. The risk mapping with key MOD-7 boundaries included is presented on **Figure 1** below.

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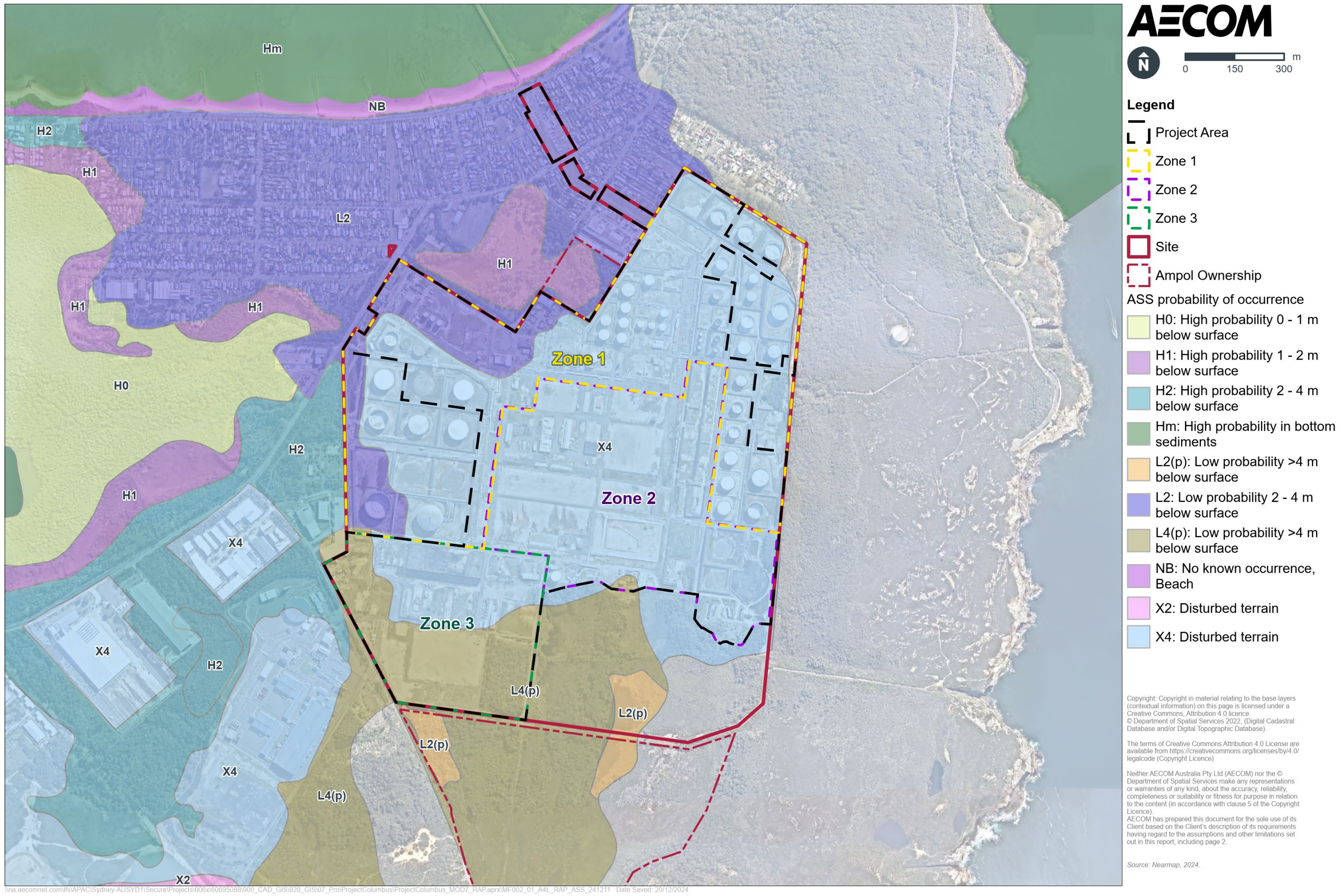

Figure 1 Acid Sulfate Soils – Risk Map (NSW DCCEEW, 2024)

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4.4 Topography and hydrology

The proposed modification is located on the Kurnell Peninsula. The land area of this peninsula, as well as the surrounding marine and estuarine waters, constitute the receiving environment for surface water discharges from the Site.

The current stormwater management strategy for the Site involved stormwater generated on Site being collected into former pipe tracks, which then discharge or are pumped to a stormwater basin on the Site's western boundary, which is then discharged to the following receiving environments:

- Quibray Bay
- Botany Bay
- Marton Park Wetland.

The Site is located within the Botany Bay catchment, which extends across a land area of 1,165 ar kilometres. The catchment is part of the Greater Sydney Local Land Services region.

The Site has a Waste Water Treatment Plant (WWTP) to treat water that is or may be impacted by petroleum hydrocarbons as a result of the Site's ongoing operation as a fuel terminal. Treated water effluent from the WWTP is discharged via outfall to the Tasman Sea at Yena Gap under Environment Protection Licence 837.

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Figure 2 Regional hydrology

4.5 Hydrogeology

At the Site, shallow groundwater has previously been observed within an unconfined aquifer in Quaternary sands (the Botany Sands Aquifer) between 0.55 mbgl and 1.0 mbgl. Groundwater flow direction, where the proposed excavations are located, is generally to the northwest. The Quaternary aquifer properties (based on literature values) have been reported as follows (Ampol, 2019):

- 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 limited by the underlying Hawkesbury sandstone profile, which predominantly acts as the imperial flow boundary (aquitard) at the base of the Quaternary sands (Ampol, 2019).

Surface water infiltration is the predominant source of groundwater recharge. Groundwater discharges through either:

- Surface water / groundwater interaction; or
- For the Project Area, discharge to Botany Bay (including Quibray Bay passing beneath Kurnell Village and the Towra Point Nature Reserve), the Marton Park Wetland area.

Groundwater Dependant Ecosystems (GDEs) are ecosystems that rely on groundwater to provide at least some of their water needs. As described in Section 7.3.2 of the SSD 5544 MOD-7 Modification Report (AECOM, 2025a), Marton Park Wetland is mapped as a high potential terrestrial GDE (Coastal Sand Forest) on the northern boundary of the Site, and Towra Point Nature Reserve, located 450 m west of the Project Area is mapped as a low potential GDE (River Mangrove).

Updated hydrogeology for the Site has been discussed further in the Groundwater Assessment, included as Annexure A of the updated Soils Groundwater and Contamination Report (Appendix F of the Submissions Report).

4.6 Previous investigations

Prior to commencement of works, a review of ASS information in the Australian Soil Resource Information System (ASRIS) database and the NSW Government Office of Environment & Heritage eSpade version 2.0 spatial viewer system (eSpade) indicated there was a low probability of PASS at more than 1 m below ground surface in the proposed area of disturbance.

Investigations for the identification of ASS have not been completed within the proposed MOD-7 remedial extents (as shown in **Annexure A Figure F2**) for which this ASSMP will apply, however ASS has been investigated historically at the Site. Where these investigations have indicated the presence of ASS, these are summarised in the following sub-sections. Further information about the condition of the soils in the Project Area generally are provided in the RAP (Appendix E of the Submissions Report).

4.6.1 AECOM, 2024a and 2024b

Environmental investigations were carried out (inclusive of ASS investigation) prior to the completion of trenching and excavation works at the Site to support a stormwater improvement (SWI) project. The SWI project involved the excavation of trenches for buried stormwater pipeline alignments within the Site’s western Zone 1 area, and two 4 m deep excavations at the Site, one within the northern Project Area, and one west of the Project Area within Zone 1. Sampling and analysis for ASS within the trenching alignment and the Project Area excavation footprint did not return exceedances of assessment criteria. Sampling and analysis within the excavation footprint west of the Project Area exceeded assessment criteria. Follow up analysis for the chromium suite confirmed that the soils were indicative of ASS. The subsequent excavation works were completed under guidance of a project specific ASSMP in accordance with the ASSMAC Acid Sulfate Soil Manual (1998).

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4.6.2 AECOM, 2025b

A contamination assessment was being undertaken within the south eastern extent of the Site, to fill in deep soil (>2 mbgl) data gaps. During these works, field indicators of ASS were observed (grey staining, sulfur odour), triggering sampling and analysis for ASS. Results exceeded assessment criteria, and follow up chromium suite analysis was scheduled, confirming presence of ASS at depths greater than 2.5 mbgl. These ASS assessments were opportunistic in nature and not completed with the intension of informing a broader characterisation of the area. Further actions were not taken.

4.6.3 Summary of historical results

From the investigation carried out historically, the following PASS indicators have been observed at the Site through field screening tests completed by an accredited laboratory:

- pH_{delta} greater than one unit.
- Visual reaction with hydrogen peroxide

Historic analytical results from the soil samples collected both inside and outside of the Project Area have exceeded the action criteria for coarse textured soil (**Table 1**). This ASSMP has been developed to management the disturbance of ASS during intrusive works proposed in MOD-7.

As mentioned in **Section 2.0**, this document is live, and should be updated as new information becomes available.

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5.0 Potential impacts

The disturbance of ASS during excavation and earthwork activities can lead to significant environmental and infrastructural impacts. These impacts are dependent on the nature, extent, and magnitude of the works and their interaction with the natural environment.

The key excavation and earthwork activities associated with this project that may disturb ASS includes the cut and fill operations for source area excavations (SAE), which based on the extent of contamination will extend to depths between 2 and 4.8 mbgl. In addition to direct disturb of soils by excavation and earthwork activities, dewatering and the lowering of the groundwater table, undertaken to support excavation, can also expose ASS.

Ground disturbance and dewatering in areas with ASS has the potential to promote the oxidation of PASS. Exposure of PASS to air through dewatering and excavation, in addition to extended exposure of excavated materials, and open excavations to air can lead to their oxidation, and the formation of AASS. The generation of AASS releases sulfuric acid into soils and potentially groundwater, which can mobilise nutrients, and heavy metals stored within the soil matrix.

Potential impacts attributable to oxidation of PASS include:

1. Environmental Contamination:
    a. Acidic Runoff: Acidic runoff from AASS sources can lower the pH of soils and water bodies with which it interacts. If runoff is managed through existing site procedures, without monitoring, this could lead to potential impacts to the receiving aquatic environments.
    b. Groundwater Quality Degradation: In-situ acidification, or uncontrolled runoff from AASS sources can reach often shallow coastal groundwater tables, altering groundwater pH, disturbing water quality, with the potential to impact groundwater dependant ecosystems.
2. Infrastructure Degradation:
    a. Corrosion of materials: Acidic conditions can corrode and degrade concrete, steel, and other materials if not considered during design stages, leading to potential structural failures and increased maintenance costs.

By proactively managing the disturbance of ASS, the project can minimise oxidation of PASS, mitigate adverse environment impacts, and protect infrastructure integrity.

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6.0 Responsibilities

A summary of the roles and responsibilities is provided in **Table 3** below.

Table 3 Roles and responsibilities – ASS management

Role	Responsibilities
Suitably qualified environmental consultant / contractor[1]	• Provide an overview of the ASSMP to the principal contractor • Collection of verification samples for acid sulfate soil field tests and laboratory analysis • Selection of verification samples for analysis • Assessment of analytical results • Environmental monitoring (soil, water) – monitoring of water matrix, is covered by a dewatering management plan (DMP) within the groundwater management plan (GWMP). • Preparation of a verification report that details compliance with the ASSMP including treatment undertaken and verification sampling results for treated material.
Principal contractor	• Preparation of a CEMP to document how environmental impacts will be managed and mitigated during construction activities • Personal managing ASS should be appropriately trained to identify and manage ASS • Civil works associated with controls and treatment of ASS in accordance with the ASSMP and maintain compliance with work health and safety requirements • Maintain written records of all activities undertaken each day • Manage and report any unexpected findings to the environmental consultant in accordance with the CEMP's unexpected finds protocol • Discuss with the Site Auditor and environmental consultant any deviations from the ASSMP prior to undertaking • Toolbox meetings to be conducted with all subcontractors which will include discussion of ASS procedures and management
Site Owner	• Appoint a suitably qualified environmental consultant / contractor and principal site contractor, and confirm that adequate resources are available to implement the ASSMP. • Retain ASSMP related records, and make them available to regulators upon request.
Site Auditor	• Review and endorse this AASMP • Review and assess the works completed to determine if it has been completed in line with AASMP requirements. • Providing interim audit advice/ site audit statement(s)

[1] Reporting deliverables will require review and sign-off from an accredited Certified Environmental Practitioner – Site Contamination (CEnvP-SC).

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7.0 Management procedures

The following management/mitigation measures are proposed to prevent potential environmental impacts associated with disturbance of ASS during the proposed modification. The excavation extents are shown in **Annexure A Figure F2** and underground services are presented on **Annexure A Figure F3**.

7.1 ASS management strategy

Should ASS be confirmed or suspected of being present within the SAE extent, the disturbance of ASS would be unavoidable. The following strategies would allow for the assessment, and if confirmed present the management of risks from disturbance of excavated PASS materials.

7.1.1 Investigation, field screening, and assessment

Prior to undertaking ground disturbance at depths greater than the water table, or 2 mbgl, field assessment of soils should be completed within the footprint of disturbance. Field investigations will target the extents of SAE and where service removal excavations will intersect the vadose zone. Sampling density is guided by ASSMAC (1998) and Water Quality Australia (WQA) (2018a), extracts of which (Table 6.1) are provided in **Table 4** below**.** The results of these investigations will inform ASSMP controls. The depth of investigation should extend at least one metre beyond the depth of the prosed excavation or the estimated drop of water table height. Investigation for ASS will be completed using Action criteria discussed in **Section 3.2**.

For large scale disturbances, per Section 6.7.3 of the WQA 2018a guidance, laboratory analysis (chromium suite) must be completed at each sample location, and depth intervals no greater than 0.5 m to allow for the confirmation of ASS presence / absence.

The minimum test parameters for the chromium suite are provided in **Table 5**.

Table 4 Minimum soil sampling densities for ASS investigations

Type of disturbance	Number of investigation holes
Small volumes (m^2)	
< 250	2
> 250 - 500	3
> 500-1000	4
Large volumes (m^2)	
Up to 1 ha	4
1-2 ha	6
2-3 ha	8
3-4 ha	10
>4 ha	2 /ha
Existing stockpiles & verification testing (m^3)	Number of samples
< 250	2
251 – 500	3
501 – 1000	4
> 1000	4 plus 1 per additional 500 m^3

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Table 5 Acid sulfate soils - chromium suite details

Test parameter	Units	Details
CRS (S_{CR})	% S	Chromium reducible sulfur (CRS)
pH_{KCl} TAA	pH_{units}, H+/t	pH / actual acidity
ANC	% CaCO3	Acid Neutralising Capacity (ANC)
S_{NAS}	% S	Net acid soluble sulfur

7.1.2 Excavated materials

It is acknowledged that at the time of drafting this document that there are present uncertainties relating to the ground conditions at the Site, which are subject to further investigations to assess. The development of the RWP(s), and subsequent excavation would occur following the completion of these further investigations. If ASS assessment as presented in **Section 7.1.1** cannot be undertaken prior to commencement of ground disturbance works, all natural soils within areas of ASS must be treated as ASS material until such a time as the material is demonstrated to be non-ASS material or treatment effectively reduces the risk associated with the material and validation results meet the relevant specifications.

Within the Project Area, aside from chemical contaminants, it is confirmed that asbestos is present as a likely contaminant within the fill soils present in the former refinery areas being targeted for SAE. Should it be determined that ASS materials are within known asbestos contaminated areas, and segregation of natural ASS materials from overlying asbestos impacted fill soils cannot be achieved, treatment of ASS materials must be completed under relevant asbestos controls. Based on the nature of contamination and the nature of ASS, a risk benefit analysis should be undertaken to determine if the planned extent of SAE should be amended to limit the disturbance of ASS. Given the historical investigations to determine the extents of ASS at the Site have been limited, additional investigations would be conducted to refine the lateral and vertical extent of ASS (if found present), allowing for targeted excavation which avoids / mitigates disturbance of ASS soils to be undertaken, if required.

If the risk benefit assessment determines that excavation of asbestos impacted ASS materials should still take place, then the treatment of ASS materials must be completed under asbestos management plan controls.

Excavated ASS materials can be managed via the following strategies:

- Neutralise disturbed ASS materials and re-use
- Neutralise disturbed ASS materials and dispose offsite.

Where material is suitable for reuse as backfill, based on geotechnical data, the excavated soil will be neutralised using a liming agent and verified prior to reuse using laboratory testing methodologies. Material for reuse will also be managed in accordance with requirements specific to any identified contaminants (metals, hydrocarbons, per- and polyfluoroalkyl substances).

If offsite removal of excess spoil is required, materials must be treated prior to disposal to a licensed landfill. Evidence of treatment (per the reporting requirements) will be provided alongside the material's waste classification documentation in accordance with the requirements of NSW EPA (2014a and 2014b) Waste Classification Guidelines: Part 1 and Part 4.

7.1.3 Treatment of excavated ASS material

Treatment of ASS soils will comprise the addition of a neutralising chemical, typically a high quality (fine) agricultural lime (aglime) product (< 1 mm in diameter) to treat potential and actual acidity, and to provide a safety factor to compensate for potential impurities in the neutralising agent, non-homogenous mixing, and limitations to the solubility of the neutralising agent.

Initial treatment volumes will be based on analytical data (chromium suite) collected during further investigations which confirmed the ASS. The calculation of liming rates is set out in **Section 7.1.3.1**.

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An example liming register has been included as **Annexure B**, presenting the information recorded for the calculation of liming rate, whilst also allowing for the documentation of liming rates and the calculated total lime require to treat an identified ASS material based on chromium suite liming rates obtained to and the planned excavation volumes for the ASS extent. Where ASS is detected, it might be suitable to characterise the ASS into depth horizons. These horizons can be presented as individual rows for treatment within the register. A default wet bulk density value of 1.8 t/m^3 (in-situ volume) should be used for soils of Sand texture for the calculation of treatment volumes.

Excavated soil (requiring treatment) can be neutralised using one or more of the following methods depending on various factors such as weather, the staging of excavations and soil physicochemical conditions (e.g. moisture and texture):

- Mixed concurrently as soil material is added directly into haul trucks prior to transporting to a designated temporary storage, thus achieving a degree of mixing during transport and placement.
- Mixed in-situ as part of the removal process (e.g. soils will be limed prior to excavation, transport and subsequent placement, thus achieving a degree of mixing during transport and final placement).
- Mixed ex-situ on a temporary treatment pad within a designated treatment area (i.e. excavated, placed on treatment pad and neutralised, see **Section 7.2.3**).

Care must be taken to confirm that effective mixing occurs throughout the depth of the layer. Where it is possible (based on asbestos management controls), materials should be relatively dry, to facilitate effective mechanical turning and mixing of neutralising amendments into soils. These activities can occur within the designated treatment area, provided controls for the capture and management of potentially acidic run-off are available.

Excavated ASS materials should be immediately transferred to the treatment area (see **Section 7.2.3**). If ASS materials are not treated in-situ prior to transfer to the treatment area, then ex-situ treatment of stockpiled excavated material should occur within one day of excavation of the material (maximum acceptable duration prior to treatment is 18 hours/overnight), as recommended by the Dear et al,2014 and Queensland Government 2024 for coarse materials types.

Where treatment is occurring ex-situ at the ASS treatment area (either as an initial treatment, or as a follow-up treatment where soils have not passed initial validation testing), ASS material should be spread to a thickness that will allow for the thorough mixing of neutralising agent through the soil prior to the addition of neutralising chemicals. The actual depth of spreading will be dependent upon the ability to mix in the amendment to the soils. A nominal spread depth should initially be no more than 300 mm. Mixing of the aglime and soil may be undertaken using an excavator shaker bucket, though other methodologies are available to support this mixing process. Some of these methods and their respective benefits are provided in **Table 6** below. These methodologies can be explored as required (Queensland Government ,2024), though this plan should be updated should an alternate mixing methodology be selected.

Table 6 ASS Treatment - Alternate mixing methodologies

Methodology	Benefits
Harrowing	Effective at breaking down soil clods, and spreading neutralising agent evenly where soils can be spread thinly, and made accessible to mobile plant. Suitable for large surface areas.
Rotary hoe	Enables deeper and more intensive mixing compared to surface methods. Can allow for treating in-situ for thicker target treatment areas.
Pug mill	Ideal for large volumes, reducing variability that can exist with manual mixing methods like shaker bucket, should this is prove to be ineffective.

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7.1.3.1 Neutralisation Chemicals and Treatment

The selection of neutralising chemical would be based on the analytical results and proposed nature of the disturbance works. Noting the current uncertainty, the neutralising chemical is assumed to be a fine ground (< 1 mm) calcium carbonate (CaCO3) or calcite (limestone or marble powder) with a pH of 8.2. Should further investigation results indicate that an alternate neutralising products other than high quality aglime are suitable and selected for use in this project, then the alternate product's capacity to neutralise the ASS would need to be demonstrated, following which this ASSMP will need to be modified to account for the change.

If an alternative neutralising compound is selected, small-scale trials should be conducted, with treatment effectiveness of the revised approach documented for inclusion with relevant reporting.

Should additional characterisation sampling be conducted on excavated materials, with the intension of updating liming rates, the Western Australia Lime Rate Calculator can be used, requiring Net acidity (% S), safety factor (1.5 default value), soil bulk density (t/m^3), and the effective neutralising value (ENV) of the chosen neutralising chemical (using 95% for aglime as a default).
The required application rate can be calculated manually using the following:

$$Liming\ Rate\ (kg\ aglime/m^3) = Net\ Acidity\ (\%S) \times \frac{623.7}{19.98} \times Wet\ Bulk\ Density\ (t/m^3) \times \frac{100}{NV} \times SF \qquad [1]$$

Where:

- NV = neutralising value of the aglime being used and represents the purity or per cent of $CaCO_3$ in the limestone. Unless otherwise known, an initial NV value of 93% will be used considering that agricultural limestone usually contains impurities.
- Wet bulk density = 1.8 t/m^3 using default bulk density values based on Sand soil texture from Table 5.1 of the National Guidance (WQA, 2018b).
- SF = safety factor (= 1.5) because aglime has a low solubility and hence a low reactivity, and in most situations will not be fully mixed with the soil regardless of the method used. (Dear et al, 2014).

Excavation volumes will vary depending on the works undertaken. Existing acid sulfate soil data may be used from the nearest location/ depth range to estimate the potential for acid sulfate soils to be present. Further sampling and testing may be required to characterise areas without suitable acid sulfate soil data.

A sufficient supply of aglime should be kept onsite at all times, for the treatment of ASS, for application on exposed excavation faces where ASS is expected or suspected, for wet weather events where existing applications will require replacement, and/or the treatment of acidic waters. Receipts, dockets and other field records showing the storage locations of all chemicals and location of all applications of neutralising agents must be kept.

ASS treatment materials should be stored in a manner that minimise the exposure of the materials to wet or humid conditions. Such conditions may result in the clumping or surface crusting of particulate lime which can reduce the level of effectiveness in neutralising water/soil. The supply should be stored in a covered and bunded area to prevent accidental exposure to water and deterioration of the inherent neutralizing capacity.

Other Notes:

- Liming rate is calculated and reported on a dry weight basis assuming the use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogenous mixing and poor reactivity of lime. For conversion of Liming Rate from kilograms/tonne dry weight to kilograms/metre^3 in situ soil, multiply reported results x wet bulk density of soil in tonnes/metre^3

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7.1.4 Validation of Treated PASS Material

Following the application and mixing of lime to the ASS the material should be allowed to stand for a minimum of 48 hours prior to validation assessment. The soils should then be assessed to establish whether the following performance criteria (Queensland Government ,2024) have been achieved:

1. Verification Net Acidity of the treated soil is less than zero. $Verification\ Net\ Acidity = (Potential\ Acidity + Actual\ Acidity + Retained\ Acidity) - \frac{post\ treatment\ ANC}{Safety\ Factor}$
2. Record that demonstrates a safety factor of at least 1.5 has been applied in calculating liming rates.
3. Post neutralisation, the soil pH is greater than pH 6.5 (and preferably less than 9).
4. Excess neutralising potential should remain in the soil as all acid generation reactions may not be complete and so the soil may still have further capacity to generate acidity.

Following treatment field tests will be used as a screening tool to determine if material is adequately treated and ready for additional validation testing. Field testing will include pH_F / pH_{FOX}, with both required to meet the post neutralisation criteria noted above for all samples per treatment batch. As a guide, field testing should be undertaken at a rate of ten samples per treatment batch (batch size up to 1,000 m^3).

Confirmatory laboratory analysis (pH and chromium suite) will be undertaken at a rate based on WQA 2018 guidance, as set out in **Table 4**. The samples obtained for laboratory analysis will be obtained by compositing three subsamples (surface, centre, base of material, to confirm effective distribution of neutralising chemical) obtained from the treatment material to provide a broader indication of net acidity levels. Samples should be obtained as close to practicable following movement of soils to the post-treatment stockpile area of the treatment zone. Each stockpile should be identified with a unique identifier and its location logged with the laboratory validation sample identification so that laboratory results can then be matched to each stockpile within the post-treatment area. Following additional applications of neutralisation chemicals, a greater density of validation sampling is necessary to confirm the successful neutralisation.

In the presence of positive field validation tests, laboratory analysis of validation samples must be employed to determine the level of net acidity and confirm that the treatment has been successful or provide an indication of the quantity of further aglime application necessary to neutralise the soil. If negative field tests occur but the confirmatory laboratory analysis results indicate that there is still net acidity, a further application of aglime will be mixed with material to confirm additional neutralisation capacity, prior to further confirmatory analysis.

Following receipt and logging of the successful laboratory validation results, the stockpile may then be released for beneficial reuse of material at the Site, or alternatively, for off-site disposal. If the laboratory results indicate that the stockpile requires further treatment, the material should be moved to the treatment pad as a unique treatment batch and treated as required prior to re-sampling.

If the validation testing indicates that neutralisation of the material is incomplete, a further application of lime and repeat of the treatment procedure will be undertaken prior to further validation assessment.

The site records kept by the Principal Contractor pertaining to treatment and the validation results will form the basis of a verification report that details compliance with this ASSMP completed by a suitably qualified environmental consultant at the completion of the works.

Given the sandy materials expected at the Site, the following additional verification testing allowance is outlined (Queensland Government, 2024):

- No single sample shall exceed a Verification Net Acidity of 18 mol H+/t (0.03 %S).
- If any single sample is between 0 and 18 mol H+ /t (0.00 to 0.03 %S), then the average of any four spatially adjacent samples (including the exceeding sample) shall have an average Verification Net Acidity of zero or negative.

Soil that has been treated by neutralisation techniques and does not meet these targets must be re-treated and re-tested until the performance criteria are met.

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Note: Retreating is costly and will impact project timeframes. Best option is to confirm adequate treatment and mixing in the first instance.

7.2 General Site Management Strategy

The following sections set out the site management strategies which might be employed by the Principal Contractor to mitigate and minimise the potential impacts related to the disturbance of ASS materials.

7.2.1 Minimisation of Disturbance

Prior to disturbance of ASS materials, the following preparations are proposed:

- Staging of disturbance such that the potential effects on any area disturbed at any one time can be effectively managed
- Identification and demarcation of suitable treatment area location(s) which are close to the areas of disturbance
- Staging of treatment to confirm sufficient drying and mixing time can be achieved for all materials needing treatment
- Staging of the excavations program to minimise the amount of time that ASS is exposed to the atmosphere (including rainfall and seeping perched waters, if any)
- Carrying out excavations and ASS disturbance activities during periods of drier weather to avoid heavy rainfall.
- Erosion and sediment control measures must be established.

7.2.2 Excavation Works

Excavation should occur as a staged process, allowing for the manageable treatment of excavated ASS materials and neutralisation of exposed excavation faces. Excavation works should be undertaken in the following manner:

- Works including disturbance of natural soils should be subject to field testing upon initial exposure of each natural soil horizon. Field testing will include pH_F and post peroxide pH_{FOX}, with required validation criteria of $pH_F > 6.5$ and $pH_{FOX} > 5.0$ to be considered non-ASS soil.
- If either the field criteria or laboratory analysis results indicate the material is ASS, then the material will require treatment as discussed in **Section 7.1.3**.
- Natural soils identified as PASS or suspected to comprise physical properties indicative of ASS should be assumed to be ASS unless demonstrated otherwise by laboratory sample analysis.
- ASS materials that have been excavated (or otherwise brought to the ground surface) should be immediately transferred to the treatment area or treated in-situ as soon as practicable to minimise the quantity of soil requiring treatment and the risk of environmental harm to the Site or potential down-gradient receptors.
- At the completion of the day's activities, where excavation works result in the exposure of known or suspected ASS, a guard layer of fine aglime (<1 mm) will be applied to the base of the excavation at a rate of 5 kg lime/m^2 of exposed soil (per 300 mm of placed ASS requiring treatment), or 10 kg lime/m2 if the Net acidity is more than 1.0 %S (Queensland Government, 2024). If the base of the excavation is to remain exposed for an extended period (i.e., more than three days), and following rain and strong wind (i.e. sustained above 40km/hr, or gusts greater than 50 km/hr) the lime coating should be checked and re-limed as necessary. Alternatively, the lime may be covered with a layer of compacted non-ASS material at least 0.3 m in thickness.
- All cut batters/exposed faces potentially including ASS, (i.e., faces at the edge of excavation faces, etc), should be coated with fine aglime at a rate of 5 kg/m^2 and the lime coating should be checked and re-limed as necessary on a daily basis during periods of dewatering, whilst the faces are temporarily exposed and/or following wet weather events.

- Equipment used in the excavation and treatment of ASS should be washed (potentially with an alkaline solution) in a designated waste down area at the completion of each work period, and prior to the weekend at a minimum, to minimise the potential corrosion of equipment.
- Any machinery used on the transfer or treatment of ASS should not traffic outside of these work zones prior to being washed in order to prevent uncontrolled spreading of ASS which could lead to loss of containment.
- The soil excavation staging strategy should consider the overnight temporary stockpiling duration recommendation.

7.2.3 Treatment Area Design

As noted in **Section 7.1.3**, excavated materials can initially be treated either in-situ within the excavation footprint, or ex-situ within the project's designated treatment area. Materials treated in-situ will still need to be transferred to and stockpiled at a treatment area until verification assessments can be completed. This sub-section sets out proposed design strategies for an ASS treatment area. Further guidance on treatment area design is provided in Queensland Government, 2024.

As a minimum an ASS treatment area would include the following:

- Installation of barriers/diversion banks upslope of all stockpiles, treatment pads and drainage features.
- Installation of sediment fencing downslope of and around all stockpiles and treatment pads.
- An upslope area of the Site must be set aside to be utilised as a dedicated ASS treatment pad, incorporating temporary drainage/water collection infrastructure, or taking advantage of suitable existing features.

The treatment area should be sized and constructed to confirm there is sufficient area to accommodate the treatment pad footprint, stockpiles of treated material and soils requiring treatment, while being able to efficiently accommodate the machinery and associated support equipment.

The ASS treatment area should be situated in an appropriate location(s) which considers the available space within the Site, staging of excavations and broader construction timing, and health and safety requirements. Neutralisation of ASS will be conducted on a temporary treatment pad (if required) within the designated treatment area. The treatment pad area should be sized to confirm that it is appropriate for the treatment batch sizes, given the nominal material spreading thickness of 300 mm.

Some control measures within the temporary stockpiling and treatment pad areas include:

- A low permeability or impervious base should be established (below a guard layer of aglime) such as compacted clayey soil material (0.3 m thick), a concrete slab, layer of bitumen or HDPE sheeting to reduce the infiltration of leachate to the soil and groundwater. The base layer should be slightly sloped to prevent leachate from pooling within the treatment pad area.
- Treated soil stockpiles should not exceed 2.0 m in height and safe batter slopes should be maintained. The stockpiles need to be covered and should have means to collect run-off water before releasing to the environment.
- A guard layer of aglime should be spread onto the base, before the placement of soils, at a rate of 5 kilograms fine aglime per square metre per vertical metre of stockpile. This will reduce the risk by neutralising acidic leachate generated in the stockpile.
- Appropriate leachate collection system and containment bund should be used to contain stormwater runoff and leachates. Stormwater run-on will be diverted away from the treatment pad using sandbags, shallow diversion/catch drains or similar (as required).
- Leachates and run-off collected and contained within the treatment pad area should be appropriately treated (refer to the relevant sections of the CEMP and/or Environmental Management Plan [EMP]) prior to discharge. The optimum pH range for discharge waters
- ASS materials must not be used in the construction of bunds and other diversion devices.

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Schematic of a typical treatment pad including a compacted clay layer, guard layer, leachate collection system and containment with bunding is given below in Plate 1.

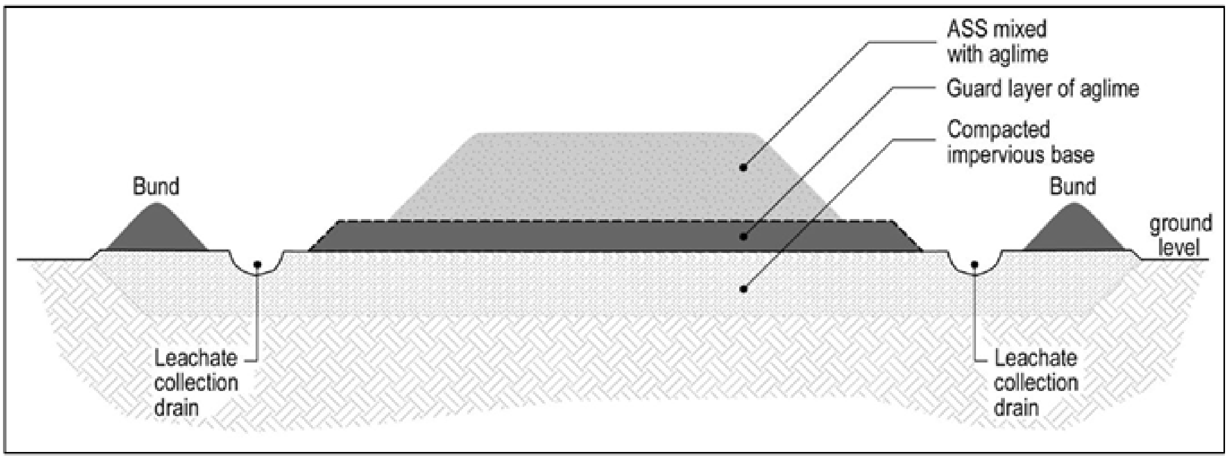

Plate 1 Schematic cross-section of a treatment pad (Queensland Government, 2024)

In addition, consideration should also be given to the ease with which environmental controls can be implemented and potential requirement for off-site disposal of the material once stabilised and validated.

Following mixing, aglime will be spread at a rate of approximately 5 kg lime/m^2 around the toe of the treated soil, around a 1 m perimeter between the toe of the material and across the exposed face of the bund to neutralise any leachate released from the soil. Once the exposed faces of the soil have sufficiently dried that no more leachate is being released, the material should be turned to confirm that any moisture within the material is dried. Drying should not be undertaken during foreseeable wet weather events due to the increased risk of runoff flushing acid from the material and into uncontrolled areas.

7.2.4 Water Management During Treatment

Waters that come in contact with ASS materials (either within the excavation or stockpiled) have the potential to become acidic and contaminated with heavy metals leached from the acidified soil. These sources of water include surface water drainage associated with rainfall, groundwater extracted through dewatering to support excavation, and leachate seeping from damp excavated soils during treatment/stockpiling.

Mitigation measures and procedures to manage and monitor the impacts of ASS on these waters include:

- Limit the period that open excavations are exposed to air and rainfall to minimize the accumulation of rainwater in the pit.
- If possible, schedule excavation works to minimise the potential for rainfall.
- Collected seepage entering the excavation or generated from the treatment pad is to be monitored for pH using a calibrated meter prior to discharge in accordance with the CEMP.

Details about the dewatering requirements to support excavation are provided in the Groundwater Assessment, included as Annexure A of the updated Soils Groundwater and Contamination Report (Appendix F of the Submissions Report). The project's CEMP would define the dewatering management requirements (developed with the CEMP or as a contained Dewatering Management Plan [DMP]) to support excavation.

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In case of large volumes of waters (groundwater, surface or leachate), collected waters should be directed to holding ponds or tanks (if needed). The water holding capacity should be directly related to the acid sulfate soil excavation and treatment areas. As a guide, holding ponds should be available to store the equivalent quantity of water associated with a 1 in 10-year rainfall event to confirm that sufficient capacity is available to store all potentially acidic water that may be generated during site works. In the case of dewatering, the treatment of acid waters may be integrated into the broader water treatment requirements.

The collected water is likely to be of variable quality based on the source of the soils, and require discharge management in accordance with the CEMP.

The water trapped in the pits maybe reused onsite (construction works, dust suppression and/or land irrigation) if the pH of excavation water is recorded between 5.5 and 9.0[2]. pH adjustment/treatment of stored low pH waters (<pH 5.5) must be carried out prior to release/reconnection to existing waterways. Hydrated lime can be used to raise the pH of the water. Approximate lime application rates based on initial pH are provided in **Table 7** below as a guide.

Table 7 Treatment of Acidic Waters (ASSMAC, 1998)

Water pH	Agricultural Lime per 1000 L of water
0.5	11.7 kg
1.0	3.7 kg
1.5	1.2 kg
2.0	0.37 kg
2.5	0.12 kg
3.0	37 g
3.5	12 g
4.0	4 g
4.5	1.2 g

For the treatment of potentially acidic waters, lime addition and mixing should continue until the pH of the water is within the range of 6.5 – 8.5 (Queensland Government, 2024).

In the event water volumes produced are greater than the capacity of the water treatment holding capacity, consideration should be given to off-site disposal of water via a licensed contractor.

7.2.5 Site Condition Monitoring

It is anticipated that environmental monitoring will be undertaken by the Principal Contractor and an independent suitably qualified environmental consultant to maintain compliance with the CEMP and ASSMP.

The following inspection/monitoring regime will be implemented during the site works period and documented as appropriate to demonstrate compliance with this ASSMP:

- Stockpiles of material within the treatment area and of treated material will be inspected daily by the site contractors with pH measurements of any retained leachate taken and recorded. If leachate is significantly acidic (pH < 5.5), the stockpiled material will be returned to the pre-treatment area until the laboratory results are available and the quantity of required additional lime application is known.
- Regular inspection of all excavation and treatment areas will be undertaken to identify potential indications of PASS oxidation. These inspections should note:

[2] As per Table 5.2.2, Section 5, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Australian and New Zealand Environment and Conservation Council (ANZECC), 2000, Volume 1

  - Unexplained scalding, corrosion or degradation of onsite steel equipment and concrete paved surfaces.
  - Formation of the mineral jarosite or other acidic salts in exposed or excavated soils.
  - Areas of surface water blue-green, blue-white in colour or extremely clarified indicating high concentrations of aluminium.
  - Rust coloured deposits on excavation faces, in drainage paths, on bunds, channels, etc indicating iron precipitates.
  - Such inspections should also identify the presence of unusual odours, including strong organic or sulfurous smells (i.e., rotten egg gas).
- All treated excavation faces to be retained for more than three days will be inspected on the third morning and lime reapplied as necessary each following morning.
- If an on-site sump/detention basin is used to manage dewatering outputs, surface water monitoring points will be set-up, and water will be monitored every day by site contractors during excavation, stockpiling, and treatment activities and weekly during periods where no active ground works are being undertaken within the ASS area (if water is present during this period).

  If the monitoring data indicate there is a sustained decrease in pH as compared to the baseline conditions (and/or pH <5.5), a sample should be collected, and laboratory analysed for chloride, sulfate, aluminium, iron, acidity, alkalinity, nutrients, and heavy metals (standard eight). Furthermore, mitigation measures such as replenishing the stockpiles and/or open excavations with Aglime should be undertaken.
- Any broader environmental monitoring requirements during construction works e.g., monitoring of surface waters within the construction works zone will be defined within the CEMP and the GWMP (to be developed as part of the CEMP) prior to the commencement of works.

7.2.6 Removal of Neutralised ASS Material from the Site

Only material confirmed to be below the criteria listed in **Section 7.1.3.1** will be considered as stabilised ASS material for potential reuse within or removal from the Site. Once stabilised, the material will be provided a final waste classification as per the requirements of EPA (2014a and 2014b) for off-site disposal to a lawful facility. A final round of field pH testing should be undertaken prior to loading of the trucks to confirm that pH levels remain above 6.5.

7.2.7 Personal Protective Equipment

All necessary Personal Protective Equipment (PPE) and controls will be used to maintain adequate measures, associated with lime neutralising activities, are implemented to minimise dust emissions, inhalation, and direct contact with fine aglime. As a minimum, safety glasses to protect the eyes, nitrile gloves (when required) and long sleeve pants and shirt to reduce direct skin contact, and an approved face mask to prevent inhalation of dust (minimum AS/NZS 1716 Class P2 face mask for casual exposure).

7.3 Contingency Strategy

7.3.1 Discovery of Unexpected or Unusual Materials

If unexpected contamination or unusual materials are discovered, the unexpected finds procedure in the CEMP will be implemented.

7.3.2 Discovery of greater volumes of ASS than expected

It is possible that once excavation commences onsite, greater than expected volumes of ASS may be discovered that requires a change in the design of the treatment area. In addition, surplus volumes of material that cannot be reused onsite may require offsite disposal to landfill. This material will require treatment and analysis to confirm classification in accordance with NSW EPA (2014a and 2014b) prior to offsite disposal at a suitably licensed landfill to accept the waste. It is recommended that prior to commencement of works, a landfill licensed to accept the potential waste types be identified.

7.3.3 Changes to groundwater pH

Groundwater monitoring will be undertaken as specified in the project's GWMP to monitor for changes in groundwater elevation and pH. The quarterly groundwater monitoring completed as part of a broader groundwater management strategy for the site will continue prior to works commencing, during and throughout the post construction works.

As per the CEMP/DMP, where groundwater water quality parameters measure outside of the pre-construction range (20th-80th percentile) for two consecutive (quarterly) monitoring rounds during construction, the project's environmental consultant must review the monitoring data for:

- Timing of events and potential. relationship with local rainfall record, and Project activities.
- Temporal trends.

The environmental consultant will conduct an additional monitoring and sampling event for the exceeding monitoring well(s). If groundwater levels and pH return to normal, return to normal operations. If groundwater levels and low pH persist, further remedial action may be required, possibly including reduction in rate of dewatering, and potentially offsite disposal of extracted dewatering product.

7.4 Reporting

Records in relation to ASS management activities and any contingency actions that are implemented during the ground disturbance phases of the Project will be kept onsite, including:

- Soil excavation volumes, treatment volumes will be recorded daily during earthworks.
- Liming register of aglime quantities used to treat excavated ASS and acidic water (if encountered) in holding ponds, to consolidate the bulk aglime brought on to site against the amount used.
- Records of all laboratory testing for soils and surface water samples.
- Records of all leachate and surface water monitoring.
- Photographic evidence of water quality in the pits and designated surface water locations.

7.5 ASSMP review and revision

As stated in **Section 2.0**, this ASSMP is a live document and as such is subject to periodic review and revision, if appropriate. The ASSMP review will be conducted by the Site Owner and suitably qualified environmental consultant. The review will rely on previous reported field observations and laboratory results to determine whether the ASSMP requires revision or updating of procedures/treatment methodology. If the ASSMP requires revision, the Principal Contractor will be notified of the changes as soon as practicable for implementation.

If the ASSMP requires revision, the revised ASSMP must be certified by a CEnvP-SC and endorsed by the Site Auditor. The date of review and revision history shall be maintained in the following **Table 8** and **Table 9**.

Table 8 ASSMP review record

Review date	Completed by	Role	Revision required?

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Table 9 ASSMP revision summary

Revision ref.	Approval	Summary of changes

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Annexure A

Figures

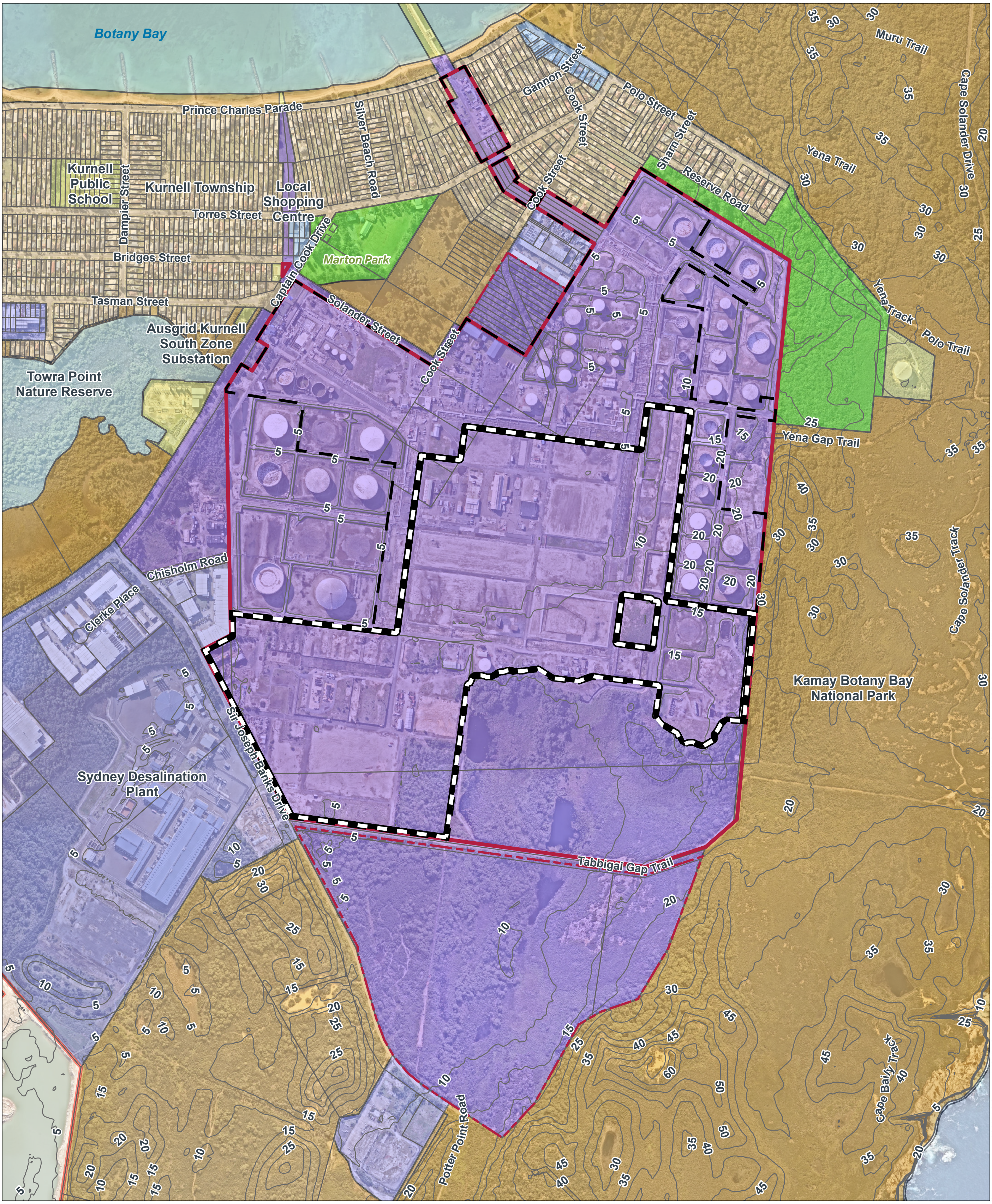

FIGURE F1: SITE LOCATION

Legend

- Site Boundary
- Ampol Ownership
- Project Area
- Audit Boundary
- Cadastral Boundaries
- Elevation Contour (m AHD)

Land Zoning

- C1 - National Parks and Nature Reserves
- C2 - Environmental Conservation; C2, Environmental Management
- C4 - Environmental Living
- E1 - Local Centre
- E4 - General Industrial
- E5 - Heavy Industrial
- RE1 - Public Recreation
- SP2 - Infrastructure
- W1 - Natural Waterways
- UL - Unzoned Land
- DM - Deferred Matter

0 150 300 m

AECOM

Source: Nearmap, 2024.

AECOM

0 100 200 m

FIGURE F2: REMEDIAL EXCAVATION EXTENTS

Site Features
- Site Boundary
- Ampol Ownership
- Project Area
- Audit Boundary
- Zone 1
- Zone 1A
- Zone 2
- Zone 3
- Zone 4
- Zone 5

Project Areas
- ACS Containment Cell
- Source Area Excavation
- Asbestos Excavation
- Excavation Contingency
- Biopiling Area
- Biopiling Area (contingency)
- Waste Management Area
- Temporary Stockpiling Area

Source: Nearmap Imagery 2024

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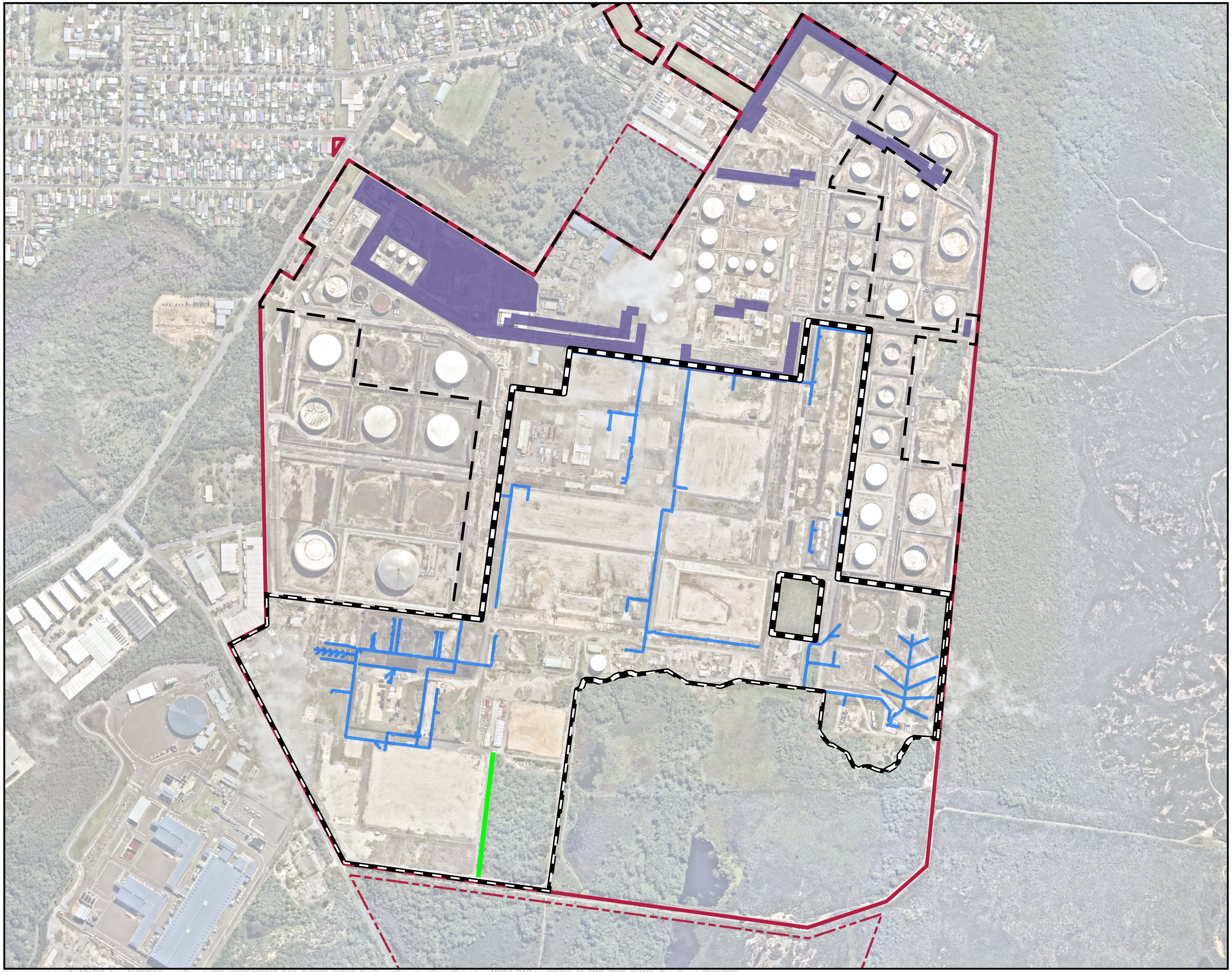

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0 100 200 m

FIGURE F3: FIRE WATER SYSTEM AND OILY WATER SEWER

- Site Boundary
- Ampol Ownership
- Project Area
- Audit Boundary
- Firewater System Relocation Area
- Oily Water System
- OSD increase

Source: Nearmap Imagery 2024

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Annexure B

Liming Register

To be provided at finalisation of document