Stage 2 Remediation Environmental Management Plan

Clyde Western Area Remediation Project

Issue date: 21/07/2021

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Revision Control Chart

Register of Amendments					
Date	**Page/Form No.**	**Revision No.**	**Description of Amendments**	**Prepared by**	**Approved by**
22/06/21	n/a	1.0	Draft	JM	WM
02/07/21	n/a	2.0	Final for Viva Energy sign off	JM	WM
02/07/21	n/a	3.0	Final for Auditor sign off	JM	WM
16/07/21	n/a	4.0	Final responding to Auditor comments and consultation	JM	WM
21/07/21	n/a	5.0	Final for consultation	JM	WM

Control Copy Distribution List

Date	Revision No.	Distribution

Contents

Abbreviations and Definitions

Aboriginal cultural heritage	The tangible (objects) and intangible (dreaming stories, song lines and places) cultural practices and traditions associated with past and present day Aboriginal communities.
AEC	Area of Environmental Concern
AECOM	AECOM Australia Pty Ltd
Applicant	Viva Energy Australia Pty Ltd, or any person carrying out any development to which this consent applies
AQMMS	Air Quality Management Method Statement
AQMP	Air Quality Management Plan
Auditor	New South Wales Environment Protection Authority Accredited Site Auditor
Biopiling	A process in which concentrations of petroleum constituents in excavated contaminated soils is reduced through the use of biodegradation.
Clyde Barging Facility	The Clyde Barging Facility is associated with the Sydney Metro City and Southwest passenger rail project, and would involve the transfer of machinery and excavated material carried by barges on the Parramatta River to trucks from a site at the eastern end of Grand Avenue. The Clyde facility will be located adjacent to the north-eastern Site boundary. This project is now complete.
Clyde Terminal, the	A part of the Site currently operating as an import, storage and distribution terminal for finished petroleum products including diesel, jet and gasoline fuels. The Clyde Terminal makes up the majority of the central part of Site and operates under SSD 5147 and EPL 570.
Council	Parramatta City Council
Contaminated Material	Contaminated material means material that is located in, on or under the Site that contains substances at a concentration above the concentration at which the substance is normally present in, on or under (respectively) land in the same locality, being a presence that presents a risk of harm to human health or any other aspect of the environment.
DC	Development Consent SSD 9302 dated 3 April 2020
DWWMS	Decontamination and Wheel Wash Method Statement
Demobilisation	Demobilisation is the final component of the remediation and includes the removal of plant and equipment, dismantling the direct thermal desorption unit and stabilisation plant, removal of offices and temporary structures and land forming.
Department	NSW Department of Planning, Industry and Environment
Detailed RAP	Detailed Remedial Action Plan
Development	The development described in the EIS and RtS, including the works and activities comprising the remediation of the Western Area of the former Clyde Refinery to enable future commercial or industrial use, as controlled by the conditions of consent (SSD 9302).
DPIE	NSW Department of Planning, Industry and Environment
DTD	Direct Thermal Desorption
ECE	Emission control enclosure, designed, operated and maintained under negative pressure and serviced by an emission control system
EES	Environment, Energy and Science Group of the DPIE
EIS	The Environmental Impact Statement titled Viva Clyde Western Area Remediation Project Environmental Impact Statement, prepared by AECOM dated January 2019, submitted with the application for consent for the development, including any additional information provided by the Applicant in support of the application
Environment	Includes all aspects of the surroundings of humans, whether affecting any human as an individual or in his or her social groupings
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EP&A Regulation	Environmental Planning and Assessment Regulation 2000
EPA	Environment Protection Authority
EPL	Environment Protection Licence under the POEO Act
ERM	Environmental Resources Management Australia Pty Ltd
ESCP	Erosion and Sediment Control Plan
Evening	The period from 6 pm to 10 pm
FERP	Flood Emergency Response Plan
GMMS	Groundwater Management Method Statement
GMP	Groundwater Monitoring and Management Plan
GWMP	Groundwater Monitoring Program

Hazardous materials	Hazardous materials in the Applying SEPP 33 guideline are defined as "substance falling within the classification of the Australian Code for Transportation of Dangerous Goods by Road and Rail (Dangerous Goods Code)".
Heavy vehicle	A vehicle which has a gross vehicle mass or aggregate trailer mass of more than 4.5 tonnes
Heritage	Encompasses both Aboriginal and historic heritage including sites that predate European settlement, and a shared history since European settlement
Heritage item	An item as defined under the Heritage Act 1977, and assessed as being of local, State and/ or National heritage significance, and/or an Aboriginal Object or Aboriginal Place as defined under the National Parks and Wildlife Act 1974, the World Heritage List, or the National Heritage List or Commonwealth Heritage List under the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth), or anything identified as a heritage item under the conditions of this consent
HSL	Health Screening Level
HSSE	Health, Safety, Security and Environment
Impact	Influence or effect exerted by a project or other activity on the natural, built and community environment
In-area soil mixing	Ground improvement technique that improves soft or loose soils, by mechanically mixing them with oxidising/activating agents.
Incident	An occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause a non-compliance
Landfarming	A process of turning the soil to encourage bioremediation.
LGA	Local Government Area
LTEMP	Long Term Environmental Management Plan
LNAPL	Light Non-Aqueous Phase Liquid
m^3	cubic metres
Material harm	Is harm that: • involves actual or potential harm to the health or safety of human beings or to the environment that is not trivial, or • results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding $10,000, (such loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment)
mbgs	metres below ground surface
Minister	NSW Minister for Planning and Public Spaces (or delegate)
Mitigation	Activities associated with reducing the impacts of the Project prior to or during those impacts occurring
MMM	Mitigation and management measure
Monitoring	Any monitoring required under this consent must be undertaken in accordance with section 9.40 of the EP&A Act
Non-compliance	An occurrence, set of circumstances or development that is a breach of this consent
NPWS	National Parks and Wildlife Service
NSW	New South Wales
OEH	Office of Environment and Heritage
Parramatta Light Rail project	Parramatta Light Rail Stage 1 is a major infrastructure project proposed by Transport for NSW, comprising a 12 kilometre two-way light rail track, connecting Westmead to Carlingford via Parramatta CBD. The proposed alignment of the main light rail track would run along Hassall Street and along James Ruse Drive. The project would involve the decommissioning of the T6 Carlingford passenger rail service and the construction and operation of a stabling and maintenance facility for the Parramatta Light Rail, located at 6 Grand Avenue, Camellia
Parramatta Terminal, the	A part of the Site currently used for distribution activities involving bulk road transport. The Parramatta Terminal is located in the north western part of the Site and operates under EPL 660.
PMP	Project Management Plan
Planning Secretary	The Secretary of the Department of Planning, Industry and Environment, or nominee
POEO Act	NSW Protection of the Environment Operations Act 1997
Preparation works	The preparation works form one aspect of the overall remediation and includes the following activities: • installation of fencing and exclusion zones; • temporary gatehouse and site offices, parking and footpath demarcation;

	• installation of decontamination equipment and wheel wash; • erosion and sediment controls; and • service location for live services and utilities.
Project, the	Remediation of contaminated soils in the Western Area to a commercial/industrial standard alongside associated infrastructure removal, waste management, soil and groundwater management, land forming and stormwater management activities. The Project involves two phases: the remediation, consisting of preparation works, remediation works and demobilisation; and ongoing operation (i.e. following completion of the remediation)
Reasonable	Means applying judgement in arriving at a decision, taking into account: mitigation benefits, costs of mitigation versus benefits provided, community views, and the nature and extent of potential improvements.
Remediation works	The remediation works is the second component of the overall remediation and includes the following activities: • removal of redundant infrastructure and waste; • remediation of contaminated material using various remediation technologies, including in-area soil mixing, landfarming, stabilisation, thermal desorption, biopiling, off-site disposal, on-site management, groundwater monitoring; and • wastewater treatment.
REMP	Remediation Environmental Management Plan
RMS	NSW Roads and Maritime Services
RtS	The Applicant's Response to Submissions titled Viva Clyde Western Area Remediation Project Response to Submissions, prepared by AECOM dated October 2019, received in relation to the application for consent for the development under the EP&A Act
SAQP	Sampling and Analysis Quality Plan
Sensitive receivers	A location where people are likely to work, occupy or reside, including a dwelling, school, hospital, office or public recreational area.
Site Audit Report	As defined in section 4 of the NSW Contaminated Land Management Act 1997
Site Audit Statement	As defined in section 4 of the NSW Contaminated Land Management Act 1997
Site Auditor	As defined in section 4 of the NSW Contaminated Land Management Act 1997
Site, the	Viva Energy owned land on the Camellia peninsula consisting of the following lots: Lot 398 DP 41324, Lots 100 and 101 of DP1168951, Lot 101 DP809340, Lot 2 DP224288, and Lot 1 DP383675. It includes the Clyde Terminal, the Parramatta Terminal, the Wetland, the Western Area and other land that is either currently vacant or leased to third parties.
SSD	State Significant Development
SVE	Soil Vapour Extraction
SWMP	Soil and Water Management Plan
SWMMS	Surface Water Management Method Statement
TfNSW	Transport for New South Wales
Thermal desorption	An environmental remediation technology that utilises heat to increase the volatility of contaminants in order for contaminants to be separated from the soils.
TMMS	Traffic Management Method Statement
TMP	Traffic Management Plan
Viva Energy	Viva Energy Australia Pty Ltd, the proponent of the Project and the landowner for the Western Area
Waste	Has the same meaning as the definition of the term in the Dictionary to the POEO Act
Wastewater	Any water that has been affected by human use, including any combination of domestic, industrial, commercial or agricultural activities, surface runoff or stormwater, and any sewer inflow or sewer infiltration.
Western Area, the	A largely vacant area of land, approximately 40 hectares in size, located in the south western part of the Site. This land previously contained a variety of refinery assets that have now been removed.
Wetland, the	A large undeveloped wetland area in the north eastern part of the Site close to the confluence of the Parramatta and Duck Rivers.
WMMS	Waste Management Method Statement
WwMMS	Wastewater Management Method Statement
WMP	Waste Management Plan
WWTP	Wastewater Treatment Plant
Year	A period of 12 consecutive months

1.0 INTRODUCTION

Viva Energy Australia Pty Ltd (Viva Energy) owns the land associated with the former Clyde Refinery (the 'Site'[1]) located at Durham Street, Rosehill on the Camellia Peninsula. Viva Energy currently operates the Clyde Terminal on part of the Site; however, a large part of the former refinery land in the south-western part of the Site (the 'Western Area') is no longer required for operational purposes. As such, Viva Energy is proposing to remediate contaminated soils in the Western Area (the 'Project') to facilitate future development of the land for other purposes permissible under the existing land use zoning.

This Remediation Environmental Management Plan (REMP) provides Viva Energy with a strategic framework for the environmental management of the remediation phase of the Project, as required by condition C2 of the Development Consent (DC) (State Significant Development (SSD) 9302).

Condition C3 of the DC provides the requirements for the REMP, and condition C1 outlines the requirements for all management plans prepared under the DC. Table 1-1 presents the requirements of conditions C1, C2 and C3 and which section of the REMP addresses each requirement.

In accordance with condition C4, Viva Energy will not commence the remediation until the REMP is approved by the Planning Secretary. Viva Energy will carry out the remediation in accordance with the REMP approved by the Planning Secretary and as revised and approved by the Planning Secretary from time to time. Viva Energy will ensure that any revision to the sub-plan(s) comply with the requirements of the Environment Protection Licence number 570 (EPL 570); and will provide a copy of any revised sub-plan, as detailed in DC condition C4 to the NSW Environment Protection Authority (EPA) at metro.regulation@epa.nsw.gov.au.

Table 1-1: DC Condition C1 and the location of the section which addresses the requirement

Condition C1 requirement	REMP Section
Management plans required under the DC must be prepared in accordance with relevant guidelines, and include:	
(a) details of:	
(i) the relevant statutory requirements (including any relevant approval, licence or lease conditions);	Appendix C Legislation, Standards, Codes And Regulations
(ii) any relevant limits or performance measures and criteria; and	Section 5.0 and 6.1
(iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;	Section 5.0 and 6.1
(b) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria;	Section 5.0
(c) a program to monitor and report on the:	
(i) impacts and environmental performance of the development;	Section 6.0
(ii) effectiveness of the management measures set out pursuant to paragraph (c) above;	Section 6.0
(d) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	Section 6.5
(e) a program to investigate and implement ways to improve the environmental performance of the development over time;	Section 6.2

[1] Note that the definition of 'Site' defined in the DC is different to the use of the term in this REMP, the Detailed RAP and associated plans. The DC defines 'Site' as Part Lot 100, DP1168951, Durham Street, Rosehill. Where as the definition of 'Site' used in the management plans is: the Viva Energy owned land on the Camellia peninsula consisting of the following lots: Lot 398 DP 41324, Lots 100 and 101 of DP1168951, Lot 101 DP809340, Lot 2 DP224288, and Lot 1 DP383675. It includes the Clyde Terminal, the Parramatta Terminal, the Wetland, the Western Area and other land that is either currently vacant or leased to third parties.

Condition C1 requirement	REMP Section
(f) a protocol for managing and reporting any:	
(i) incident and any non-compliance (specifically including any exceedance of the impact assessment criteria and performance criteria);	Section 4.4 and 6.3
(ii) complaint;	Section 4.3
(iii) failure to comply with statutory requirements; and	Section 6.3
(g) a protocol for periodic review of the plan	Section 6.2
Condition C2 requirement	**REMP Section**
Prior to the commencement of remediation works, the Applicant must prepare a Remediation Environmental Management Plan (REMP) in accordance with the requirements of condition C1, to the satisfaction of the Planning Secretary. The REMP and sub-plans required by condition C3 must be prepared in consultation with relevant agencies including but not limited to Council and the EPA. The Applicant must provide the Site Auditor's Interim Auditor Advice to the EPA and the Planning Secretary, endorsing the environmental management measures set out in the REMP, prior to submitting the REMP to the Planning Secretary.	Whole document
Condition C3 requirement	**REMP Section**
The REMP required under condition C2 must: (a) describe the role, responsibility, authority and accountability of all key personnel involved in the environmental management of the development;	Section 4.2
(b) describe the procedures that would be implemented to: (i) keep the local community and relevant agencies informed about the environmental performance of the development;	Section 4.3
(ii) receive, handle, respond to, and record complaints;	Section 4.3
(iii) resolve any disputes that may arise;	Section 4.5
(iv) respond to any non-compliance;	Section 6.3
(v) respond to emergencies;	Section 4.7
(c) include the following sub-plans: (i) Air Quality Management Plan (see condition B17); (ii) Soil and Water Management Plan (see condition B20); (iii) Groundwater Monitoring and Management Plan (see condition B22); (iv) Waste Management Plan (see condition B31); (v) Traffic Management Plan (see condition B33).	Appendix B

Viva Energy will manage the environmental aspects of the Project and will ensure that controls are properly implemented and regularly monitored and audited to assess their effectiveness. Changes to the controls will be instigated if they are not achieving their objectives.

This REMP is consistent with:

- Development Consent SSD 9302 dated 7 May 2020
- Viva Energy Western Area Remediation Project Environmental Impact Statement (EIS) (AECOM, 2019)
- Viva Energy Western Area Remediation Response to Submissions (RtS) (AECOM, 2019)
- Environmental Management Systems – Requirements and Guidance for Use (ISO 14001:2015)
- Guideline for the Preparation of Environmental Management Plans (New South Wales (NSW) Department of Infrastructure, Planning and Natural Resources, 2004).

1.1 Applicability of the REMP

The Project consists of two phases: remediation and ongoing operation. The first phase involves the remediation of impacted soils (where required) and the management of impacted soil and groundwater within the portions of the Western Area to enable the land to be used for permissible development under the existing land use zoning in the future. The second phase is the ongoing operation and management of the Western Area. Following completion of the Project, the Western Area will be a broadly flat, vacant site with the Stage 2 area integrated with the design presented in SSD-10459 (Central Sydney Industrial Estate and Downer Sustainable Road Resource Centre) granted on the 31 January 2021. Operational activities will be limited to those associated with environmental monitoring and ongoing management of the final landform.

The REMP applies to the remediation phase of the Project (refer to Section 2.3).

1.2 Objectives of the REMP

The objectives of this REMP are to:

- provide a clear framework for the environmental management of the Project, outlining the processes to be implemented under which all remediation employees and contractors are expected to undertake works in accordance with the requirements and conditions of the DC and the EPL 570
- address and manage environmental risks and issues that may arise during the remediation works
- ensure the compliance with relevant legislative and other requirements including those contained in the DC and any commitments identified in the EIS and RtS
- communicate the commitment to Project-specific environmental compliance and environmental management in accordance with legislation and other requirements to all employees and contractors
- provide a reference document for requirements relating to environmental monitoring, data collection, incident and complaint handling, reporting and auditing.

Viva Energy is responsible for the overarching environmental management of the Project, and it is expected that all employees and contractors are responsible for ensuring the objectives and targets of the associated management plans are met and environmental compliance is achieved.

2.0 PROJECT DESCRIPTION

2.1 Site Description

The Site is located approximately 16 kilometres west of the Sydney Central Business District, within the Parramatta Local Government Area (LGA), on the Camellia peninsula. The Site is surrounded by a mixture of land uses but is primarily in an industrial setting. To the west are the Rosehill Gardens Racecourse and a mix of industrial and commercial developments. To the south is Duck River, beyond which there is the industrial and commercial development of Silverwater. Industrial development within the suburb of Rosehill is adjacent to the north and west of the Site. Duck River runs along the south-eastern boundary of the Site and eventually joins the Parramatta River at the eastern most point of the Site (refer to Figure 2-1).

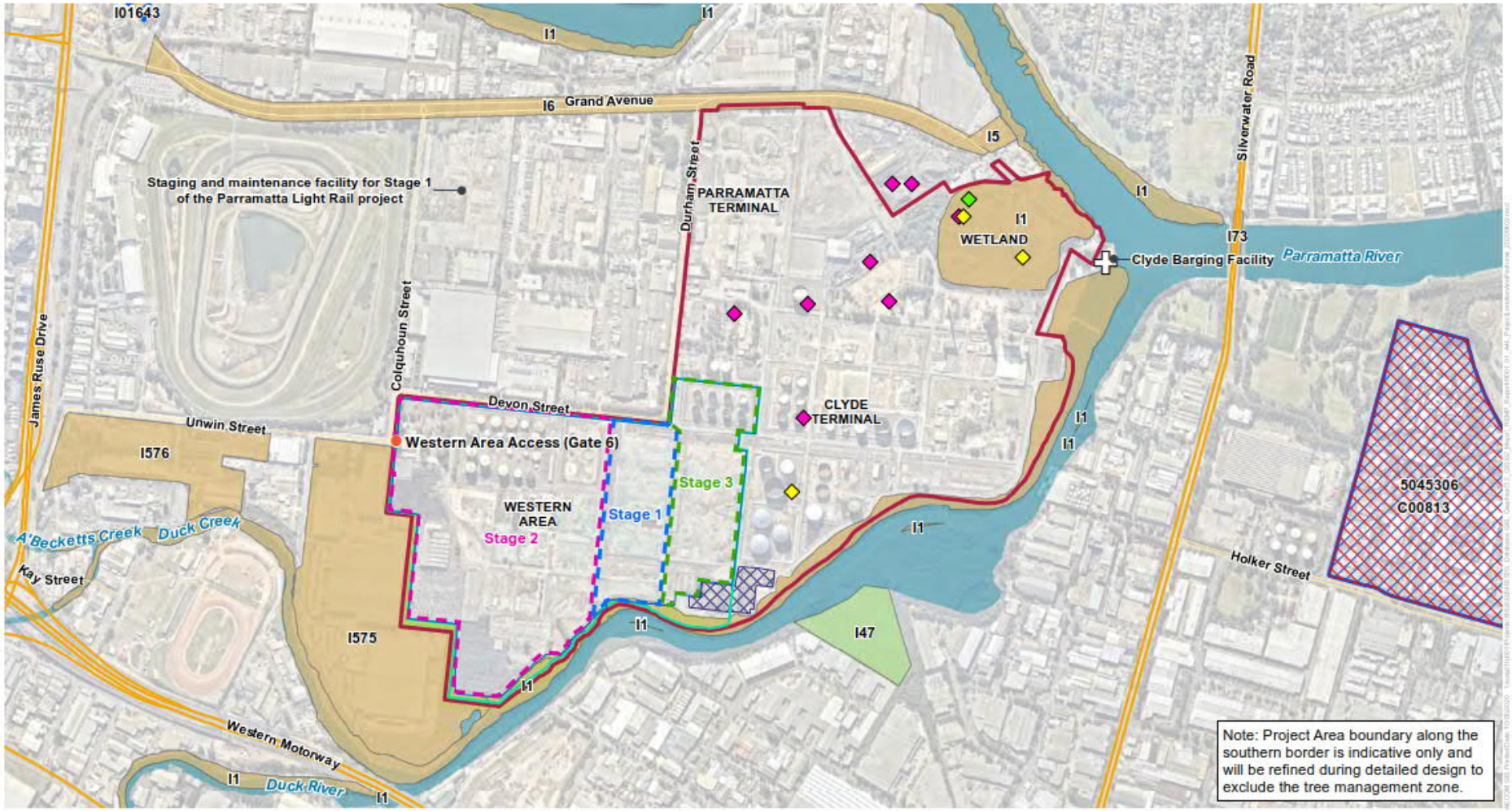

FIGURE 2-1: PROJECT LOCATION, SITE FEATURES AND SENSITIVE RECEPTORS

KEY

- Site boundary
- Project Area boundary
- Western Area boundary
- Stage 1 Area boundary
- Stage 2 Area boundary
- Stage 3 Area boundary
- Waste Water Treatment Plant (WWTP)
- State road
- Local road

Sensitive Receptors

- Riparian vegetation
- Duck River

Green and Golden Bell Frog Sightings

- Green and Golden Bell Frog *Litoria aurea* (UBMS, 2007)
- Green and Golden Bell Frog *Litoria aurea* (Bionet Records)
- Green and Golden Bell Frog *Litoria aurea* (AECOM survey, Oct 2012)

LEP Heritage

- State Heritage Act
- Conservation Area - General
- Item - General
- Item - Landscape

SREP (Sydney Harbour Catchment) 2005

- Shell Oil Refinery Wharf

AECOM

0 100 200 300 m

Figure 2-1: Project Location, Site Features and Sensitive Receptors

The Site is owned by Viva Energy and consists of the following lots:

- Lot 398 DP41324
- Lots 100 and 101 of DP1168951
- Lot 101 DP809340
- Lot 2 DP224288
- Lot 1 DP383675.

All of these lots are located within the Parramatta Local Government Area. The whole Site is zoned as IN3 Heavy Industrial under the Parramatta Local Environmental Plan 2011.

The Site includes the Clyde Terminal, the Parramatta Terminal, the Wetland, and the Western Area, as shown Figure 2-1. The Western Area is located within the Site, to the south-west of the Clyde Terminal. The Western Area is approximately 40 hectares in size and located on part of Lot 100 DP1168951. The land is largely vacant.

The Project is located within the Western Area, excluding vegetation within protected areas and certain portions of the Western Area which do not require remediation.

2.2 Environmental Approvals

Development consent

An Environmental Impact Statement (EIS) for the Project was prepared by AECOM Australia Pty Ltd (AECOM) in 2019 to support the State Significant Development Application under Part 4 of the *Environmental Planning and Assessment Act 1979 (NSW)* (EP&A Act). The EIS was prepared in accordance with the provisions of the EP&A Act and addressed the Secretary's Environmental Assessment Requirements for the Project, dated 1 June 2018. The EIS identified and described the environmental impacts associated with the proposed development and recommended a suite of mitigation measures to be implemented for reducing and managing these impacts.

The EIS was placed on public exhibition on 7 February 2019 until 6 March 2019. A Response to Submissions (RtS) report was prepared by AECOM and submitted in October 2019. The RtS summarises the submissions received during and after the exhibition period and provided responses to the issues raised. Mitigation measures identified in the EIS were amended in response to the submissions and are documented in the RtS.

On 5 May 2020, the Minister for Planning and Places approved the development application (SSD 9302) for the Clyde Western Area Remediation Project. The DC for this Project can be found here: https://www.planningportal.nsw.gov.au/major-projects/project/11341.

Previous Approvals

In 2015, development consent was granted for the Clyde Terminal Conversion Project (SSD 5147) (the 'Conversion Project'). The Conversion Project included the demolition of redundant tanks and other infrastructure and upgrades and improvements to site infrastructure. It was aimed at improving the efficiency of the Clyde Terminal by upgrading existing facilities and structures, improving environmental performance and further improving the safety of the Clyde Terminal.

The Clyde Terminal continues to receive and distribute finished petroleum products, operating under Environment Protection Licence number 570 (EPL 570) issued under the *Protection of Environment Operations Act 1997 (NSW)* (PoEO Act). The Clyde Terminal is also a Major Hazard Facility under the Work Health and Safety Regulation 2011 (NSW).

The operational conditions of consent for SSD 5147 and the conditions of EPL 570 still apply to either all or part of the Western Area. The Site will continue to be classified as a Major Hazard Facility.

2.3 Project Description

Project Objectives

Viva Energy has developed three main Project objectives to ensure both its business objectives and the necessary regulatory requirements are met:

1. Ensure the on-going operational viability of Clyde Terminal assets and associated licences to operate (including but not limited to SafeWork NSW Major Hazard Facility Licence, NSW EPA licence and SSD 5147 consent conditions).
2. Ensure any future redevelopment decisions are considerate of the operational requirements of the existing Clyde Terminal.
3. Meet applicable regulatory requirements.

Project Phases

The Project includes two phases, being the remediation phase and, following completion of the remediation, ongoing operation phase. These phases and associated activities are summarised in Table 2-1. This REMP applies to the remediation phase. The remediation phase will be delivered in a number of Stages. These Stages are discussed further in Section 2.4 below.

Table 2-1: Project activities

Component	Description	Covered in this REMP
Remediation		
Preparation Works	The first component of the remediation phase is the preparation works. In order to prepare the Western Area for the Project the following activities will be completed: • establishment of fencing around the Western Area, including exclusion zones identified as part of the remediation; • establishment of temporary facilities (e.g. gatehouse and site offices), parking for Project workers and demarcation of footpaths; • installation of personnel decontamination equipment and wheel washing facilities; • installation of temporary erosion and sediment controls for the works; • service location for live services/utilities.	Yes
Remediation Works	The second component of the remediation are the remediation works, this includes the following activities: • removal of redundant infrastructure and waste; • remediation of contaminated soils; • soil and groundwater management; and • wastewater treatment.	Yes
Demobilisation	The final component of the remediation phase is the demobilisation from the Western Area. Demobilisation includes: the removal of plant and equipment, removal of offices and temporary structures and land forming.	Yes
Ongoing Operation		
Ongoing Operation	Following completion of the remediation, the Western Area will be a broadly flat, vacant site, with the Stage 2 area integrated with the design presented in SSD-10459 (Central Sydney Industrial Estate and Downer Sustainable Road Resource Centre) granted on the 31 January 2021. Ongoing operational activities on the Western Area will be limited to those associated with environmental monitoring and ongoing management of the final landform.	No. Ongoing management requirements for the Western Area after completion of the remediation works will be detailed in Long Term Environmental Management Plans (LTEMPs) prepared for the land as required.

2.4 Remediation Description

Remediation Objectives

The remediation objectives for the Project are as follows:

- Remediate the soil and manage groundwater within the appropriate parts of the Western Area, to enable the land to be used for commercial/industrial purposes in the future, thereby reducing the risk of contamination from the land adversely affecting human health and the environment
- Ensure any approved remediation process that is implemented adheres to all applicable regulatory requirements so as to limit or eliminate (where possible) adverse effects to human health or ecological receptors.

Remediation Activities

Investigations completed within the Western Area have shown that not all of the soil and groundwater within this area requires remediation or management. As such, remediation activities will only be required in a number of targeted areas within the Western Area.

The parts of the Western Area that will be required to be disturbed/excavated will primarily result from activities associated with the removal of existing redundant surface and subsurface infrastructure, contaminated land remediation and landforming works. Further, based on the analytical data obtained from several stages of site investigations, the remediation will be limited to less than 4 metres below ground surface (mbgs), and will be generally focused within 2 mbgs.

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

1. already meets applicable commercial/industrial land use criteria; and/or
2. the remaining soil or groundwater impacts are unlikely to pose a risk to human health or the environment (when managed under an LTEMP).

The remediation activities for the Project will focus on petroleum hydrocarbon impacts in soils (refer to the description of the Stage 2 works below and the Stage 2 Detailed RAP). Other non-petroleum chemicals of potential concern have been found to occur within the soil and groundwater in the Western Area. Where it is identified that non-petroleum hydrocarbon impacts warrant remediation, these contaminants will either be treated alongside hydrocarbon impacts in the proposed remediation technologies or will be managed on-site or transported off-site.

Following the progressive completion of remediation activities, parts of the Western Area will be fully disconnected from the Clyde Terminal's WWTP. This has already occurred for the Stage 2 area. Once disconnected, stormwater from these areas will be managed through overland flow, with appropriate erosion and sediment control techniques employed.

It is anticipated that the final landform across the Western Area will be at broadly the same level it is at present, with the Stage 2 area integrated with the design presented in SSD-10459 (Central Sydney Industrial Estate and Downer Sustainable Road Resource Centre) granted on the 31 January 2021. To achieve the final landform across the Western Area, remediated soils and other suitable and approved materials will be used as backfill.

The volumes of soil that will require remediation will be confirmed in each of the Detailed RAPs prepared for the remediation.

Remediation Stages

Viva Energy are proposing to stage the remediation of the Western Area as follows:

- Stage 1 – Former Process West
- Stage 2 – Former Utilities and Movements
- Stage 3 – Former Process East.

These three stages focus on different parts of the Western Area. Figure 2-2 shows the current staging plan for the Project.

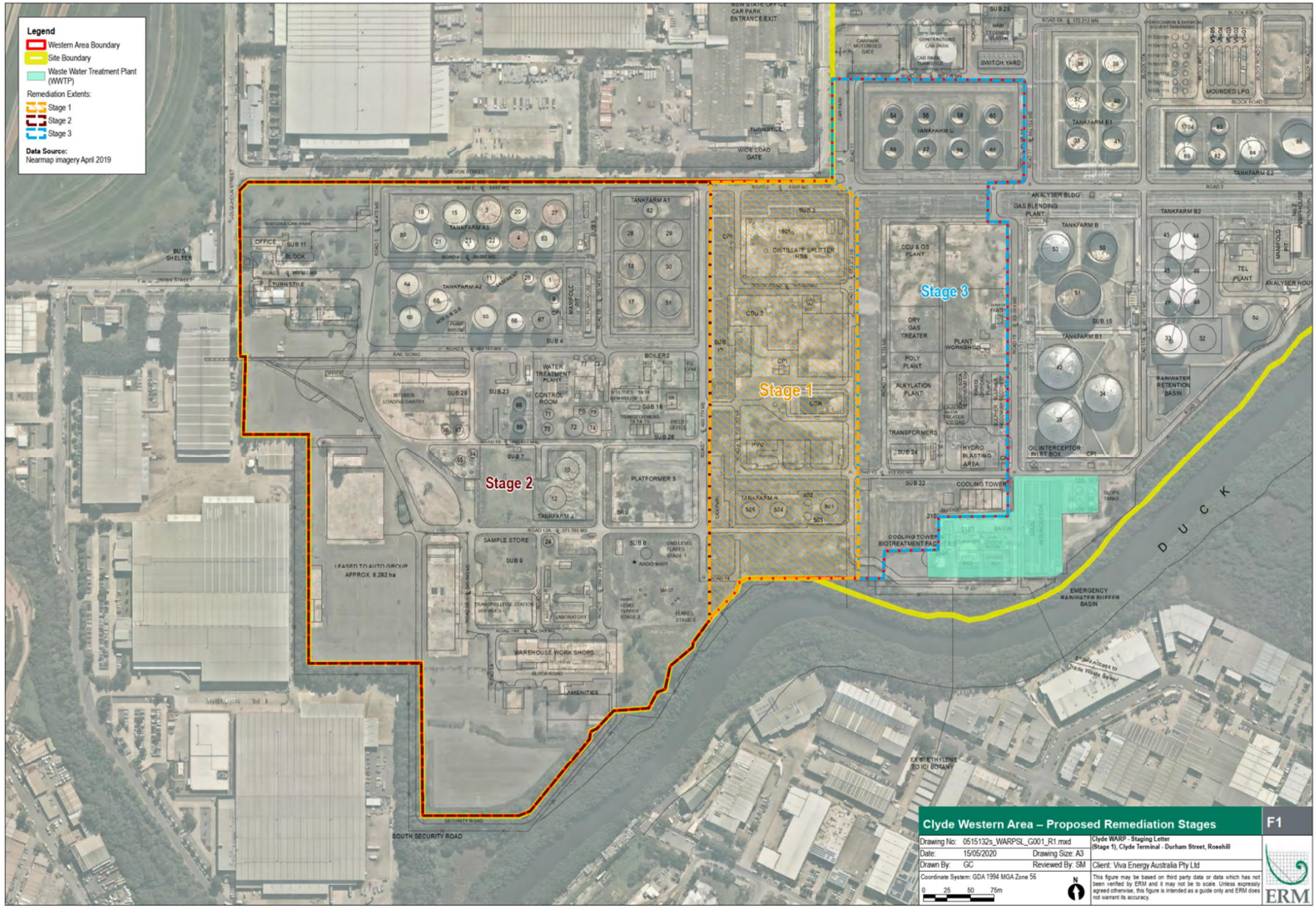

Figure 2-2: Proposed Remediation Stages

In accordance with the consent conditions associated with approval SSD 9302 for the Project, a Detailed Remediation Action Plan (RAP) and associated management plans is required to be developed prior to the commencement of preparation works for each of these stages.

This REMP and its subplans primarily apply to Stage 2 of the remediation phase, however contextual information for the whole Project has been also included to ensure that the documentation for each stage refers back to the DC, and the overarching environmental management framework for the Project. Specific information from each stage of the Project will be included in each of the REMPs and their associated documents as required. As this REMP includes additional detail for Stage 2, it references the Stage 2 AEVR and Stage 2 Detailed RAP.

Importantly, the staged nature of remediation works means that vehicular access and storm water management measures will need to be periodically reviewed and updated depending on the remediation and landforming works required. Where relevant these changes will be reflected in this REMP and its subplans as necessary.

In addition, certain remediation activities that were consented for the whole Project and have been mentioned in the section above may not all occur during Stage 2. For example, the use of thermal desorption unit will not be required for Stage 2

Stage 2 Remediation

A Detailed RAP has been prepared for Stage 2, which outlines the approach to the remediation for Stage 2 Area (Former Utilities and Movements). The proposed remediation methodologies for the Stage 2 Area are as follows:

- Excavation and off-site disposal of soils (asbestos removal);
- Excavation for on-site bioremediation (biopiling); and
- Excavation and on-site management (engineered capping).

These remedial technologies were selected for use in combination to address the impacted soil. A validation approach for assessment of excavations and beneficial re-use of remediated material within later stages of the Project has been presented in the Stage 2 Detailed RAP.

A detailed remediation works overview is provided in Section 9 of the Stage 2 Detailed RAP.

Figure 2-3 shows the Stage 2 layout. The extent of the material that requires remediation in the Stage 2 Area is contained within the following Areas of Environmental Concern:

- AEC-3A, AEC-3C, AEC-3D, AEC-3E, AEC-14A, AEC-14B (biopiling);
- AEC-4 (engineered cap); and
- AEC-1 and AEC-3B (off-site disposal).

Excavation and Off-Site Disposal (asbestos removal)

Asbestos identified in soils within AEC-1 and AEC-3B will be excavated and transported off-site for disposal. The following will be undertaken during these works:

- Carefully excavate impacted materials using appropriate equipment (e.g. excavators /backhoes), from the AEC-1 and AEC-3B Areas. Works are to be conducted in accordance with the approved management plans (including this REMP) as detailed in Section 1.10 of the Stage 2 Detailed RAP;
- The validation consultant shall observe the excavation and excavated materials for indicators of unexpected finds including visual (staining, discolouration) and olfactory (odours). If indicators of potential contamination that are inconsistent with identified Asbestos Containing Material (ACM) impacts are observed, the Unexpected Finds Protocol (UFP) detailed within Appendix C of the Stage 2 Detailed RAP will be implemented; and
- Materials would be excavated and placed in temporary covered stockpiles (to eliminate dust/airborne particles) or placed directly into a truck for transport to an approved / suitably licensed off-site disposal location.

As offsite disposal of excavated ACM containing soils is required, these soils will be placed within a temporary stockpile in the vicinity of the excavation area for additional assessment and waste classification purposes or classified in-situ based on existing data.

Where classification of materials is required to be undertaken prior to disposal, samples will be collected either in-situ or from stockpiled materials to determine the requirements for off-site disposal. Sampling densities and

stockpile validation processes are documented in the Stage 2 Detailed RAP in accordance with the NSW EPA Waste Classification Guidelines (NSW EPA, 2014).

Where waste materials are not temporarily stockpiled on hardstand, following removal of stockpiled impacted materials, the footprint of the stockpile location will require validation to verify no cross contamination.

The results of collected waste classification and stockpile footprint validation samples are to be collated and provided for inclusion into the final site validation report.

Various controls are to be implemented as per the Stage 2 Detailed RAP and the relevant controls within this REMP. These controls would be further detailed in the asbestos management plan required under Mitigation and Management Measure SWMP3 (refer to the Soil and Water Management Plan).

Biopiling

Biopiles are constructed via placement of soil in 1 m layers with solid and perforated pipe being laid prior to the next layer being placed. The solid pipe will extend into the stockpile where it is attached to the perforated pipe and is adjoined to a piping manifold. The piping is connected to a Soil Vapour Extraction (SVE) system which extracts air (and soil vapour) from the stockpile (via a powered blower unit) into an air/water separator with 'drop out' tank for removal of moisture. The 'drop out' tank will be pumped (as required) to a holding tank prior to testing and off-site disposal at an appropriately licenced facility.

The SVE system will be attached to vessels of granular activated carbon filter media, to treat contaminated air and remove odours prior to emission via an exhaust stack. A 'lead' and 'lag' vessel will be installed in a continuous circuit such that if breakthrough of contaminants occur through the lead vessel, it is captured via the lag vessel prior to emission.

Biopiles will be covered with an impermeable cover to contain potential air emissions and odours from the stockpile, to prevent creation of leachate via rainfall, and to retain soil moisture and temperature to encourage biodegradation.

Following completion of biopiling the material will be re-used within the Western Area during future stages of remediation or disposed off-site to a suitably licensed receiving facility if unable to be treated to the re-use criteria outlined in the Stage 2 Detailed RAP.

Engineered Cap Construction

The preferred strategy for managing AEC-4 (refer to Figure 2-3 below) is to manage the subsurface contaminated fill in-situ as this material does not pose ongoing risks to human health or the environment. The need to cap this area has been proposed primarily to mitigate potential direct contact risks to future on-site workers, however it will also limit surface water infiltration at the ground surface reducing potential for future contaminant mass flux in groundwater.

Construction of the engineered cap would be completed by removing existing asphalt handstand capping across AEC-4 for offsite disposal or recycling. Re-working and grading of soil material will be undertaken as required to achieve the desired landform. Waste classification sampling and appropriate off-site disposal of surplus materials will be completed as required.

After these grading works have been conducted, a capping layer will be placed down, including a trafficable hardstand covering as specified in the Stage 2 Detailed RAP. The final relative levels of the cap will be confirmed within the Detailed Cap Design produced by the remediation contractor.

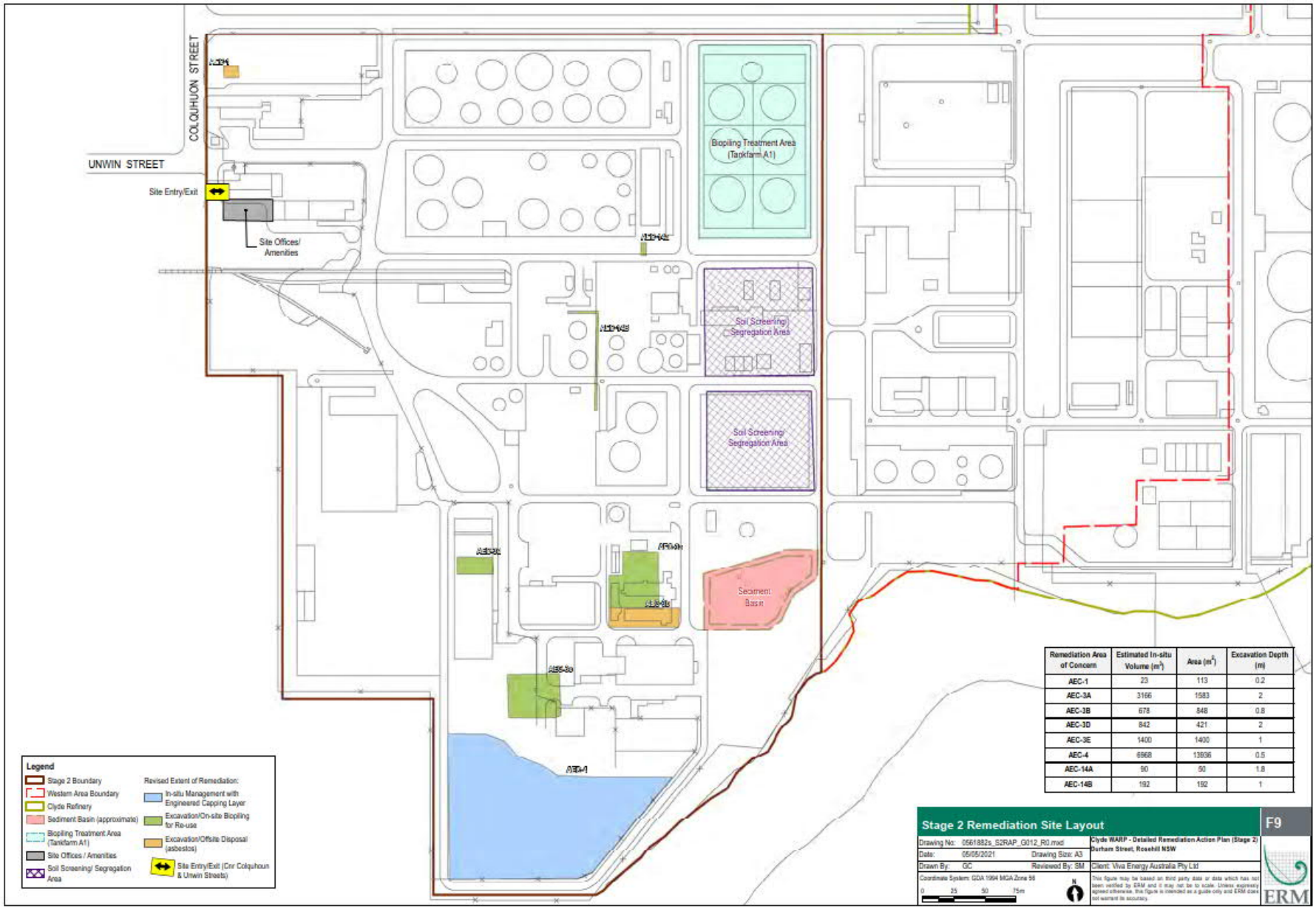

Figure 2-3: Stage 2 Remediation Layout

Stage 2 Remediation Activities

The Stage 2 Remediation Scope of Work will include the completion of the following tasks to achieve the stated remediation objectives:

- Task 1 – Preparation Works:
  - installation of fencing and exclusion zones;
  - establishment of site amenities offices, parking and footpath demarcation;
  - installation of decontamination equipment and wheel wash;
  - erosion and sediment controls;
  - service location for live services and utilities;
  - isolation and de-energisation of underground utilities;
  - breakout of hardstand and surface reinforcements (with separation of recoverable materials such as concrete, asphalt and metal)
- Task 2 – Removal of redundant infrastructure and waste:
  - removal of stockpiled waste materials from the Stage 2 Area (as required);
  - excavation of subsurface structures such as drains, pits, interceptors, footings or pipework (if drainage network is unable to be decommissioned in-situ prior to remediation).
- Task 3 – Remediation:
  - Task 3.1 Excavation and offsite disposal (asbestos areas):
    - targeted excavation and removal of contaminated soil material from AEC-1 and AEC-3B; and
    - odour, emission controls and monitoring (as required by the AEVR, this REMP and/or agreed EPL 570 conditions).
  - Task 3.2 Excavation and on-site bioremediation (biopiling):
    - Targeted excavation of contaminated soil material from AEC-3A, AEC-3C, AEC-3D, AEC-3E, AEC-14A, AEC-14B;
    - segregation of excavated soils suitable for re-use from visibly contaminated soils requiring treatment;
    - soil sampling of stockpiled materials;
    - screening of soil material to separate oversized recyclable material (such as concrete, bricks) and homogenise soils for biopiling to a maximum particle size of 50 mm (where treatment is required);
    - loading of contaminated soil material into trucks for transport to the designated to the on-site soil treatment area or loading of soil material deemed suitable for re-use to the surplus soils stockpiling area;
    - materials tracking (on-site or off-site);
    - validation of remedial excavation surfaces (walls and floors);
    - survey of completed excavation surfaces and sample locations;
    - formation of biopiles (undertaken by soil treatment contractor), including the following tasks:
      - construction of soil treatment pad;
      - formation of biopiles;
      - setup of Soil Vapour Extraction (SVE) System, including pipework; and
      - covering stockpiles.
    - Ongoing treatment and monitoring of soils to maintain soils within acceptable parameters for aerobic degradation of petroleum hydrocarbon COPCs. Ongoing soil treatment will be conducted concurrently with remediation tasks 4 and 5.
  - Task 3.3 Engineered cap construction:
    - removal of existing asphalt hardstand capping across the AEC-4 for off-site disposal or recycling;

- re-working and re-grading of area to achieve desired landform;
- waste classification and off-site disposal (if required) of surplus materials;
- importation, placement and compaction of appropriate backfill material to meet the remedial objectives for the barrier layer as detailed in the Stage 2 RAP and future use of the area;
- installation of new hardstand covering;
- survey of relative levels throughout the works;
- reinstatement of groundwater monitoring wells (as required by the Groundwater Monitoring Program (GWMP) (Attachment A of the Groundwater Monitoring and Management Plan located at Appendix B.3 of this REMP);
- odour, emission controls and monitoring (as required by the AEVR, this REMP and/or agreed EPL 570 conditions);
- materials tracking (on-site or off-site).

- Task 4 – Land forming: The landforming works for the Stage 2 area will be integrated with the design presented in SSD-10459 (Central Sydney Industrial Estate and Downer Sustainable Road Resource Centre) granted on the 31 January 2021
- Land forming involves the following tasks:
  - importation of Virgin Excavated Natural Material to backfill remedial excavations (as required) and raise the site to required relative levels (RLs);
  - placement and re-use of on-site validated materials;
  - grading and compaction of imported material.
- Task 5 – Completion of works and demobilisation.
  - This would include the demobilisation of plant, equipment and personnel associated with the remediation works from the Site.

2.5 Access and Demarcation

Access to the Stage 2 area will be through an existing access point on the corner of Unwin Street and Colquhoun Street (refer to Figure 2-1), known as Gate 6. Project related traffic movements will be largely along Grand Avenue, Durham Street and Devon Street, entering the Stage 2 area at Gate 6. The Site will also be accessed from Parramatta Road via Wentworth Street, Kay Street and Unwin Street.

The Stage 2 area is currently bounded by chain wire fencing to the north (along Devon Street and Durham Street), to the west (adjacent to neighbouring commercial activity), and to the south (adjacent to Duck River). A new fence has been erected between the Stage 1 area and the Stage 3 area and the Stage 1 area and the Stage 2 area. These new fences separate the Clyde Terminal land from the Stage 1 and Stage 2 areas. Gates have been installed at appropriate locations (e.g. for Viva Energy staff access between the Western Area and the Clyde Terminal). The Stage 2 area and Western Area is shown on Figure 2-1.

Further to this, there are some parts of the Western Area that are excluded from the remediation. The excluded parts of the Western Area primarily relate to the strip of vegetation along the southern border of the Western Area. Excluded areas will be protected from disturbance. No activities related to the Project will occur in these areas.

3.0 ENVIRONMENTAL MANAGEMENT

3.1 Environmental Management Framework

The framework for the environmental management of the Project is depicted in Figure 3-1. The management of environmental impacts is governed by the DC (SSD 9302), the EPL 570 and the Viva Energy Health, Safety, Security and Environment (HSSE) Policy.

The HSSE Policy outlines Viva Energy's commitment to pursuing the goal of no harm to people and protecting the environment. This is called Goal Zero. The Viva Energy HSSE Policy is provided in Appendix A.

The Project Management Plan (PMP) outlines the procedures and processes for managing remediation activities. The PMP also includes Occupational Health and Safety Plan, Quality Management Plan and Emergency Response and Contingency Plan, and Flood Emergency Response Plan.

DC condition C2 requires Viva Energy to have a REMP for the Project. Viva Energy are staging the delivery of the Project, therefore, as agreed by the Planning Secretary, this REMP is primarily focused on the works proposed for Stage 2 of the Project and the necessary environmental controls, mitigation measures, contingency plans and monitoring programs for that stage. However, where necessary this REMP also discusses the overall framework for environmental management of remediation activities. The environmental management sub-plans that are appended to this REMP provide the aspect-specific requirements for Stage 2 in the framework of the wider Project (refer to Appendix B).

Long Term Environmental Management Plans (LTEMPs) will be prepared for relevant parts of the Stage 2 area to outline the environmental controls, mitigating measures, contingency plans and monitoring programs after remediation has been completed and/or where ongoing management is required (i.e. during ongoing operation).

Table 3-1 lists the management plans, their associated requirements and their location in this REMP.

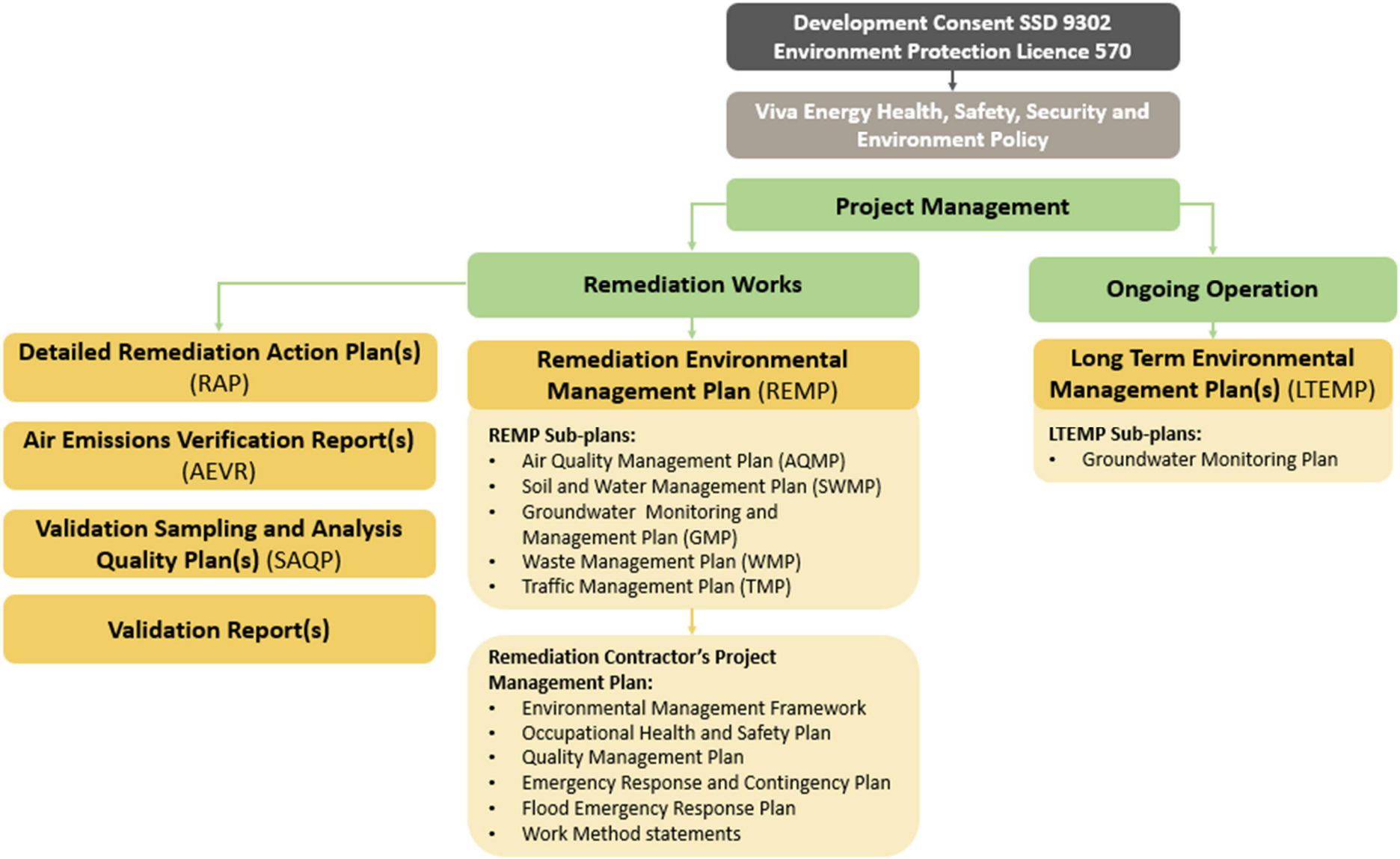

Figure 3-1: Project Environmental Management Framework

Table 3-1: Environmental Management Sub-plans

Plan	Location	To meet the requirements of:	
		DC Condition	DC Appendix 2 MMM Reference
Air Quality Management Plan (AQMP)	Appendix B – B.1	B17	AQ2
Soil and Water Management Plan (SWMP)	Appendix B – B.2	B20	SGC2, SW1
Groundwater Monitoring and Management Plan (GMP)	Appendix B – B.3	B22	SGC6
Waste Management Plan (WMP)	Appendix B – B.4	B31	W1
Traffic Management Plan (TMP)	Appendix B – B.5	B33	TT1

3.2 Approvals and Licensing Requirements

In accordance with DC condition C4, Stage 2 of the remediation works will not commence until this REMP is approved by the Secretary of the Department of Planning, Industry and Environment (Planning Secretary). Prior to submitting this REMP to the Planning Secretary for approval, the Site Auditor must endorse the environmental management measures set out in the REMP and document this endorsement within an Interim Advice. This Interim Advice must be provided to the NSW EPA and the Planning Secretary, prior to the Planning Secretary approving the REMP (DC condition C2).

Other approvals required for the Project are discussed in Table 3-2.

A summary of key environmental legislation is provided in Appendix C. These legislative requirements have also been incorporated into the management plans detailed in Table 3-1. Personnel are required to comply with these statutory obligations and requirements. Roles and responsibilities are outlined in Section 4.2 below.

Table 3-2: Other approvals

Approval	Comment
Aquifer Interference Approval	Due to predicted contact with groundwater, an aquifer interference approval may be required under section 91 of the Water Management Act 2000 (WM Act). Following remediation trials and excavation as part of the Stage 1 works, it was considered that groundwater interception by the remediation works would be minor. Discussions with the NSW Natural Resource Access Regulator have confirmed that an aquifer interference approval is only required if the works will dewater more than 3 megalitres of groundwater per annum. Based on the completed Stage 1 remediation works in 2020, the proposed shallow depths of excavation for Stage 2, low transmissivity within clay lithology consistent with Stage 1 soils and observations of little water ingress observed during previous works, groundwater ingress into the excavation is expected to be minor and is unlikely to require dewatering of significant volumes to safely complete excavations. As such it is unlikely that more than 3 megalitres of groundwater per annum will be dewatered during the Stage 2 works. Should an aquifer interference approval potentially be required for the remediation activities for Stage 3 of the Project, this requirement will be outlined in the Detailed RAP for that respective stage.
Water Access Licence	No water removed from remediation excavations would be discharged to the Duck River either directly or via the Clyde Terminal Wastewater Treatment Plant. As such the Stage 2 works would not involve the removal and movement of water from one water source to another and a water access licence under section 56 of the WM Act would not be required. Should a water access licence potentially be required for the remediation activities for Stage 3 of the Project, this requirement will be outlined in the Detailed RAP for that respective stage.

Approval	Comment
Environment Protection Licence	The Site has an EPL (no. 570) under Chapter 3 of the PoEO Act (for any purposes referred to in section 43 of that Act). EPL 570 applies to the majority of the Site and applies to the Stage 2 area. The Project will be carried out in line with the conditions stipulated in EPL 570, in particular the discharge and monitoring requirements where they are relevant. The EPLs for the Site are frequently amended, in consultation with the NSW Environment Protection Authority (NSW EPA), to ensure that the activities at the Site are appropriately managed. Any amendments required to EPL 570 as a result of the Project will be managed in consultation with the NSW EPA. The changes to EPL 570 will be agreed with the NSW EPA, once the detailed design for each stage of the Project is confirmed and prior to works commencing.

3.3 Management plan consultation

The REMP and sub-plans will be prepared in consultation with relevant stakeholders (DC condition C2). Table 3-3 outlines the consultation requirements for the REMP and its subplans. The management plans will be provided to the stakeholders referenced in Table 3-3, for their review (shading indicates that consultation is required). The stakeholders will be provided a two week review period within which to provide comments on the plans. If no response is received after this period then it will be assumed that the stakeholder has no comments to make.

Table 3-3: Management Plan Consultation Requirements

Management Plan	Government Agency					DC condition
	EPA	DPIE Water	Council	TfNSW*	RMS*	
REMP						C2
AQMP	Consultation not required by DC					B17
SWMP						B20(a)
GMP						B22(a)
WMP	Consultation not required by DC					B31
TMP						B33(b)

* RMS is now part of TfNSW and therefore this consultation will only be required with TfNSW.

4.0 IMPLEMENTATION

4.1 Remediation Hours

The working hours for the remediation phase, as stated in DC condition B36, are shown in Table 4-1. As outlined in Section 2 of this REMP, the Direct Thermal Desorption (DTD) Plant will not be required and therefore the part of Condition B36 relevant to that technology has not been included.

Table 4-1: Remediation Working Hours

Activity	Day	Time
Preparation works, remediation works (excluding the DTD Plant) and demobilisation	Monday – Friday Saturday	7:00 am to 6:00 pm 8:00 am to 5:00 pm

Works outside of the hours presented in Table 4-1 may be undertaken in the following circumstances (DC condition B37):

a. Works that are inaudible at the nearest sensitive receivers;

b. Works agreed to in writing by the Planning Secretary;

c. For the delivery of materials required outside these hours by the NSW Police Force or other authorities for safety reasons; or

d. Where it is required in an emergency to avoid the loss of lives, property or to prevent environmental harm.

4.2 Roles and Responsibilities

Viva Energy is responsible for the implementation of environmental management plans and mitigation measures contained in this REMP. All employees and contractors will meet the requirements of the DC, EPL and management plans.

Key personnel and their general responsibilities in relation to environmental management and compliance for the Project are described in Table 4-2. An organisation chart is provided in Figure 4-1.

Table 4-2: Personnel and Responsibilities

Role	Responsibility
Western Area Remediation Project Manager Viva Energy	Implementation of Viva Energy's commitment to HSSE with respect to the Project. • Overall responsibility for development, implementation, maintenance and compliance with this REMP and sub-plans. • Overall responsibility and allocation of resources to annual reporting and environmental audits. • Ensure contracts contain relevant environmental provisions. • Review and sign off on this REMP and subsequent revisions.
Project Remediation Lead Viva Energy	• Accountable for remediation related environmental matters within the scope of the remediation work packages. • Ensure the requirements of this REMP and management plans are implemented in relation to the remediation work packages. • The Remediation Lead to regularly liaise with the Community Engagement Officer to provide key updates on the Project.
Project Environment Lead Viva Energy	The role of the Project Environment Lead is to review and advise on the implementation of the REMP, and monitor the implementation and effectiveness of the mitigation and management measures. This includes the following responsibilities: • Provision of advice in relation to the environmental performance of the remediation works. • Audit of the implementation of this REMP and management plans. • Approve or reject "minor amendments" to the REMP and management plans. Consult with the DPIE where uncertain as to whether an amendment to the REMP or management plans constitutes a "minor amendment". • Require reasonable steps be taken to avoid or minimise unintended or adverse environmental impacts and failing the effectiveness of such steps, direct that relevant actions be ceased immediately should an adverse impact on the environment be likely to occur. • Be consulted when responding to the community concerning the environmental performance of the remediation works where the resolution of points of conflict between Viva Energy and the community is required. • Regularly liaise with the Western Area Remediation Project Manager and Remediation Lead in order to ensure environmental compliance. • Training the Project workforce in the REMP and associated sub-plans. • The Project Environment Lead to regularly liaise with the Community Engagement Officer to provide key updates on the Project.
Community Engagement Officer Viva Energy	• Review and advise on the Community Engagement Plan • Facilitate implementation of the Community Engagement Plan

Role	Responsibility
	• The Remediation Lead and Project Environment Lead to regularly liaise with the Community Engagement Officer to provide key updates on the Project. • Ensure that the local community is kept informed about the Project including projected timelines and potential impacts from planned works and environmental performance of the Project. • Consult with the Project Environment Lead when responding to the community on the environmental performance of the remediation works and/or where the resolution of points of conflict between Viva Energy and the community is required.
Remediation Contractor - Project Manager Remediation Contractor	• Ensure compliance with the requirements of the DC, EPL and this REMP and other management plans. • Overall responsibility for the development and implementation of the Contractor's Environmental Management Framework and Management Method Statements. • Reporting of all environmental incidents as they occur. • Regularly liaise with the Project Remediation Lead and Project Environmental Lead to ensure environmental compliance.
Site HSSE Manager Remediation Contractor	• The Site HSSE Manager will be based on-site at the Western Area and will oversee the environmental performance of the Project • The Site HSSE Manger will report all incidents and non-compliances immediately to the Project Environment Lead. • Carry out inspections as directed by the Project Environment Lead.
All Personnel Viva Energy, Contractors, Validation Consultants	• Comply with the requirements of the DC, EPL and Management Plans relevant to their role. • Report all environmental incidents as they occur to the Site HSSE Manager. • Attend HSSE inductions and REMP training as required.
Clyde Terminal Controller(s) Viva Energy	• Report any complaints received to the Community Engagement Officer and Project Manager. • Report any activity at the Clyde Terminal that may impact upon the remediation works and/or environmental performance of the Project.
Site Auditor Independent to Viva Energy and the Validation Consultants	• Review and approve the: - Detailed RAPs - AQMPs - SWMPs - GMPs - Air Emissions Verification Reports (AEVRs) - Validation Reports, following completion of the remediation works - LTEMPs. • Verify compliance with the WMPs. • Endorse the environmental management measures set out in the REMPs. • Within twelve months of the completion of demobilisation, or as otherwise agreed with the Planning Secretary, submit a Site Audit Report, Site Audit Statement and Validation Report to the EPA. • Provide advice and suggestion to improve environmental performance where applicable.
Validation Consultant(s) ERM, AECOM	• Prepare the REMPs, LTEMPs, Detailed RAPs, AEVRs, Validation Reports, and associated management plans. • Undertake onsite validation sampling and analysis throughout the remediation works.

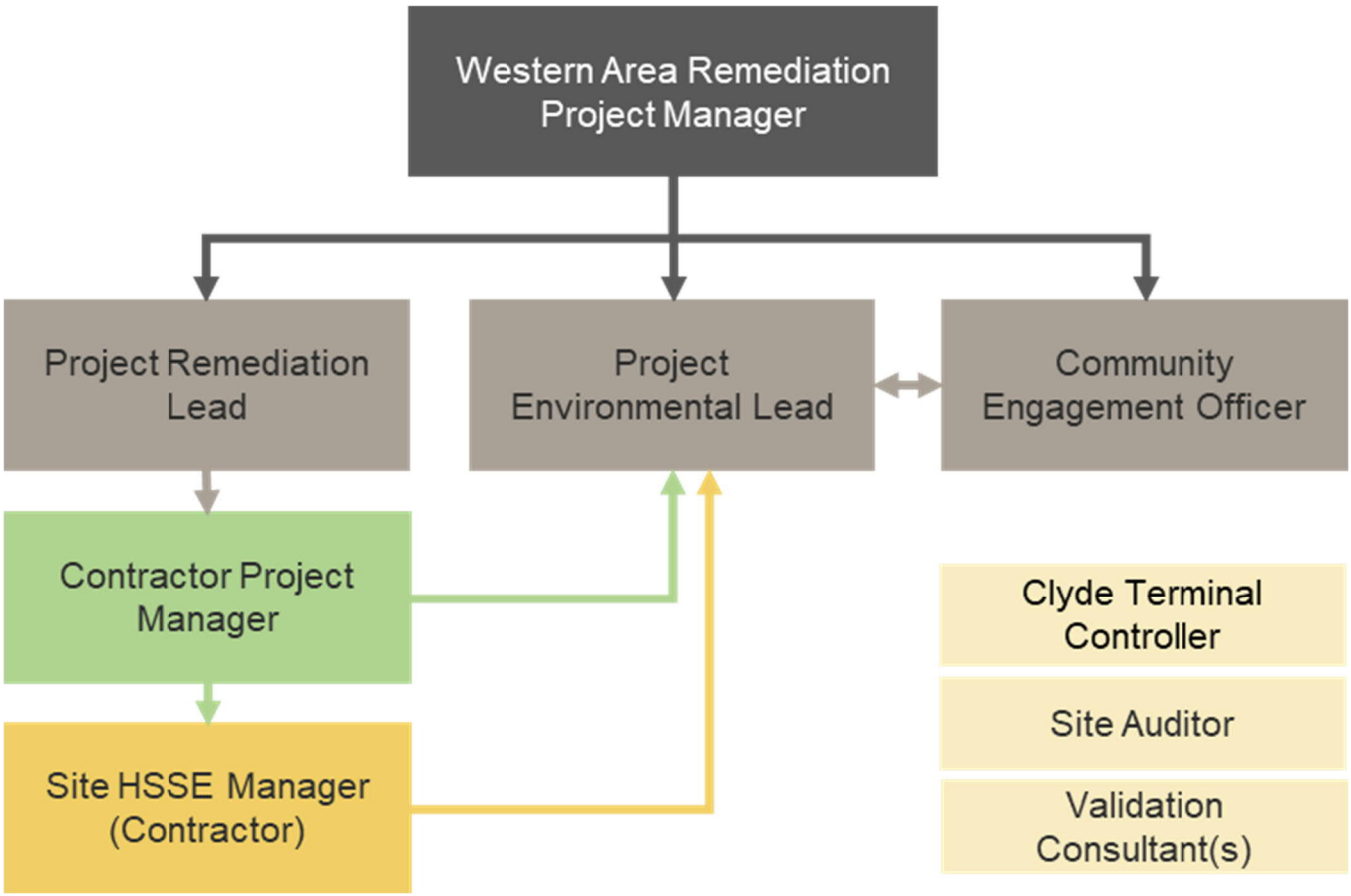

Figure 4-1: Organisation Chart for the Project

4.3 Stakeholder Consultation

In accordance with DC condition B48 consultation and/or engagement with the community will be undertaken regularly throughout the Project including with nearby sensitive receivers, relevant regulatory authorities and other interested stakeholders.

Management measure G8 required a Community Engagement Plan to be produced. This section of the REMP and Section 4.4 below covers the requirements of this management measure by identifying the relevant stakeholders, discussing the frequency of communications and the types of information that may be shared, and outlining the complaints management process.

The key stakeholders involved with the Project are as follows:

- Viva Energy – Site Owner and Clyde Terminal Operator
- NSW Department of Planning, Industry and Environment (DPIE)
- NSW Environment Protection Authority (NSW EPA)
- Site Auditor
- Validation Consultant
- Remediation Contractors
- Neighbouring businesses and local community.

Viva Energy's engagement with these stakeholders has and will continue to include measures to keep the local community informed of the Project including projected timelines and potential impacts from planned works.

Project communications will (at a minimum) provide details of contact point(s) to which community complaints and enquiries may be directed, including a telephone number, a postal address and an email address.

The Clyde Terminal webpage will continue to be updated with the communications on the Project and provide contact information, such as the 24 hour community (including complaints) hotline and information on how to provide comments or feedback.

The local Camellia Peninsula will be informed of the Project including projected timelines and potential impacts from planned works.

The frequency of communication will be based on the requirements of the DC and the schedule of planned works. The following information may be included in communications, as required and where relevant:

- key details of when the relevant work activities are planned to commence
- the stages of works planned
- anticipated traffic, noise, and/or other potential impacts to public amenity
- exclusion zones or road closures (where required)
- days and hours of work
- the nature of the work to be carried out
- the method of the work to be carried out (where relevant)
- who to contact (phone, postal address, e-mail address to make a complaint, provide feedback or seek information.

Ongoing consultation and engagement with government agencies such as DPIE, NSW EPA and the Council will likely occur in the form of written communications, meetings, review of documents and other approvals (if required).

4.4 Management of Complaints

Viva Energy currently manages community complaints in accordance with the requirements of the EPL No. 570 (conditions M5 and M6), which includes:

- reporting complaints in the Annual Return
- keeping a legible record of all complaints made to Viva Energy and its contractors, including:
  - the date and time of the complaint
  - the method by which the complaint was made
  - any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect
  - the nature of the complaint
  - the action taken by Viva Energy in relation to the complaint, including any follow-up contact with the complainant
  - if no action was taken by Viva Energy, the reasons why no action was taken.
- the complaints record must be produced to any authorised officer of the NSW EPA who asks to see it.
- the complaints record must be kept for at least four years after the complaint was made.
- operation of a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

Viva Energy will notify the public that the existing complaints line telephone number should be used for making complaints in relation to the remediation project.

Viva Energy operates a 24-hour hotline telephone number. This contact information is provided on the Terminal's webpage [https://www.vivaenergy.com.au/operations/clyde/west-area-remediation-project/western-area-remediation-project] and will also be provided during Project updates.

Questions, complaints or concerns relating to the Project may be addressed to the Western Area Remediation Project Manager and Community Engagement Officer. These contact details are provided in communications updates about the Project.

Complaints raised about the Project will be received and logged by the Clyde Terminal Controllers and communicated to the Project Manager who will notify the Environment Lead and/or the Community Engagement Officer as required. Responses to complaints, where reasonably possible, are made within 48 hours of receiving the complaint.

A complaints management procedure is provided in the Project Community Engagement Plan and includes:

- maintenance of a complaints register
- if required, monitoring would be conducted to examine compliance against relevant criteria (e.g. noise, air quality, etc.)
- where required, corrective actions may be implemented including, reasonable and feasible measures to address impacts to amenity and/or the environment
- a feedback process to manage complaints, including responding to the complainant and updating them on investigations and action/s taken.

4.5 Dispute Resolution

In the event that a dispute arises between Viva Energy and Council or a public authority other than the DPIE in relation to a specification or requirement applicable under the development consent for the Clyde WARP (SSD 9302), the matter will be referred by either party to the Planning Secretary, whose determination of the dispute shall be final and binding to all parties. For the purpose of this REMP, 'public authority' has the same meaning as provided in the EP&A Act.

4.6 Incident Management

An incident is an occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause a non-compliance. Material harm is harm that:

- involves actual or potential harm to the health or safety of human beings or to the environment that is not trivial; or
- results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding $10,000, (such loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment).

All personnel (Viva Energy and Contractors) have the responsibility to report all environmental incidents as they occur. In the event of an incident:

1. The person who observed the incident immediately takes action to prevent harm to human health or the environment, where safe to do so and reports the incident to the Site HSSE Manager.
2. The Site HSSE Manager immediately reports the incident to the Project Environment Lead and the Project Manager.
3. The incident will be investigated by the Project Manager (or delegate) to determine possible causes and management actions.
4. A site inspection will be undertaken by the Project Manager (or delegate), where required.
5. Relevant personnel will be contacted and advised of the problem.
6. An agreed action will be identified; or action will be implemented to rectify the problem.
7. The Project Manager notifies the relevant public authorities as per Table 4-3.

In addition to the above, incidents which are considered to have the potential to adversely affect the soil or groundwater quality outside the remediation area, pose an increased risk to the groundwater resource, or exceed the specified air quality/ odour levels will be reported to the Validation Consultant who will be responsible for notifying Viva Energy and preparing an Environmental Incident Report within 48 hours of the incident. The Environmental Incident Report will provide a description of the incident, analyse of the cause of the incident, provide details of corrective action required, identify the person(s) responsible for taking action, and the document the outcome of previous actions taken.

Obligations for incident reporting to the relevant public authority fall under: the DC, EPL 570 and the POEO Act. The responsibilities for incident reporting lie with the Project Manager. The incident notification requirements are outlined in Table 4-3.

Table 4-3: Incident Notification

Condition	Authority	Timing	Process	Responsibility
EPL 570: R2	EPA	Immediately after becoming aware of the incident	Notifications of environmental harm must be made by telephoning the Environment Line service on 131 555.	Western Area Remediation Project Manager
		Within 7 days of the date on which the incident occurred.	Viva Energy will provide written details of the notification to the NSW EPA within 7 days of the date on which the incident occurred.	
EPL 570: R2	Ministry of Health SafeWork NSW Local Authority Fire and Rescue NSW	Immediately after becoming aware of the incident	Viva Energy must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately in accordance with the requirements of Part 5.7 of the POEO Act.	Western Area Remediation Project Manager
DC: C8	NSW Department of Planning, Industry and Environment (DPIE)	Immediately after becoming aware of the incident	Notify in writing to compliance@planning.nsw.gov.au. The notification must identify the development (including the development application number and the name of the development if it has one) and set out the location and nature of the incident. Subsequent notification requirements must be given and reports submitted in accordance with the requirements set out in Appendix D.	Western Area Remediation Project Manager

4.7 Emergency Response

A comprehensive Emergency Response Plan is currently implemented at the Clyde Terminal, including the Western Area. Key personnel are trained to support the implementation of the system. Regular training exercises are carried out by Viva Energy in conjunction with relevant emergency response agencies.

All personnel on site (employees and contractors) will be immediately informed in the event of a site emergency, this can include a pollution incident, via the emergency alarm, the public broadcast system and/or via electronic communication.

As the Site is located in proximity to the community and businesses, it is expected that the NSW Emergency Services will allocate an Incident Controller who will co-ordinate any necessary advice to the local community.

A specific Emergency Response and Contingency Plan will be prepared for the Project as part of the PMP.

A separate Flood Emergency Response Plan for the Project will be prepared and will align with the existing Viva Energy Clyde Terminal Flood Emergency Response Plan (DC condition B24).

At completion of the Project the existing Emergency Response Plan for the Site will be updated to reflect the changed site conditions in the Western Area (MMM HR4).

The Contractor may be required to implement their own Emergency Management Plan, consistent with the plan outlined above. This will be communicated to the Contractors during the contract tendering process.

5.0 ENVIRONMENTAL MANAGEMENT

Viva Energy will ensure that the environmental measures for the remediation phase as outlined in the DC conditions and measures in Appendix 2 are implemented. The conditions relating to the REMP sub-plans are summarised in Table 5-1. The REMP sub-plans are presented in Appendix B. Each sub-plan addresses a particular environmental matter. Where conditions are relevant to one of these matters, they have been listed in the sub-plan. However the management measures that have been developed from these conditions are only specific to the Stage 2 works.

The measures related to the REMP which are not covered under the management sub-plans are summarised in Table 5-2.

Table 5-1: Environmental Management Sub-Plan Requirements

Requirement	Condition Reference	DC Appendix 2 MMM Reference	Location in REMP
Prior to the commencement of remediation works, Viva Energy must prepare the following plans to the satisfaction of the Site Auditor and the Planning Secretary, and in accordance with the requirements of DC Condition C1 and the mitigation and management measures outlined in Appendix 2 of the DC:	C1, C2 and C3		
• Air Quality Management Plan (AQMP)	B17	AQ1 to AQ8	Appendix B.1
• Soil and Water Management Plan (SWMP)	B20	SGC1, SGC2, SW1, SW2, SW4 & SW5	Appendix B.2
• Groundwater Monitoring and Management Plan (GMP)	B22	SGC6	Appendix B.3
• Waste Management Plan (WMP)	B31	W1 to W4	Appendix B.4
• Traffic Management Plan (TMP).	B33	TT1 to TT5	Appendix B.5
Viva Energy must: • not commence remediation works until the AQMP, SWMP, GMP, WMP and TMP are approved by the Planning Secretary • implement the most recent version of the AQMP, SWMP, GMP, and WMP approved by the Planning Secretary for the duration of the Project.	B18, B21, B23, B32	-	

Table 5-2: Environmental Management Requirements

REMP Reference	Source Reference	Aspect	Mitigation and Management Measure	Responsibility	Frequency
General					
Gen-A	EPL O2.1	Plant and Equipment	The Contractor will ensure that all plant and equipment used during the remediation will be: • maintained in a proper and efficient condition; and • operated in a proper and efficient manner.	Remediation Contractor Project Manager	During the remediation phase
Human Health					
HuH-A	DC: B11 MMM: HH1	Occupational health and safety plan	The Contractor will prepare an Occupational Health and Safety Plan, which will outline the personal protective equipment and occupational health and safety measures to manage potential risks to on-site workers. This plan will be prepared and implemented in accordance with NSW Work Health and Safety Regulation 2017 and the requirements of SafeWork NSW. The Occupational Health and Safety Plan will be prepared as part of the PMP. All staff will be trained in the requirements of the Occupational Health and Safety Plan.	Remediation Contractor Project Manager	Preparation: Two weeks prior to commencement of preparation works Implementation: During the Project
HuH-B	-	Occupational health and safety plan	Periodic audits will be undertaken against the Occupational Health and Safety Plan to ensure compliance. In the event that a non-conformance is identified, the process provided in Section 6.3 will be followed.	Site HSSE Manager	Quarterly
Flooding					
FL-A	DC: B24 & B25	Flood emergency response plan	The Contractor will prepare Flood Emergency Response Plan for the Project, as part of the PMP, and implement it for the duration of the Project. This plan will: • detail the procedures for managing flood risks during remediation works, including the protection of human safety, plant and equipment • detail flood recovery measures and sufficient warning times for flash flooding • detail procedures for control of discharges from the development • identify assembly points, emergency evacuation routes, flood warning alarms and evacuation procedures. The Flood Emergency Response Plan will be aligned with the Viva Energy Clyde Terminal Emergency Response and Contingency Plan. All staff will be trained in the requirements of the Flood Emergency Response Plan.	Remediation Contractor Project Manager	Preparation: Two weeks prior to commencement of preparation works Implementation: During the Project

REMP Reference	Source Reference	Aspect	Mitigation and Management Measure	Responsibility	Frequency
Noise and Vibration					
NV-A	DC: B38 EPL 570: L6.1 MMM: NV1	Airborne noise	The Contractor will minimise the noise generated by the Project in accordance with the requirements in the Interim Construction Noise Guideline (DECC, 2009), or its latest version. Feasible and reasonable noise mitigation measures will be implemented and any activities that could exceed the construction noise management levels will be identified and managed. These measures include: • using plant and equipment with low noise emission levels where practicable • ensuring plant and equipment are properly maintained • turning off machinery when not in use • ensuring work occurs in line with the requirements detailed in Section 4.1. • training of the Project workforce in the above. The Contractor's Management Methods Statement will include measures to reduce noise emissions as described above.	Remediation Contractor Project Manager Site HSSE Manager All personnel	During the remediation phase
NV-B	DC: B39	Vibration	The Contractor Environmental Management Framework will outline how vibration caused by the Project at any residence or structure outside the Western Area will be limited to: • for structural damage, the latest version of DIN 4150-3 (1992-02) Structural vibration - Effects of vibration on structures (German Institute for Standardisation, 1999) • for human exposure, the acceptable vibration values set out in the Environmental Noise Management Assessing Vibration: a technical guideline (DEC, 2006) (as may be updated or replaced from time to time).	Remediation Contractor Project Manager Site HSSE Manager All personnel	During the remediation phase
NV-C	MMM: NV1	Vibration	The Contractor will conduct vibration trials when vibration intensive work (e.g. a 20 t padfoot roller) is proposed within 30 m of buildings.	Remediation Contractor Project Manager	During vibration intensive work
Aboriginal Heritage					
AH-A	DC: B40 & B41 MMM: AH1	Unexpected Aboriginal heritage find	The Project Environment Lead and Remediation Contractor Project Manager will ensure that all workers and contractors are made aware of the unexpected Aboriginal heritage finds procedure.	Remediation Contractor Project Manager Project Environment Lead	During site inductions

REMP Reference	Source Reference	Aspect	Mitigation and Management Measure	Responsibility	Frequency
AH-B	DC: B40 & B41 MMM: AH1	Unexpected Aboriginal heritage find	If any item or object of Aboriginal heritage significance is identified on the Western Area: • all work in the immediate vicinity of the suspected Aboriginal item or object must cease immediately • report the find to the Site HSSE Manager • a 10 m wide buffer area around the suspected item or object must be cordoned off • Site HSSE Manager to notify the Remediation Contractor Project Manager and Project Environment Lead • Project Environment Lead to contact the Environment, Energy and Science Group of the NSW DPIE immediately • a suitably qualified archaeologist is to be engaged to determine the nature, extent and significance of the find and provide appropriate management advice • an Aboriginal Heritage Information Management System site card is to be prepared and submitted for the site. Work in the immediate vicinity of the Aboriginal item or object may only recommence in accordance with the provisions of Part 6 of the National Parks and Wildlife Act 1974. Any items of potential Aboriginal archaeological or cultural heritage conservation significance or human remains discovered during remediation will be managed in accordance with the: • NSW Police Force Handbook (2016) • NSW Health Exhumation of Human Remains Policy (2013). The unexpected heritage finds procedure provided in Appendix E should be adopted. In the event that potential human skeletal remains are identified, the following unexpected human remains finds procedure should be followed: • all work in the vicinity of the remains should cease immediately • the location should be cordoned off and the NSW Police notified • if the Police suspect the remains are Aboriginal, they would contact the Environment, Energy and Science Group of the NSW DPIE and arrange for a forensic anthropologist or archaeological expert to examine the site. Subsequent management actions will be dependent on the findings of the inspection undertaken under Point 3 (refer to Appendix E for further detail on these actions).	All personnel Site HSSE Manager Remediation Contractor Project Manager Project Environment Lead	As required

REMP Reference	Source Reference	Aspect	Mitigation and Management Measure	Responsibility	Frequency
Historic Heritage					
HH-A	MMM: HH1	Sensitive heritage receivers	The Project Environment Lead and Remediation Contractor Project Manager will ensure that all workers and contractors are made aware of, during the site induction: • the heritage values of the former Clyde Refinery and the three surrounding listed items of Lower Duck River Wetlands (I47), Wetlands (I1) and Capral Aluminium (I575) • the unexpected historic heritage finds procedure.	Remediation Contractor Project Manager Project Environment Lead	During site inductions
HH-B	DC: B42 MMM: HH2	Unexpected historic heritage finds	Should an unexpected find of likely significance be uncovered (including artefact scatters (glass, animal bone, ceramic, brick, metal etc.), building foundations, etc.), consistent with the unexpected finds protocol from the Clyde Terminal Conversion Project (SSD 5147), the following stop work procedure will be followed: • all work in the nearby area is to cease immediately • report the find to the Site HSSE Manager • Site HSSE Manager to notify the Remediation Contractor Project Manager and Project Environment Lead • Project Environment Lead to contact OEH Heritage Branch • Project Environmental Lead to ensure that the unexpected find is evaluated and recorded in accordance with the requirements of the Department of Premier and Cabinet Heritage Division. Depending on the possible significance of the relics, an archaeological assessment and an excavation permit under the *NSW Heritage Act 1977* may be required before further works can continue in that area.	All personnel Site HSSE Manager Remediation Contractor Project Manager Project Environment Lead	As required
Biodiversity					
BD-A	DC: B43 MMM: BD1	Vegetation	The Contractor will include in their Environmental Management Framework measures to minimise impacts on the Duck River riparian corridor and Swamp Oak Floodplain Forest contained within the riparian corridor. These measures will include the installation of appropriate exclusion fencing protecting vegetation to be retained outside of the remediation works area. Exclusion fencing will be placed at a distance sufficient to minimise impacts within the vegetation's TPZs and in accordance with AS4970-2009 Australian Standard. Protection of trees on development sites (Standards Australia Committee, 2009).	Remediation Contractor Project Manager	Preparation: Prior to works commencing Implementation: During the Project

REMP Reference	Source Reference	Aspect	Mitigation and Management Measure	Responsibility	Frequency
			Fencing is to include appropriate signage such as 'No Go Zone' or 'Environmental Protection Area'. The location of any 'No Go Zones' will be identified in site inductions.		
BD-B	DC: B43 MMM: BD2	Green and Golden Bell Frog	To mitigate against potential impacts to the Green and Golden Bell Frog (GGBF) population the following measures will be included in the Contractor Environmental Management Framework: • works inductions that focus on the potential occurrence of the species • pre-clearance surveys by an environmental representative as needed of stockpiles and excavations to check for the presence of GGBF • management of stockpiles to minimise the chances of frogs using them for shelter habitat (e.g. maintenance of sediment fencing around stockpiles and no ponding of water) • measures will also be implemented to minimise indirect impacts to GGBF through spread of Chytrid fungus • measures aimed at excluding Green and Golden Bell Frogs from remediation areas, consistent with the Revised Plan of Management: Restoration of Green and Golden Bell Frog Habitat, Clyde Terminal, January 2019, or its latest version • an unexpected finds protocol which outlines the need to engage a suitably qualified ecologist to relocate any GGBF encountered. Mitigation and management measures will be aligned with the actions undertaken during the Conversion Project to maximise their successful implementation, and minimise potential confusion surrounding requirements.	Remediation Contractor Project Manager	Preparation: Prior to works commencing Implementation: During the Project
BD-C	MMM: BD3	Protection of biodiversity	Contractor Management Method Statements will require that material stockpiles, vehicle parking and machinery storage to be located within cleared areas and outside of vegetation exclusion zones.	Remediation Contractor Project Manager	During the remediation phase
BD-D	MMM: BD4	Soil erosion and waste reduction	Where appropriate, native vegetation cleared from the Western Area should be mulched for reuse on-site, to stabilise bare ground (or similar).	Remediation Contractor Project Manager	During the remediation phase
BD-E	DC: B27 MMM: BD5	Weed management	Measures to minimise the potential for the spread of weeds will be detailed in the Contractor Environmental Management Framework. These measures will include the clearing of the remediation works area of African Lovegrass (Eragrostis curvula) during preparation works and disposal of the weeds to an appropriately licensed facility.	Remediation Contractor Project Manager	Preparation: Prior to works commencing Implementation: During the Project

REMP Reference	Source Reference	Aspect	Mitigation and Management Measure	Responsibility	Frequency
Hazards and Risks					
HR-A	DC: B45 MMM: HR1	Transport, storage and handling of hazardous substances	The Contractor will keep records of the types and volumes of dangerous goods stored and handled at the Western Area. The quantities of dangerous goods stored and handled at the Western Area will be below the threshold quantities listed in the Department of Planning's Hazardous and Offensive Development Application Guidelines – Applying SEPP 33 at all times. In the event that a material is to be used during the Project which has not been assessed in the EIS (Chapter 18 Hazards and risks) or greater quantities and/or vehicle movements are required for materials used during the Project, then a screening risk assessment will be completed by the Contractor and discussed with Viva Energy before the material can be transported, stored or used on-site.	Site HSSE Manager	During the remediation phase
HR-B	DC: B46 MMM: HR2 & SW2	Transport, storage and handling of hazardous substances	The Contractor Management Method Statements will require that all chemicals, fuels and oils used for the Project are stored in appropriately bunded areas in accordance with the requirements of all relevant Australian Standards, and/or EPA's Storing and Handling of Liquids: Environmental Protection – Participants Manual (Department of Environment and Climate Change, 2007). Specifically potential chemical pollutants (e.g. fuels, additives, stockpiles etc.), will be stored in appropriate containers and/or within bunded and lined areas to minimise the risk of spillages, or mobilisation of these pollutants into aquatic environments in the event that a storm surge or flood event impacts the Western Area.	Remediation Contractor Project Manager Site HSSE Manager	During the remediation phase
HR-C	MMM: HR1	Use of granular activated carbon	The Contractor will only procure granular activated carbon (for biopiling) which is not listed as a dangerous good under the Australian Dangerous Goods Code. This will be confirmed by checking the relevant Material Safety Data Sheets before purchasing the material.	Remediation Contractor Project Manager	During the remediation phase
HR-D	MMM: HR1	Use of portland cement and/or fly ash	The Contractor will only procure portland cement and/or fly ash which is not the type which is listed as dangerous good under the Australian Dangerous Goods Code. This will be confirmed by checking the relevant Material Safety Data Sheets before purchasing the material.	Remediation Contractor Project Manager	During the remediation phase

REMP Reference	Source Reference	Aspect	Mitigation and Management Measure	Responsibility	Frequency
HR-E	MMM: HR2	Transport, storage and handling of hazardous substances	The Contractor Environmental Management Framework will require that the transport, storage and handling of hazardous substances to be undertaken in accordance with: • Work Health and Safety Act 2011 (NSW) • Protection of the Environment Operations (Waste) Regulation 2005 (NSW) • Dangerous Goods (Road and Rail Transport) Act 2008 (NSW) • Dangerous Goods Regulation (Road and Rail Transport) Regulation 2014 (NSW) • Australian Code for the Transport of Dangerous Goods by Road and Rail (National Transport Commission, 2018) • relevant Australian Standards • the thresholds outlined in Applying SEPP 33 guidelines • the relevant Material Safety Data Sheets.	Remediation Contractor Project Manager	Preparation: Prior to works commencing Implementation: During the Project

6.0 MONITORING AND REPORTING

6.1 Environmental Monitoring

A summary of the environmental monitoring required for the Stage 2 remediation works is provided in Table 6-1. Monitoring related to the ongoing operations will be detailed in the LTEMP prepared for each Stage.

The summary in Table 6-1 has been extracted from the management plans included in Appendix B. Further detail is provided in the plans.

Table 6-1: Stage 2 Environmental Monitoring Requirements

Sub-plan	Aspect	Monitoring Description	Responsibility	Frequency
AQMP	Boundary VOC and odour emissions	Ambient boundary VOC and odour surveys to be conducted to assess VOC and odour control performance during the more intense phases of the Stage 2 works, which normally include soil excavation and screening.	Validation Consultant	Over two to three sampling rounds, nominally when excavation of contaminated material and biopiling operations are occurring
AQMP	Excavation and Biopile Treatment Area VOC and odour emissions	PID monitoring to be conducted during soil handling operations.	Validation Consultant	During soil handling operations
AQMP	Dust emissions	Maintain visual awareness of dust and log any observations of dust seen to be leaving the site.	Remediation Contractor and Validation Consultant	At all times
AQMP	Biopile Soil Vapour Extraction (SVE) System	PID monitoring of inlet, outlet and between lead and lag vessels for VOC concentrations as described in Section 6.5.3 of the Stage 2 AEVR. PID monitoring of the SVE system emissions (at pre-filter, between lead and lag vessels and at the outlet) to inform the change-out of filter media as outlined in Section 6.5.3 of the Stage 2 AEVR.	Remediation Contractor	Daily during the first week of operation. Daily during weekdays for a SVE system where the lead vessel breakthrough time is less than 30 days. At least weekly when the lead vessel breakthrough time is greater than 30 days.
AQMP	Bioremediation Area Inspection	Visual assessment of the biopiling area to observe that the work area is secure, fencing is in place, environmental controls are operating correctly, bunds are intact, covers over stockpiles are secure and that the SVE system is functioning correctly.	Remediation Contractor	Minimum weekly basis
AQMP	General	Ad hoc visual observations to ensure compliance with air quality management requirements.	Remediation Contractor	At all times
AQMP	General	Quarterly audits against the requirements of the Stage 2 AQMP and Stage 2 Air Quality Management Method Statement (AQMMS).	Remediation Contractor and Viva Energy	Quarterly

Sub-plan	Aspect	Monitoring Description	Responsibility	Frequency
SWMP	EPL 570 Monitoring [SW1]	Monitoring requirements will be fulfilled as required in EPL 570.	Viva Energy Clyde Terminal Operations Manager	As required. In line with the EPL
SWMP	Inspection of erosion and sediment controls [SW1]	Routine inspections to monitor the implementation and integrity of the erosion and sediment control structures, including: • routine inspections of excavations to instigate the pump out of water accumulating in excavations • inspections in line the ESCP provided in Attachment A of the SWMP.	Remediation Contractor	At all times or as detailed within the ESCP
SWMP	Monitoring of groundwater [SCG2]	The proposed groundwater monitoring for the Stage 2 works is outlined in the Clyde Western Area Remediation Project Stage 2 Groundwater Monitoring and Management Plan (GMP) and Groundwater Monitoring Program (GWMP) attached to the Stage 2 REMP.	Western Area Remediation Project Manager and Validation Consultant	As outlined in the GMP and GWMP
SWMP	Testing of hydrocarbon remediation excavations	Testing of excavation base and wall to validation remediation in line with the approach outlined in Section 12.3 of the Stage 2 Detailed RAP (ERM, 2021).	Validation Consultant	On completion of excavation
SWMP	Testing of stockpiled excavated soil	Testing of stockpiled material to enable classification prior to reuse or disposal	Validation Consultant	As required, minimum of 3 per stockpile
SWMP	Assessment of asbestos remediation excavations	Assessment and documentation of excavated surface material for the presence of ACM in line with the approach outlined in Section 12.3 of the Stage 2 Detailed RAP (ERM, 2021).	Validation Consultant	On completion of excavation
SWMP	Assessment of capping layer	Verification that capping layer construction has been completed in accordance with the detailed design	Validation Consultant	On completion of construction
SWMP	Testing of leachate and accumulated water in excavations	Leachate and accumulated water in excavations related to remediation activities will be collected and tested prior to off-site disposal	Remediation Contractor	As required
SWMP	Bioremediation Area Inspection	A visual assessment of the biopiling area to observe that the work area is secure, fencing is in place, bund is intact, and covers over piles/windrows are secure.	Remediation contractor	Minimum weekly basis

Sub-plan	Aspect	Monitoring Description	Responsibility	Frequency
SWMP	Soil treatment progress monitoring	Monitoring to assess the progress of biological treatment. Progress monitoring requirements have been outlined in the Stage 2 Detailed RAP (ERM, 2021). Once biopiling of soils has commenced, inlet concentrations of VOC, as measured at the pre-filter port of the SVE system with a PID will be used to determine timing for validation sampling of soil. This timing will be based on observed stabilisation of VOC concentrations for a period of 3 weeks. Upon completion of treatment works, a final validation sampling event will be performed to demonstrate that soils are acceptable for re-use on-site under a commercial/ industrial land use scenario.	Validation Consultant	As required. Sampling of soils undertaken based on stabilised inline concentration of VOCs, as measured from SVE system.
SWMP	Baseline and post-decommissioning monitoring	Monitoring (using existing data, where available) of native soils beneath the bioremediation area to assess whether bioremediation works, including temporary stockpiles, have impacted the treatment site.	Validation Consultant	On completion of remediation / on removal of temporary stockpile
SWMP	Inspection of equipment and plant [SCG2]	Regular inspections of remediation equipment and plant to be carried out to ensure the potential for leaks are minimised and identified issues are rectified.	Remediation Contractor	At all times
SWMP	General	Ad hoc visual observations to ensure compliance with soil and water management requirements.	Remediation Contractor	At all times
SWMP	General	Quarterly audits against the requirements of the SWMP and any active Groundwater Management Method Statement (GMMS), Surface Water Management Method Statement (SWMMS), Wastewater Management Method Statement (WwMMS) or Decontamination and Wheel Wash Method Statement (DWWMS).	Remediation Contractor and Viva Energy	Quarterly
GMP	Monitoring groundwater levels and quality	Groundwater monitoring in line with the EPL 570	Western Area Remediation Project Manager and Validation Consultant	At all times
GMP	Groundwater monitoring during remediation - Excavation Areas (nearby wells) - Sampling	Groundwater monitoring in line with the GMP.	Western Area Remediation Project Manager and Validation Consultant	• Baseline sampling prior to commencement of remediation works • Within 3 months following completion of remediation works

Sub-plan	Aspect	Monitoring Description	Responsibility	Frequency
GMP	Groundwater monitoring during remediation - Excavation Areas (nearby wells) - Gauging	Groundwater monitoring in line with the GMP.	Western Area Remediation Project Manager and Validation Consultant	• Gauging weekly during excavation and/or dewatering
GMP	Groundwater monitoring during remediation - Down-gradient boundary	Groundwater monitoring in line with the GMP.	Western Area Remediation Project Manager and Validation Consultant	• Monthly during active remediation conducted up-gradient
GMP	Groundwater monitoring post remediation - Excavation Areas (nearby wells)	Groundwater monitoring in line with the GMP.	Western Area Remediation Project Manager and Validation Consultant	• Completion of a single post-remediation sampling event (within 3 months of completion of remediation work)
GMP	Groundwater monitoring post remediation - Down-gradient boundary	Groundwater monitoring in line with the GMP.	Western Area Remediation Project Manager and Validation Consultant	• Biannually (every 6 months) following completion of post remediation sampling event • Requirement for ongoing sampling is to be reviewed annually (i.e. every two GMEs) based on trend analysis and reported concentrations
GMP	Excavation water and discharge monitoring	Water removed from excavations and leachate will be collected and tested prior to off-site disposal.	Remediation Contractor for removal, testing and disposal Validation Consultant for testing	As required
GMP	General	Ad hoc visual observations to ensure compliance with groundwater management requirements	Remediation Contractor	At all times

Sub-plan	Aspect	Monitoring Description	Responsibility	Frequency
GMP	General	Quarterly audits against the requirements of this GMP and GWMP and any active GMMS	Remediation Contractor and Viva Energy	Quarterly
WMP	Remediation works waste	Waste tracking system will be implemented in accordance with NSW EPA requirements. Documentation (such as receipts) for the transport and disposal of waste and recycling materials from the Western Area. Material tracking records will include types, volumes and management measures for waste and resource arising from/used for the Project.	Remediation Contractor and Viva Energy	At all times
WMP	Remediation works waste	Waste tracking system will be audited to confirm system is being implemented in accordance with NSW EPA requirements.	Project Environment Lead	6-monthly
WMP	Asbestos register	Maintain an asbestos register for all asbestos waste generated during remediation activities.	Remediation Contractor	At all times
WMP	Imported fill	Imported fill material will be stockpiled and tracked separately to the on-site materials and tested/validated to confirm the fill meets the criteria to be reused on the Project Area.	Remediation Contractor	As required
WMP	General	Ad hoc visual observations to ensure compliance with waste management requirements.	Remediation Contractor	At all times
WMP	General	Quarterly audits against the requirements of the WMP and any active Waste Management Method Statement (WMMS).	Remediation Contractor and Viva Energy	Quarterly
TMP	General	Ad hoc visual observations to ensure compliance with traffic management requirements.	Remediation Contractor	At all times
TMP	General	Quarterly inspections against the requirements of the TMP and any active Traffic Management Method Statement (TMMS).	Remediation Contractor and Viva Energy	Quarterly

6.2 Annual Report

Viva Energy will review and report on the environmental performance of the Project on an ongoing basis. In accordance with DC condition C12, Viva Energy will prepare an Annual Report within 12 months of the commencement of remediation works, and every year thereafter until the completion of demobilisation, or other timing as may be agreed by the Planning Secretary.

The review will:

(a) be submitted to the Planning Secretary and EPA

(b) describe the works that were carried out in the previous year and the works to be carried out in the coming year

(c) include a comprehensive review of the monitoring results and complaints records of the Project over the previous year, to demonstrate the effectiveness of the remediation works, including a comparison of:

  (i) air quality monitoring data with relevant limits or performance measures/criteria

  (ii) water discharges with established discharge criteria for contaminants of concern

  (iii) groundwater monitoring data with background data and trigger levels established in accordance with DC condition B22

  (iv) detail community consultation activities during the year, including any alterations to works or mitigation measures implemented to address community concerns

(d) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance

(e) describe what contingency measures will be implemented over the coming year to improve the environmental performance of the Project, should any issues be identified with the effectiveness of the remediation works.

6.3 Non-compliance and corrective actions

A non-compliance is an occurrence, set of circumstances or development that is a breach of the requirements of the REMP, DC, EPL or associated management plans, including exceedance of monitoring limits; and may be identified by:

- incidents (Section 4.4)
- monitoring (Section 6.1)
- complaints (Section 4.3)
- Viva Energy in the Annual Report (Section 6.2) and/or
- other external audit by government agency.

Where non-compliance is detected or monitoring results are outside of the expected range:

- the results will be analysed by the Project Manager (or delegate) in more detail to determine possible causes for non-compliance
- a site inspection will be undertaken by the Project Manager (or delegate)
- relevant personnel will be contacted and advised of the problem
- an agreed action will be identified; or action will be implemented to rectify the problem
    - The NSW DPIE will be notified in writing to compliance@planning.nsw.gov.au within seven days after Viva Energy becomes aware of any non-compliance (in accordance with DC condition C9).

The non-compliance notification must identify the development and the application number for it, set out the condition of consent that the development is non-compliant with, the way in which it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance (DC condition C10).

A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance (DC condition C11).

6.4 REMP Review

The REMP and associated sub-plans will be reviewed periodically as required by DC condition C6.

The REMP shall be formally reviewed by the Project Environment Lead and approved by the Project Manager; or when any of the following occur (in accordance with condition C5):

- the submission of an incident report under DC condition C8;
- the approval of any modification of the conditions of the DC; or
- the issue of a direction of the Planning Secretary under condition A2(b) which requires a review.

In the event of any of the above events occurring, the review must be completed within three months of the event and the DPIE and the EPA must be notified in writing that a review is being carried out (DC condition C4(d), C5 and C6).

In accordance with DC condition C7: if necessary to either improve the environmental performance of the Project, cater for a modification or comply with a direction, the strategies, plans and programs required under the DC must be revised, to the satisfaction of the Planning Secretary. Where revisions are required, the revised document must be submitted to the Planning Secretary for approval within six weeks of the review.

A summary of changes will be recorded in the revision control chart and the REMP will be distributed to personnel on the control copy distribution list (refer to page i).

The Contractors will be requested to review and update their respective plans within one month of amendments to the REMP, if necessary.

6.5 Contingency Planning

The Stage 2 Detailed RAP provides a contingency plan for reassessment of the remediation strategy in the event that the remediation is not successful and the remediation fails to achieve the Site Specific Target Levels (given in the Detailed RAP) after completion.

The procedures for receiving complaints (refer to Section 4.3), incident management (Section 4.4), annual reporting (Section 6.2) and non-compliance management (Section 6.3) aim to identify potential areas of the REMP which may not be successful at mitigating or managing environmental impacts. In the event that an issue is identified, the REMP will be reviewed (Section 6.4) and corrective actions and/or improvements implemented to ensure that the Project is effectively managing environmental impacts.

7.0 REFERENCE DOCUMENTS

ERM, 2021, Viva Energy Clyde Western Area Remediation Project, Stage 2 Detailed Remediation Action Plan, June 2021

ERM, 2021, Viva Energy Clyde Western Area Remediation Project, Stage 2 Air Emission Verification Report, June 2021

AECOM, 2019, Viva Energy Clyde Western Area Remediation Project, Environmental Impact Statement, January 2019.

AECOM, 2019, Viva Energy Clyde Western Area Remediation Project, Response to Submissions, October 2019.

Development Consent – Industry, Application Number: SSD 9302, granted by the Minister for Planning and Public Spaces under Section 4.38 of the Environmental Planning and Assessment Act 1979, Department of Planning, Industry and Environment

Environment Protection Licence Number 570, granted by the NSW Environmental Protection Authority under Section 55 Protection of the Environment Operations Act 1997, 25 February 2021.

Environmental Resources Management Australia Pty Ltd (ERM), 2021, Clyde Western Area Remediation Project, Stage 2 - Detailed Remediation Action Plan, July 2021

NSW Department of Infrastructure, Planning and Natural Resources, 2004, Guideline for the Preparation of Environmental Management Plans

NSW Environmental Protection Agency, 2014, Waste Classification Guidelines: Part 1: Classifying Waste.

APPENDIX A VIVA ENERGY HEALTH, SAFETY, SECURITY AND ENVIRONMENTAL POLICY

Our Commitment to

Health, Safety, Security and Environment

We believe every incident is preventable and are committed to pursuing the goal of no harm to people and protecting the environment.

We call this Goal Zero.

"You have my full support to stop operations at any time if you are concerned about the safety of yourself or others."

Scott Wyatt
CEO
Viva Energy Australia

To make this commitment we will:

- Demonstrate visible and felt leadership for health, safety and the environment
- Ensure that our business plans consider associated HSSE risks including potential impact
- Create targets that measure, assess and report to reduce incidents
- Audit and maintain systems to identify and manage risks and prevent incidents
- Provide appropriate information, instruction, training and supervision
- Comply with our legal obligations and company procedures
- Communicate, support and consult with employees, contractors and stakeholders
- Encourage people to intervene, report unsafe situations and have positive conversations
- Conduct regular reviews and share learnings to continuously improve our performance

October 2017

APPENDIX B ENVIRONMENTAL MANAGEMENT SUB-PLANS

B.1 Air Quality Management Plan

B.2 Soil and Water Management Plan

B.3 Groundwater Monitoring and Management Plan

B.4 Waste Management Plan

B.5 Traffic Management Plan

Air Quality Management Plan

Air Quality Management					
Document Control	Revision	Date	Description	Author	Approved
	5.0	21/07/2021	Final for consultation	AECOM	WM
Background	The Conditions of Consent for SSD 9302 require an Air Quality Management Plan (AQMP) to be produced as a subplan to the Remediation Environmental Management Plan (REMP) for the Clyde Western Area Remediation Project (the Project). This document provides the AQMP subplan for Stage 2 of the Project. This AQMP applies to the remediation phase for Stage 2 of the Project, including preparation works, remediation works and demobilisation.				
Objectives	• Identify potential sources of air emissions, dust and odour and minimise and manage potential air quality impacts throughout the remediation phase of the Project. • Ensure compliance with relevant legislative and other requirements including the Development Consent (DC) (SSD 9302) conditions, mitigation and management measures (MMM) in Appendix 2 of the DC and the Environment Protection Licence (EPL) 570.				
Performance Criteria	• Air quality pollutant levels are within the criteria contained in legislative and other requirements including DC, Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales, EPA (2017).and EPL 570. • No complaints raised by the community / surrounding businesses / stakeholders with regards to air emissions, dust or odour related to the remediation phase. • No visual observations of airborne dust related to Project activities being emitted from the site. • Carry out all reasonable and feasible measures to minimise dust and other emissions generated during the Project.				
Key Performance Indicators	• No complaints raised by the community / surrounding businesses / stakeholders with regards to air emissions, dust or odour in relation to demolition and construction. • No non-compliances related to air quality monitoring during remediation.				
Legislative Requirements	Development Consent (SSD 9302) conditions [Dated 7 May 2020]				
	Limits	B12. The Applicant must install and operate equipment to ensure the development complies with all air quality criteria, limits and monitoring requirements as specified in the EPL for the development.			
		B13. The Applicant must ensure the development does not cause or permit the emission of any offensive odour (as defined in the POEO Act).			
	Dust Minimisation	B14. The Applicant must take all reasonable steps to minimise dust generated by the development, including minimising emissions from: a) site excavations; b) stockpiles; c) handling, processing and treatment of materials; d) transport of materials; and e) reinstatement work.			
	Air Emissions Verification Report	B15. Prior to the commencement of preparation works, the Applicant must prepare an Air Emissions Verification Report (AEVR) to the satisfaction of the Planning Secretary. The AEVR must: a) be prepared by a suitably qualified and experienced person(s); b) be prepared in consultation with the EPA and the Site Auditor; c) address or respond to any comments, advice or recommendations obtained from the EPA during the consultation process; d) be approved by the Planning Secretary, prior to the commencement of preparation works;			

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		e) incorporate findings from the Remedial Site Investigation, Human Health and Ecological Risk Assessment and Remediation Trials Summary Report; f) detail the emission controls and management measures for each selected remediation method and remediation activities, including but not limited to: i. excavation and material classification; ii. material handling, stockpiling and storage; iii. processing and treatment; iv. material transport; and v. validated materials. g) benchmark the emission control and management measures with relevant best practice process design and emission control; h) the benchmarking of emission controls systems must consider the risks associated with the emissions to air of total and speciated petroleum hydrocarbons, principal air toxics and odour; i) include robust justification for the handling, processing, treating or storing of contaminated material proposed to be conducted outside of an emission control enclosure (ECE), that considers but is not limited to technical, logistical, financial and health and safety considerations.
		B16. The Applicant must: a) submit any subsequent revisions of the AEVR to the EPA for comment prior to the commencement of preparation works. b) submit the approved AEVR to the EPA prior to the commencement of preparation works.
	Air Quality Management Plan	B17. Prior to the commencement of remediation works, the Applicant must prepare an Air Quality Management Plan (AQMP) to the satisfaction of the Site Auditor and the Planning Secretary. The AQMP must form part of the REMP required by condition C2 and must: a) be prepared by a suitably qualified and experienced person(s); b) detail and rank all emissions from all sources of the development; c) describe a program that can evaluate the performance of the remediation works and determining compliance with key performance indicators; d) identify the proactive mitigation strategies and control measures that will be implemented for each emission source including a timeframe for implementation; e) nominate the following for each of the proposed controls: i. key performance indicator; ii. monitoring method, location, frequency and duration; iii. response procedures; and iv. compliance monitoring. f) include an ambient air quality monitoring program and reactive management strategy, including real-time meteorological data, pollutant and odour monitoring and trigger levels for implementing reactive measures; g) include a complaint register and response procedures
		B18. The Applicant must: a) not commence remediation works until the Air Quality Management Plan is approved by the Planning Secretary; and

<table>
<tr><td colspan="3">Air Quality Management</td></tr>
<tr><td></td><td></td><td>b) submit the approved Air Quality Management Plan and any subsequent revisions to the EPA prior to the commencement of remediation works; and
c) implement the most recent version of the Air Quality Management Plan approved by the Planning Secretary for the duration of the development.</td></tr>
<tr><td></td><td>Annual Report</td><td>C12. Within 12 months of the commencement of remediation works, and every year thereafter until the completion of demobilisation, or other timing as may be agreed by the Planning Secretary, the Applicant shall review and report on the environmental performance of the development. The report shall:
(c) include a comprehensive review of the monitoring results and complaints records of the development over the previous year, to demonstrate the effectiveness of the remediation works, including a comparison of:
(i) air quality monitoring data with relevant limits or performance measures/criteria.</td></tr>
<tr><td></td><td colspan="2">Environment Protection Licence EPL 570 [25 February 2021]</td></tr>
<tr><td></td><td>3 LIMIT CONDITIONS
L2 Load limits</td><td>L2.1 The actual load of an assessable pollutant discharged from the premises during the reporting period must not exceed the load limit specified for the assessable pollutant in the table below.
L2.2 The actual load of an assessable pollutant must be calculated in accordance with the relevant load calculation protocol.
<table>
<tr><th>Assessable Pollutant</th><th>Load limit (kg)</th></tr>
<tr><td>Benzene (Air)</td><td>26000.00</td></tr>
<tr><td>Volatile organic compounds – Summer (Air)</td><td>-</td></tr>
<tr><td>Volatile organic compounds – Air</td><td>1250000.00</td></tr>
</table>
Note: An assessable pollutant is a pollutant which affects the licence fee payable for the licence</td></tr>
<tr><td></td><td>L7 Potentially offensive odour</td><td>L7.1 No condition in this licence identifies a potentially offensive odour for the purposes of section 129 of the Protection of the Environment Operations Act 1997.
Note: Section 129 of the Protection of the Environment Operations Act 1997 provides that the licensee must not cause or permit the emission of any offensive odour from the premises but provides a defence if the emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of a licence directed at minimising odour</td></tr>
<tr><td></td><td>4 OPERATING CONDITIONS
O1 Activities must be carried out in a competent manner</td><td>O1.1 Licensed activities must be carried out in a competent manner. This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.</td></tr>
<tr><td></td><td>O2 Maintenance of plant and equipment</td><td>O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.</td></tr>
<tr><td></td><td>O3 Dust</td><td>O3.1 The premises must be maintained in a condition which minimises or prevents the emission of dust from the premises.</td></tr>
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	O6 Other Operating Conditions	<u>Air emissions</u> O6.2 The premises must be maintained in a condition which minimises or prevents the emission of air pollution from the premises. O6.3 All operations and activities occurring at the premises must be carried out in a manner that will prevent or minimise the emissions of air pollution from the premises.
	5 Monitoring and Recording Conditions M1 Monitoring records	M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.
		M1.2 All records required to be kept by this licence must be: a) in a legible form, or in a form that can readily be reduced to a legible form; b) kept for at least 4 years after the monitoring or event to which they relate took place; and c) produced in a legible form to any authorised officer of the EPA who asks to see them. M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence: a) the date(s) on which the sample was taken; b) the time(s) at which the sample was collected; c) the point at which the sample was taken; and d) the name of the person who collected the sample.
	M4 Testing methods - load limits	*Note: Division 3 of the Protection of the Environment Operations (General) Regulation 2009 requires that monitoring of actual loads of assessable pollutants listed in L2.2 must be carried out in accordance with the relevant load calculation protocol set out for the fee-based activity classification listed in the Administrative Conditions of this licence.*
	M5 Recording of pollution complaints	M5.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies. M5.2 The record must include details of the following: a) the date and time of the complaint; b) the method by which the complaint was made; c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect; d) the nature of the complaint; e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and f) if no action was taken by the licensee, the reasons why no action was taken. M5.3 The record of a complaint must be kept for at least 4 years after the complaint was made. M5.4 The record must be produced to any authorised officer of the EPA who asks to see them.

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	M6 Telephone complaints line	M6.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence. M6.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint. M6.3 The preceding two conditions do not apply until 3 months after: the date of the issue of this licence
	M7 Requirement to monitor volume or mass measure, specified below.	M7.1 For each discharge point or utilisation area specified below, the licensee must monitor: a) the volume of liquids discharged to water or applied to the area; b) the mass of solids applied to the area; c) the mass of pollutants emitted to the air; d) at the frequency and using the method and units of measure outlined in the EPL. Note: Under the current version of the EPL, no air emission discharge points require monitoring.
Activities	Potential key sources of air emission from the Project include: • Dust emissions from materials handling associated with excavation, remediation and land forming activities, wind generated dust from stockpiles and exposed surfaces, wheel generated dust from on-site truck movement and crushing and screening activities • Combustion emissions from mobile and stationary plant equipment • Volatile Organic Compounds (VOCs) and odour from soil vapour emissions and materials handling of contaminated spoil • Stack emissions including combustion emissions and VOC emissions from operation of the biopile aeration system.	

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Predicted Impacts discussed in the EIS and RtS	As detailed within the EIS, RtS and other relevant SSD documentation, potential air quality impacts of the Project for all pollutants with the exception of PM_{10}, $PM_{2.5}$ and odour were below the relevant EPA criteria. To address these exceedances additional air quality mitigation and management measures were considered including reduced active excavation areas and increased use of odour suppressant sprays. The outcome of the revised dust and odour assessments was as follows: • There were two predicted exceedances of the 24-hour cumulative concentration for $PM_{10,}$ each occurred close to the boundary of the Western Area. In both instances the background concentration was elevated and the maximum project contribution during the exceedances was 7% of the EPA 24-hour criterion of 50µg/m^3. • There were two predicted exceedances of the 24-hour cumulative concentration for $PM_{2.5,}$ each occurred close to the boundary of the Western Area. In both instances the background concentration was elevated and the maximum project contribution during the exceedances was 11% of the EPA 24-hour criterion of 25µg/m^3. • For odour, the 99th percentile concentrations at all sensitive receptors were below the 2OU criteria. Whilst the AQIA in the SSD documentation identified the potential for some off-site exceedances of particulates, the predicted impacts had a high level of conservatism with a wide range of activities occurring simultaneously and at a higher intensity than proposed within Stage 2. The Stage 2 AEVR, suggests that significantly lower emissions are predicted for the Project based on changes in the remediation design including: • implementation of staged remediation approach; • removal of Direct Thermal Desorption (DTD) (and therefore the associated pre-treatment of soils) as a preferred treatment method for the AEC-4 area during the Stage 2 works; • no requirement during the Stage 2 works for landfarming or concrete crushing; • precise articulation of areas requiring active remediation with prescription of COPCs and excavation volumes, thus resulting in excavation volumes that are anticipated to be an order of magnitude lower than the 135,000 m^3 allowed for in the EIS; and • a review of the Stage 1 remediation and air emission characterisation with the scope of activities considered in the AQIA and associated assessments provided in the RtS. At a broad level, the reduced scope and intensity of the Stage 2 works indicates that the adverse air impacts expected from these works are likely to be significantly lower than those identified within the RtS and SSD application documentation. Originally reactive air quality management plans (RAQMPs) were considered for both dust and odour emissions, however due to the reduced scope, scale and duration of dust generating works relative to the activities proposed in the SSD documentation, RAQMPs are no longer required. Remediation activities are predicted to be of significantly lower emission intensity as those considered in the EIS, RtS and the AQIA. Potential air quality impacts would be minimised in accordance with measures in the Stage 2 AEVR, and with reference to the original proposed mitigation measures in the EIS and RtS (where still applicable).
Detailed Remedial Action Plan for Stage 2	Viva Energy are proposing to stage the remediation of the Western Area as follows: • Stage 1 – Former Process West • Stage 2 – Former Utilities and Movements • Stage 3 – Former Process East. A Detailed Remedial Action Plan (RAP) has been prepared for Stage 2. This section outlines the approach to the remediation for Stage 2 Area (Former Utilities and Movements) as it applies to air quality considerations. The layout for Stage 2 is presented in Figure B.1-1. **Remediation Methodology for Stage 2** • The proposed remediation methodologies as stated in the Stage 2 RAP are as follows: – Excavation and off-site disposal of soils (asbestos removal); – Excavation for on-site bioremediation (biopiling); and – Excavation and on-site management (engineered capping).

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	• These remedial technologies were selected for use in combination to address the source areas in the soil and to manage potential human health risks. A validation approach for assessment of excavations and beneficial re-use of material has been presented in the Stage 2 Detailed RAP. • Given the current assessment that hydrocarbon concentrations in groundwater are stable to decreasing, it is expected that the remediation works proposed will enhance the current natural attenuation processes to reduce residual groundwater impacts over time. • A detailed remediation works overview is provided in Section 9 of the Stage 2 Detailed RAP. **Excavation and off-site disposal of soils (asbestos removal)** • Asbestos identified in soils within AEC-1 and AEC-3B will be excavated and disposed off-site in line with the approach presented in the Stage 2 Detailed RAP. Various controls are to be implemented to manage potential risks. These controls would be detailed in the asbestos management plan required under Mitigation and Management Measure SWMP3 (refer to the Soil and Water Management Plan); • Excavation works in these areas would involve: – Careful excavation of impacted materials using appropriate equipment (e.g. excavators /backhoes), from the AEC-1 and AEC-3B areas. Works will be conducted in accordance with the approved management plans with particular emphasis on dust mitigation; – A validation consultant shall observe the excavation and excavated materials for indicators of unexpected finds including visual (staining, discolouration) and olfactory (odours). If indicators of potential contamination that are inconsistent with identified Asbestos Containing Materials (ACM) impacts are observed, the Unexpected Finds Protocol (UFP) detailed within Appendix C of the Stage 2 Detailed RAP will be implemented; – Where practicable, to reduce the area of disturbed material, the number of areas subject to excavation works at any one time will be minimised and materials will be excavated and placed in temporary covered stockpiles (to eliminate dust/airborne particles) or placed directly into a truck for transport to an approved / suitably licensed off-site disposal location.; • As offsite disposal of excavated ACM containing soils is required, these soils will be placed within a temporary stockpile in the vicinity of the excavation area for additional assessment and waste classification purposes or classified in-situ based on existing data. Where classification of materials is required to be undertaken prior to disposal, samples will be collected either in-situ or from stockpiled materials to determine the requirements for off-site disposal. Sampling densities and stockpile validation processes are documented in the Stage 2 Detailed RAP in accordance with the NSW EPA Waste Classification Guidelines (NSW EPA, 2014); and • Where waste materials are not temporarily stockpiled on hardstand, following removal of stockpiled impacted materials, the footprint of the stockpile location may require validation to verify no cross contamination. The results of collected waste classification and stockpile footprint validation samples are to be collated and provided for inclusion into the final site validation report. **Excavation for on-site bioremediation (biopiling)** • Biopiles are constructed via placement of soil in 1 m layers with solid and perforated pipe being laid prior to the next layer being placed. The solid pipe will extend into the stockpile where it is attached to the perforated pipe and is adjoined to a piping manifold. The piping is connected to a Soil Vapour Extraction (SVE) system which extracts air (and soil vapour) from the stockpile (via a powered blower unit) into an air/water separator with 'drop out' tank for removal of moisture. The 'drop out' tank will be pumped (as required) to a holding tank prior to disposal off-site. • The SVE system will be attached to vessels of granular activated carbon filter media, to treat contaminated air and remove odours prior to emission via an exhaust stack. A 'lead' and 'lag' vessel will be installed in a continuous circuit such that if breakthrough of contaminants occur through the lead vessel, it is captured via the lag vessel prior to emission. • Biopiles will be covered with an impermeable cover (polypropylene or similar) to contain potential air emissions and odours from the stockpile, to prevent creation of leachate via rainfall, and to retain soil moisture and temperature to encourage biodegradation. • Following completion of biopiling the treated material will be validated and re-used within the Western Area during future stages of remediation or disposed off-site to a suitably licensed receiving facility if unable to be treated to the re-use criteria outlined in the Stage 2 Detailed RAP.

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	Excavation and on-site management (engineered capping) • The engineered cap will be constructed via excavations of soil up to 0.5 metres deep along the AEC-4 footprint to remove the existing asphalt hardstand. The existing asphalt hardstand that would be removed is currently in variable condition with unsealed sides and visible cracking throughout. Once excavated, this will be disposed off-site disposal or recycled. • After the existing hardstand has been removed, re-work and re-grading of the soil, as well as waste classification sampling of soil material, will be completed in order to achieve the desired landform. • After the desired landform has been achieved, a capping layer will be placed in the AEC-4 footprint. This capping layer will manage direct contact with impacted soils. The AEC-4 area will be covered with appropriate backfill material before the placement of the hardstand covering. The final relative levels of the cap will be confirmed within the Detailed Cap Design produced by the remediation contractor.
Management Approach	**Air Quality Management Overview** The approach to managing air quality impacts related to Stage 2 of the Project is based on design mitigation, the Air Emissions Verification Report (AEVR) and the measures in this AQMP. **Stage 2 Design Mitigation** As outlined in the EIS, a range of controls (design mitigations) were included in the design of the remediation technologies for the whole Project. The key measures relevant to Stage 2 are: • level 2 watering (>2 litres/m2/h) for dump trucks carrying soil and concrete (NPI Mining, 2012); • watering with or without dust suppressants on exposed areas and stockpiles; • application of odour and VOC suppressant foam or sprays (with a control efficiency of 95% or higher) on exposed excavation areas and exposed biopiles where required and practical; • biopiles will be covered during operation and off-gas from biopiles will be passed through air filters to remove volatile hydrocarbons; • all mobile and stationary diesel engines will be compliant with US EPA Tier 3 and EU Stage III A Non-road Diesel Engine Emission Standards; • where possible stockpiles will be covered. **Air Emissions Verification Report (AEVR)** AEVRs will be developed for each stage of the Project and will detail the emission controls and management measures for the remediation methods and activities, including but not limited to: • excavation and material classification; • material handling, stockpiling and storage; • processing and treatment; • material transport; and • validated materials. The AEVRs will also: • benchmark the final emission control and management measures with best practice process design and emission control; • benchmark emission controls systems to consider the risks associated with the emissions to air of total and speciated petroleum hydrocarbons, principal air toxics and odour; and

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include robust justification for the handling, processing, treating or storing of contaminated material proposed to be conducted outside of an emission control enclosure (ECE), that considers but is not limited to technical, logistical, financial and health and safety considerations.
Further detail on the AEVR for Stage 2 is provided in the following sections.
Reactive Air Quality Management Program (RAQMP)
The EIS Air Quality Impact Assessment (AQIA) and RtS nominated the implementation of a Reactive Air Quality Management Plan (RAQMP) for implementation during the Project. It was intended that the RAQMP provide real-time guidance and verification of the control of particulate matter impacts across the suite of remediation activities that were considered in the EIS.
As consistent with Stage 1, the RAQMP has not been nominated for implementation as part of Stage 2 on the basis of the reduced scope, scale and duration of dust generating works relative to the EIS, as detailed below:
Activities that formed the key contribution to the AQIA and RtS findings are not proposed as part of Stage 2;
The excavation and biopile construction operations are of limited duration, and active handling of soil in biopiling operations occurring on an intermittent basis;
The activities undertaken in relation to AEC-4 are all effectively mitigated by conventional management measures, which when considered in conjunction with the short duration present a minimal risk of adverse air quality impacts.
Monitoring Requirements and Performance Indicators
Air quality monitoring requirements, relevant controls and performance indicators are outlined in the AEVR prepared for Stage 2.
</td></tr>
<tr><td>Air Emissions Verification Report for Stage 2</td><td>
The objective of the Stage 2 AEVR is to develop a set of targeted air emission control and management measures for Stage 2 of the Project, as based on review and assessment of project specific information, inclusive of the Human Health and Ecological Risk Assessment (HHERA), Remedial Options Analysis (ROA) and Detailed Remedial Action Plan. To meet this objective, the Stage 2 AEVR comprises a range of reviews and assessments that collectively designate air emission controls to be incorporated into the Stage 2 of the remediation.
Key Pollutants
The Stage 2 AEVR identified the following key pollutants for the key pollutants to be addressed in the control and management of air emissions during Stage 2:
Volatile organic compounds (VOCs); the key VOCs are ethylbenzene, xylenes, trimethylbenzenes and naphthalene;
Particulate matter; and
Odour: diesel / heating oil type hydrocarbon odours.
Asbestos Containing Materials (ACM) are present in AEC-1 and AEC-3B. Remediation of AEC-1 and AEC-3B will be conducted in accordance with the NSW Code of Practice – How to Safely Remove Asbestos (SafeWork NSW, 2019), inclusive of the associated control and monitoring requirements.
Air Emission Sources
Air emission sources associated with Stage 2 of remediation relate to soil handling processes associated with excavation, transport, biopiling activities and storage of soil materials. Air emissions sources for hydrocarbon impacted soils undergoing biopiling in Stage 2 are summarised in the following table:
<table>
<tr><th>Activity</th><th>VOC</th><th>Odour</th><th>Particulate Matter</th></tr>
<tr><td colspan="4">AEC-3A, AEC-3D, AEC-3E, AEC-14A, AEC-14B
Excavation Areas</td></tr>
<tr><td>Excavation of soil to stockpile</td><td>x</td><td>x</td><td>x*</td></tr>
<tr><td>Open excavation</td><td>x</td><td>x</td><td>x*</td></tr>
<tr><td>Stockpile surface</td><td>x</td><td>x</td><td>x</td></tr>
<tr><td>Loading / screening to truck</td><td>x</td><td>x</td><td>x</td></tr>
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Biopile Treatment Area			
Unloading and Receipt	x	x	x
Construction	x	x	x
Turning	x	x	x
Dismantling / Loading	-	-	x
SVE System	x	x	-
Soil Screening and Segregation Area	-	-	-
Unloading and Receipt	x	x	x
Screening	x	x	x
Loading	-	-	x

* Note: Anticipated to be minimal due to the moist nature of soils near to the water table

Risk Ranking

A risk ranking exercise has been undertaken in the AVER to provide a collective consideration of factors that influence potential air quality impacts and qualitatively rationalise air quality risks for key remediation activities.

Summary of risk ranking factors – Excavation of hydrocarbon impacted soils

Parameter	AEC-9 (Stage 1)	AEC-3			AEC-14	
		A	D	E	A	B
Proximity (industrial receptors)	100	250 m	150 m	100 m	150 m	200 m
Proximity (residential receptors)	750	500 m	550 m	500 m	700 m	650 m
Duration of Operations	2-3 weeks	~2 weeks	~1 week	~1 week	~1 week	~1 week
		~ 8 weeks				
Relative Scale	Small (0.3 ha)	Small (0.16 ha)	Small (0.04 ha)	Small (0.14 ha)	Small (50 m^2)	Small (190 m^2)
Level of contamination	Low-Moderate*	Moderate				
Emission Intensity (Unmitigated)	Moderate-High	Moderate-High	Moderate	Moderate	Minor	Minor
Effectiveness of Mitigation	High	High				

Note: *Material anticipated to be equal to or less contaminated than that encountered during the excavation trials

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Summary of risk ranking factors – ACM Removal and AEC-4 Capping

Parameter	AEC-1	AEC-3B	AEC-4 Capping Area
Proximity (industrial receptors)	50 m	250 m	50 m
Proximity (residential receptors)	1000 m	450 m	350 m
Duration of Operations	~2 days	~1 week	~6 weeks
Relative Scale	Small (0.01 ha)	Small (0.09 ha)	Large (1.4 ha)
Level of contamination	Moderate	Moderate	Low
Emission Intensity (Unmitigated)	Moderate	Moderate	Potential for dust generation
Effectiveness of Mitigation	High*	High*	High

Note: *SafeWork Code of Practice for asbestos removal (2019) to be implemented, inclusive of validation monitoring.

Summary of risk ranking factors – Soil handling and treatment

Parameter	Soil Screening and Segregation Area	Biopile Area
Proximity (industrial receptors)	~ 100 m (east)	~ 150 m (north)
Proximity (residential receptors)	~ 600 m (south)	~ 800 m (south-east)
Duration of Operations	Intermittent operations over within approximately 8 weeks	Ongoing throughout Project
Relative Scale	Small (Active operations typically within a ~20 x 30 m area)	Small (Operations within a ~20 x 10 m area)
Contamination of Handled Materials	Low – Moderate*	Clean to Moderate
Emission Intensity (Unmitigated)	Moderate - High	Moderate (intermittent active operations) –biopile construction.
Effectiveness of Mitigation	High	High

Selection of Emission Controls and Management Measures

Emission controls have been allocated to each area part of the Stage 2 remediation and are presented in the following table.

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Activity	Nominated Emission Controls and Monitoring Measures	
	VOC/Odour	Particulate Matter
General	• Remediation staff will be briefed on air-quality management requirements as part of the remediation induction process. • Meteorological forecasts will be reviewed at the daily toolbox talk and used in the planning of works and review of mitigation requirements.	
Excavation Area		
Excavation of soil to stockpile Open excavation Stockpile surface Loading / screening to truck	• Conducting periodic downwind boundary surveys (Total VOC and odour) during the handling of odorous materials. • Use of a calibrated Photo-Ionisation Detector (PID) with alarm to provide timely alerts as to elevated VOC emissions. Investigation of alarms prior to progression of works. • Backfilling excavations with non-odorous material as soon as practicable. • Application of an interim barrier (such as suppressant foam or light fill cover) to odorous excavation faces that are not able to be backfilled to local grade at the completion of excavation operations for the day. • Covering stockpiled material that is required to remain in the excavation area overnight. • Preventing excessive accumulation of odorous water in excavations through either pump-out or management of excavation depth.	• Maintaining a visual awareness of dust emissions. • Wetting down dry materials prior to handling. • Applying water sprays during handling of dusty material. • Reducing or suspending dust generating work during high winds.
Biopile Treatment Area		
Unloading and Receipt / Construction / Turning (as required)	• Preference of potentially emissive operations within the southern extent of the biopile treatment area so as to maximise buffer distances between biopiling operations and the Site boundary. • Use of a calibrated PID with alarm to provide timely alerts as to elevated VOC emissions. Investigation of alarms prior to progression of works. • Understanding the odour potential of material prior to delivery at biopile treatment area (via communication with excavation team). • Covering received material that is not able to be directly used in biopile construction. • Maintaining work area in a clean condition with minimisation of odorous materials in trafficked areas.	• Preference of potentially emissive operations within the southern extent of the biopile treatment area such as to maximise buffer distances between biopiling operations and the site boundary. • Maintaining a visual awareness of dust emissions. • Wetting down dry materials prior to handling. • Applying water sprays during handling of dusty material. • Reducing or suspending work during high winds. • Maintaining work area in a clean condition with minimisation of loose materials in trafficked areas.

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Dismantling / Loading	Not applicable	
Soil Vapour Extraction (SVE) System	• Using Granular Activated Carbon (GAC) adsorption to capture VOCs/odour from vacuum SVE system. System will comprise a minimum of two adsorption vessels in series (i.e. a 'lead and 'lag' vessel). • Routine PID monitoring of Total VOC concentrations in the SVE system exhaust, and between lead and lag vessels. • Undertaking change-out of GAC media upon breakthrough of the lead vessel, with switching of lag vessel into the lead position.	Not applicable
AEC-4 Capping Area		
Unloading	Not applicable	• Application of water sprays to stockpiles of potentially dusty materials where not covered. • Covering stockpiles during storage periods of greater than one day. • Maintaining a visual awareness of dust emissions. • Wetting down dry materials prior to handling. • Applying water sprays during handling of dusty material. • Maintaining work area in a clean condition with minimisation of loose materials in trafficked areas. • Reducing or suspending work during high winds.
Storage		
Loading		
Miscellaneous Areas		
Material transport between areas	• Covering soil loads where there is potential for odour generation.	• Use of a wheel wash to minimise track-out. • Maintaining sealed roads in a clean condition. • Applying speed limits of 10 km/h on unsealed surfaces, and 20 km/h on sealed surfaces. • Watering unsealed roads that are in frequent use. • Covering soil loads where there is potential for dust generation.

Excavation Area – Total Exposed Area

The active excavation area would be limited as outlined in the table above. In application of this mitigation measure, active areas are defined to include the sum of:

- Total (plan) area of open excavations in which contaminated material is exposed; and
- Total (plan) area of uncovered contaminated soil temporarily stockpiled adjacent to excavations.

Active areas would not include:

- Excavations (or parts of excavations) that have been validated as suitable for future use as per protocols identified in the Stage 2 RAP.
- Stockpiles containing excavated material that has been validated as not requiring treatment prior to future use.

Air Quality Management	
	Excavations or stockpiles for which emission controls have been implemented, inclusive of: – Application of covers; – Application of VOC suppressing barrier foams or sprays; and – Application of other controls (as per Remediation Contractor Work Method statements) that prevent the emission of odour and/or VOCs. **Monitoring Framework and Performance Indicators** ***Boundary VOC and Odour Monitoring*** Ambient boundary VOC and odour surveys will be conducted to assess VOC and odour control performance during more intensive phases of the Stage 2 works. Boundary VOC and odour monitoring will be conducted as per the following: • Be undertaken over two to three sampling rounds, nominally when excavation of contaminated material and screening operations are occurring, nominally at locations consistent with those adopted during the Stage 1 remediation works; • Be undertaken using the US EPA TO-15a methodology, which involves VOC analysis using Gas Chromatography / Mass Spectrometry (GC-MS) with collection of samples within passivated evacuated canisters. Analysis will be undertaken by a laboratory that carries National Association of Testing Authorities (NATA) accreditation for this analytical method; • Nominally include a duplicate sample at a frequency of 1 in 10 primary samples; • Include odour observations at canister sample commissioning and decommissioning; • Canisters will be fitted with flow regulators set to a period between 8 and 24 hours; • Canister samples will be collected at (nominally) four boundary locations surrounding the Western Area, as required to understand the potential influence of extraneous sources and address variability in winds over the sampling period. Ideally, locations should be consistent between separate sampling rounds; • Consider the use of a near-source samples to provide an additional understanding of VOC emissions associated with the Stage 2 remediation works; and • Be compared against nominated screening criteria that are protective of off-site human health risks, and applicable for an averaging period that corresponds to the canister sample duration. Potential sources of such criteria include: – NEPC 2011, *National Environment Protection (Air Toxics) Measure* (as amended), National Environment Protection Council Service Corporation, 16 September 2011. – ATSDR 2021, *Minimal Risk Levels* (MRLs) 2021, United States Agency for Toxic Substances and Disease Registry. – OEHHA 2015, *Air Toxics Hot Spots Program, Risk Assessment Guidelines – Guidance Manual for Preparation of Health Risk Assessments*, Air, Community, and Environmental Research Branch, Office of Environmental Health Hazard Assessment, California Environmental Protection Agency, February 2015. *Performance Indicators:* • Boundary VOC concentrations within adopted screening criteria; • No offensive odours detected at the boundary; and • No odour complaints from off-site receptors related to the Stage 2 remediation works. ***Excavation and Biopile Area Monitoring*** The following operational monitoring practices should be undertaken within the excavation and biopiling areas: • Site staff will maintain a visual awareness of dust, and upon sighting of dust plumes: – Implement controls as required to mitigate visible dust and cease operations if visible dust is observed after mitigation; and – Log any observations of dust seen to be leaving the Site.

Air Quality Management	
	• PID monitoring will be conducted during soil handling operations at each area, to provide real time notification of elevated Total VOC (TVOC) concentrations: – The PID monitor should be calibrated on a daily basis prior to use, and recorded in the daily field notes; – The PID monitor will be operational during soil handling operations; – The PID monitor will be primarily located downwind of the source (as defined by prevailing winds), and at a nominal distance of 5 – 20 m from the operations; and – The monitoring will include Level 1 and Level 2 response triggers, e.g.: **<u>Level 1 - Nominal Concentration: 5 ppm***:</u>** ▪ Notify plant operator of elevated ambient VOC concentrations. ▪ Investigate potential sources if unknown, e.g.: o Review excavation for visual presence of contamination; o Conduct PID survey across a transect of excavation area; and o Assess upwind conditions for external influences. ▪ Review potential measures to reduce VOC emissions. These could include: o alternating activity (e.g. excavation from alternate face); o reducing stockpile areas (e.g. hauling to classification location); o covering impacted soils with (visually) less impacted soils; and o applying suppressant foam or spray, covers and/or light soil cover to exposed surfaces. **<u>Level 2 - Nominal Concentration: 10 ppm***:</u>** ▪ Cease soil handling operations and implement measures listed under Level 1 until VOC emissions consistently reduce below the Level 1 trigger; and ▪ Investigate the potential for Stage 2 related odours to be detected at the downwind boundary. *** Note: Concentrations represent nominal values for review upon implementation (as specified within Section 6.5.2 of the Stage 2 AEVR). These values apply on an instantaneous basis as ppm TVOC (Isobutylene equivalent). PID monitoring variability, and the need to review and revise the trigger levels discussed above, is acknowledged and further discussed in Section 6.5.2 of the Stage 2 AEVR. *Performance Indicators:* • VOC concentrations remain within adopted screening criteria; • No offensive odours detected at the boundary; • No dust observed beyond the boundary; and • No odour complaints related to the Stage 2 remediation works. ***Biopile Soil Vapour Extraction (SVE) System*** As implemented during Stage 1 works, the GAC system will comprise a lead and lag vessel arrangement, with sample ports at the inlet, outlet and between the two vessels. PID monitoring will be conducted across these sample points in order to identify when change-out is required, and that VOC treatment is effective. PID monitoring of inlet, outlet, lead and lag vessels for VOC concentrations, should be undertaken at the frequency specified in the following table. The upper limit of Total COV (TVOC) emissions at the outlet is established as 10 ppm (AECOM, 2019), to be applied as TVOC – isobutylene equivalent. Exceedance of this threshold at an interstage sample point indicates breakthrough of the lead vessel is occurring and requires replacement. The SVE system should be shut down temporarily to with change-out of filter media prior to re-operation and confirmation of clean emissions. This should nominally involve retirement of the lead vessel, and placement of the lag vessel into the lead position. A new lag vessel shall then be installed, comprising virgin GAC.

Air Quality Management

Parameter Description	Description
Sample Points	Interstage sampling point/s (located between lead and lag vessels) Exhaust/s (as per Remediation Contractor's Work Method Statement, including detailed biopiling design)
Lead vessel change out threshold	10 ppm-TVOC (isobutylene equivalent) – applicable at interstage sample point
Exhaust emission limit	10 ppm-TVOC (isobutylene equivalent)
Sample method	Calibrated Photo-Ionisation Detector (PID). Sample collected over a minimum of 3 minutes (allowing for stabilisation). Average value to be reported
Sample Frequency	• Daily during first week of operation to ensure stable operation and enable an initial calculation of estimated carbon breakthrough time for the lead vessels; Following calculation of breakthrough times in Week 1: • Daily during weekdays for an SVE system for which the lead vessel breakthrough time is less than 30 days. • Weekly for an SVE system for which the lead vessel breakthrough time is greater than 30 days. Weekly recalculation of carbon breakthrough times to be undertaken at the end of each working week to ensure appropriateness of monitoring frequency.

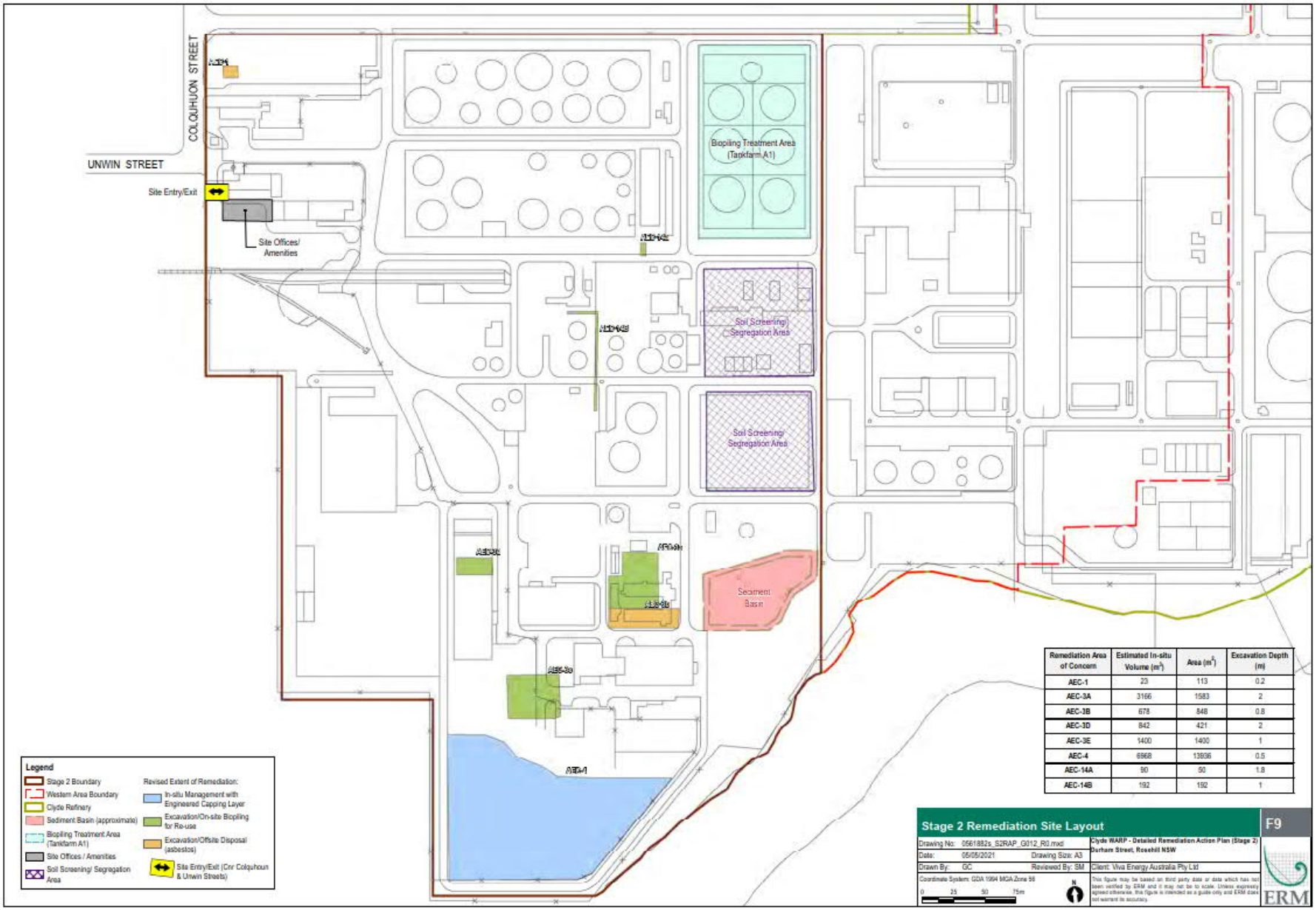
Air Quality Management Plan - Mitigation and Management Measures					
Reference	Source Reference	Aspect	Mitigation and Management Measure	Responsibility	Timing
AQMP1	DC: B12–B18 EPL 570: L2, L7, O1, O2, O3, M4, M5 & M6 MMM: AQ1–AQ8	Air quality management	The Project will be delivered to meet the objectives, performance criteria and key performance indicators outlined in this plan. Compliance with the objectives, performance criteria, key performance indicators and the mitigation and management measures will be demonstrated.	Remediation Contractor	At all times
AQMP2	MMM: AQ1 DC: B13, B14, B15, B1 & B16 EPL 570: O2, O3, O6.2, O6.3	Air quality management controls	Detailed emission controls and management measures identified in the Air Emissions Verification Report for each selected remediation method and remediation activity will be applied and managed in line with the EIS, AEVR and AQMP. Controls that will be in place for Stage 2 include: • premises must be maintained in a condition which minimises or prevents the emission of air pollution; • all operations and activities must be carried out in a manner that will prevent or minimise the emissions of air pollution from the premises; • level 2 (>2 litres/m2/h) watering of on-site haul roads; • watering with or without dust suppressants on exposed areas and stockpiles; • application of odour and VOC suppressant foam or sprays (with a control efficiency of 95% or higher) on exposed excavation areas where both required and practical; • all mobile and stationary diesel engines will at a minimum be compliant with US EPA Tier 3 and EU Stage III A Non-road Diesel Engine Emission Standards; • where possible stockpiles will be covered including stockpiles of excavated material that is not able to be directly used in biopile construction; • application of odour and VOC suppressant sprays (with a control efficiency of 95% or higher) on exposed untreated biopiles (i.e. during construction of the biopile) over night; • biopile remediation systems must be designed, constructed and operated to prevent fugitive emissions at all times; • progressively covering biopiles during construction; • biopiles to be covered during operation and off-gas from biopiles to be passed through air filters to remove volatile hydrocarbons • operation of each SVE system must be configured and operated with a lead and lag adsorption bed at all times. This includes when the systems are operated in series or parallel.	Remediation Contractor	At all times

Air Quality Management Plan - Mitigation and Management Measures					
Reference	Source Reference	Aspect	Mitigation and Management Measure	Responsibility	Timing
AQMP3	MMM: AQ2 Stage 2 AEVR DC: B17 & B18 EPL 570: M5	Air quality management method statement	An air quality management method statement (AQMMS) will be developed for Stage 2 to describe a program that can evaluate the performance of the remediation works and determine compliance with key performance indicators. The AQMMS will outline: • timeframe for implementation of all identified emission controls as detailed within the relevant AEVR, including a carbon bed breakthrough plan; • how the relevant key performance indicator(s) outlined in the AEVR will be achieved and responsibilities for demonstrating and reporting achievement of key performance indicator(s); and • for each control: - monitoring method, location, frequency and duration; - response procedures; and - compliance monitoring. The AQMMS must be approved by Viva Energy prior to the prior to commencement of the relevant remediation.	Remediation Contractor	Two weeks prior to commencement of remediation works
AQMP4	MMM: AQ3 & AQ8	Stack emissions monitoring	Emissions testing of the soil vapour extraction (SVE) for the biopiles will be used to help validate the potential air quality impact against predicted impacts in the AQIA and associated assessment documentation in the RtS, ensure ongoing performance of ventilation systems and demonstrate compliance with other required limits. Emissions testing will include periodic emission testing of the SVE system exhaust to ensure total VOC concentration is below 10 parts per million (ppm)-TVOC (isobutylene equivalent). Testing will also occur between the lead and lag GAC adsorption vessels. This testing will help identify when granular activated carbon (GAC) filters used to remove VOCs need to be replaced. Emissions testing will be carried out in accordance with the NSW EPA's Approved Methods for Sampling and Analysis of Air Pollutants in New South Wales (DEC, 2007).	Remediation Contractor	Daily during the first week of operation. Daily during weekdays for a SVE system where the lead vessel breakthrough time is less than 30 days. At least weekly when the lead vessel breakthrough time is greater than 30 days.

Air Quality - Monitoring Requirements			
Aspect	Description	Responsibility	Frequency
Boundary VOC and odour emissions	Ambient boundary VOC and odour surveys to be conducted to assess VOC and odour control performance during the more intense phases of the Stage 2 works, which normally include soil excavation and screening.	Validation Consultant	Over two to three sampling rounds, nominally when excavation of contaminated material and biopiling operations are occurring
Excavation and Biopile Treatment Area VOC and odour emissions	PID monitoring to be conducted during soil handling operations.	Validation Consultant	During soil handling operations
Dust emissions	Maintain visual awareness of dust and log any observations of dust seen to be leaving the site.	Remediation Contractor and Validation Consultant	At all times
Biopile Soil Vapour Extraction (SVE) System	PID monitoring of inlet, outlet and between lead and lag vessels for VOC concentrations as described in Section 6.5.3 of the Stage 2 AEVR. PID monitoring of the SVE system emissions (at pre-filter, between lead and lag vessels and at the outlet) to inform the change-out of filter media as outlined in Section 6.5.3 of the Stage 2 AEVR.	Remediation Contractor	Daily during the first week of operation. Daily during weekdays for a SVE system where the lead vessel breakthrough time is less than 30 days. At least weekly when the lead vessel breakthrough time is greater than 30 days.
Bioremediation Area Inspection	Visual assessment of the biopiling area to observe that the work area is secure, fencing is in place, environmental controls are operating correctly, bunds are intact, covers over stockpiles are secure and that the SVE system is functioning correctly.	Remediation Contractor	Minimum weekly basis
General	Ad hoc visual observations to ensure compliance with air quality management requirements.	Remediation Contractor	At all times
General	Quarterly audits against the requirements of the Stage 2 AQMP and Stage 2 AQMMS.	Remediation Contractor and Viva Energy	Quarterly

Air Quality – Reporting Requirements			
Aspect	Description	Responsibility	Frequency
KPI and compliance reporting	Reporting of key performance indicator(s) and compliance quarterly, including a summary of any visual observations and audits undertaken in the period.	Remediation Contractor	Quarterly
Complaints	Register of complaints will be maintained and updated.	Viva Energy	As required
Annual report/return documents	In accordance with EPL 570 R1.1 and DC condition C12, Viva Energy will review and report on the environmental performance of the development. The report shall include a comprehensive review of the monitoring results and complaints records of the development over the previous year, to demonstrate the effectiveness of the remediation works, including a comparison of air quality monitoring data with relevant limits or performance measures/criteria. The Remediation Contractor must provide to Viva Energy the required data, to allow Viva Energy to complete the report.	Remediation Contractor and Viva Energy	Annually

Air Quality - Corrective Actions			
Aspect	Description	Responsibility	Frequency
Non-compliance with any relevant EPL 570 limits, DC or MMMs	An investigation and, as required, corrective action and update to the AQMP, will be undertaken in line with Section 4.6 and 6.4 of the REMP, should any of the following occur: • Non-compliance raised; • Incident involving pollution of air; • Complaints from the local community; or • Discharges to air above the limits outlined in the EPL or Detailed RAPs.	Project Environment Lead	Ongoing, as required



Remediation Area of Concern	Estimated In-situ Volume (m³)	Area (m²)	Excavation Depth (m)
AEC-1	23	113	0.2
AEC-3A	3166	1583	2
AEC-3B	678	848	0.8
AEC-3D	842	421	2
AEC-3E	1400	1400	1
AEC-4	6968	13936	0.5
AEC-14A	90	50	1.8
AEC-14B	192	192	1

Figure B.1-1 – Stage 2 Remediation Site Layout

Soil and Water Management		
		(i) detail the use of existing bunded areas and drainage systems for landfarming and biopiling activities (j) describe the measures to manage surface water during excavation and removal of sub-surface infrastructure (k) detail proposed monitoring to ensure the development complies with the discharge requirements of the EPL. B21. The Applicant must: (a) not commence preparation works until the Soil and Water Management Plan required by Condition B20 is approved by the Planning Secretary (b) submit the any subsequent revisions of the Soil and Water Management Plan to the EPA for comment prior to the commencement of preparation works (c) submit the approved Soil and Water Management Plan to the EPA prior to the commencement of preparation works; and (d) implement the most recent version of the Soil and Water Management Plan approved by the Planning Secretary for the duration of the development.
	Soils Imported Material	B26. The Applicant must: (a) ensure that only VENM, ENM, or other materials approved in writing by EPA is brought onto the Western Area; (b) keep accurate records of the volume and type of fill to be used; and (c) make these records available to the Department upon request.
	Annual Report	C12. Within 12 months of the commencement of remediation works, and every year thereafter until the completion of demobilisation, or other timing as may be agreed by the Planning Secretary, the Applicant shall review and report on the environmental performance of the development. The report shall: (c) include a comprehensive review of the monitoring results and complaints records of the development over the previous year, to demonstrate the effectiveness of the remediation works, including a comparison of: (ii) water discharges with established discharge criteria for contaminants of concern.
	Environment Protection Licence EPL 570 [25 February 2021]	
	2 Discharges to Air and Water and Applications to Land P1 Location of monitoring/discharge points and areas	Section P1 of the EPL provides the location and description of monitoring/discharge points and utilisation areas.

Soil and Water Management		
	3 Limit Conditions L1 Pollution of waters L3 Concentration limits L4 Volume and mass limits L5 Waste	Section 3 of the EPL provides limit conditions for discharging pollutants to receiving waters. The Development must comply with these limit conditions. • L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997 [Prohibition of pollution of waters] • L3 provides the water and/or land concentration limits • L4 provides the volume and mass limits • L5.10 After onsite treatment to reduce hydrocarbon contamination of soil or sediment to less than 1% on a weight basis, such treated waste may be disposed of onsite in the area marked “Treated Material Onsite Disposal Site (TPH < 1%)” as shown on drawing labelled ‘Environmental Protection Licence No.570 Licenced Discharge Points' - CLR_0126667_0004 Rev1 (EPA ref. DOC21/70815-1), or offsite to a facility that can lawfully accept that waste.
	4 Operating Conditions O1 Activities must be carried out in a competent manner	O1.1 Licensed activities must be carried out in a competent manner. This includes: a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.
	O2 Maintenance of plant and equipment	O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity: a) must be maintained in a proper and efficient condition; and b) must be operated in a proper and efficient manner.
	O4 Processes and management	• O4.2 Oily sludge and/or soil contaminated with hydrocarbon may be treated in the landfarm area or the sludge dewatering facility as defined by the shaded area labelled "Landfarm" and "Sludge dewatering facility" on drawing number CLR_0126667_0004 Revision 1 (EPA ref. DOC21/70815-1). • O4.3 Treated soil contamination with hydrocarbons and/or oily sludge may be disposed of in the disposal area as defined by the shaded area labelled "Treated Material Onsite Disposal Site (TPH < 1%) on drawing 'Environmental Protection Licence No.570 Licenced Discharge Points' - CLR_0126667_0004 Rev 1 (EPA ref. DOC21/70815-1), or disposed of off-site to a facility that can lawfully accept that waste. • O4.4 The licensee must store all chemicals, fuels and oils used for the development in appropriately bunded areas in accordance with the requirements of all relevant Australian Standards, and/or EPA’s *Storing and Handling of Liquids: Environmental Protection – Participants Manual* (Department of Environment and Climate Change, 2007).
	O6 Other operating conditions	• O6.1 Discharges to Duck River at Point 25 must only be a result of dewatering from bunded areas in the tank farm or from water pressure testing of chemical storage tanks within the premises.

Soil and Water Management		
	5 Monitoring and Recording Conditions M1 Monitoring records	M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition. M1.2 All records required to be kept by this licence must be: a) in a legible form, or in a form that can readily be reduced to a legible form; b) kept for at least 4 years after the monitoring or event to which they relate took place; and c) produced in a legible form to any authorised officer of the EPA who asks to see them. M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence: a) the date(s) on which the sample was taken; b) the time(s) at which the sample was collected; c) the point at which the sample was taken; and d) the name of the person who collected the sample.
	M2 Requirement to monitor concentration of pollutants discharged	Section M2 of the EPL provides requirements for Viva Energy to monitor the concentration of certain pollutants discharged to receiving waters.
	M3 Testing methods - concentration limits	M3.1 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.
	M5 Recording of pollution complaints	M5.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies. M5.2 The record must include details of the following: (a) the date and time of the complaint; (b) the method by which the complaint was made; (c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect; (d) the nature of the complaint; (e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and (f) if no action was taken by the licensee, the reasons why no action was taken. M5.3 The record of a complaint must be kept for at least 4 years after the complaint was made. M5.4 The record must be produced to any authorised officer of the EPA who asks to see them.
	M7 Requirement to monitor volume or mass	Section M7 of the EPL provides volume/mass requirements for monitoring at each discharge point. Viva Energy must comply with these requirements.

Soil and Water Management		
	8 Pollution Studies and Reduction Programs U1 Soil and Groundwater monitoring program	U1.1 On or before 31 March 2011 and annually thereafter, a report must be submitted to the EPA's Manager Sydney Industry (RegOps.MetroRegulation@epa.nsw.gov.au). The report must include: (a) a summary of groundwater monitoring results for the previous 12 months (b) details of any soil or groundwater investigations undertaken and the results of such investigations (c) details of the progress against works proposed in the previous year's report (d) an update of the conceptual site model (CSM) if conditions change significantly (e) an update of the Soil and Groundwater Monitoring Program (SGMP) if required.
Activities	The Project activities which are likely to cause impacts related to soil and water include: • Activities involving soil exposure or ground disturbance such as vegetation clearing and excavations • Excavation related to remediation activities • Activities including remediation activities and land forming involving handling, stockpiling, transportation and/or storage of spoil and waste materials • Activities involving chemical use and storage • Activities which impact existing stormwater systems and other on-site water treatment facilities • Activities that create wastewater flows (e.g. leachate, wheel wash areas etc.).	
Predicted Impacts discussed in the EIS and RtS	**Soil and contamination impacts:** • Excavation of contaminated soil resulting in the unlikely but potential exposure of acid sulfate soils which may cause impacts to Duck River should surface water or groundwater come into contact with the ASS and migrate into the river (refer to Figure B.2-1) • Movement of and disturbance of contaminated soils around the Project Area resulting in the contamination of previously uncontaminated areas, including areas off-site through mobilisation of sediment or dust • Spills and leaks of fuels and oils from plant and equipment resulting in unintentional additional contamination on-site and the potential for additional contamination to mobilise off-site • Imported fill material not meeting the required industrial standard and causing additional contamination within the Project Area • Erosion impacts to soils (including new topsoil) following completion of the Project. **Surface water, wastewater and flooding impacts:** The surface water quality from the preparation and remediation works could be potentially impacted by: • erosion and entrainment of dust, soil and other material in surface water from areas where ground disturbance works, and excavation are required • leaks of fuel and hydraulic fluid from various plant items • leaks of residual matter from within redundant pipework prior to removal • the interaction of surface water with contaminated soils potentially exposed by excavation works • poor stockpile management resulting in contaminated leachate • leaks from materials stored and used on-site as part of the remediation works.	

Soil and Water Management	
	Water Treatment: The site drainage network within the Stage 2 Area has been decommissioned and isolated from the Clyde Terminal Wastewater Treatment Plant (WWTP) and access from the Stage 2 area to the WWTP is no longer possible. Surface water runoff will be directed around excavations and will flow to a sediment basin the south eastern part of the Stage 2 area (refer to Attachment A – Erosion and Sediment Control Plan). Potentially contaminated surface water (i.e. wastewater) will be managed in line with the discussion below and will be collected and disposed offsite. Potential impacts from the land forming and demobilisation works include the improved quality of overland flow from the Western Area. This is due to reduced impervious surfaces; reduced contamination in soils and fill; proposed topsoiling and vegetation; and use of swales to convey runoff. **Other considerations:** • Use of water for dust suppression and biopile moisture control. There is more than sufficient potable water available, and the proposed use would be an order of magnitude lower than when the Clyde Refinery was operational. • Riparian vegetation is not being removed and therefore indirect impacts caused by the loss of riparian vegetation, such as the effects of climate change and associated sea level rise on wetlands, are not anticipated. Retaining this vegetation can also potentially minimise flood and coastal process impacts by slowing down flood waters and helping them to spread around the floodplain (DECCW, 2010). • It is not anticipated that the Project would impact on the flooding potential in the Project Area during the remediation. It is unlikely that there would be an impact to flood levels or flow conveyance within Duck River or on neighbouring properties as a result of the remediation. • In relation to coastal processes, the Project would result in a reduction in total runoff volume/velocity and pollutant loads. • Increases in sea levels as a result of climate change would not significantly impact the Western Area as the terrain is sufficiently higher than existing and projected future sea levels. The impact of sea level rises on the Project Area would not be exacerbated by the Project as the final landform has been developed to largely maintain surface levels and retain floodplain storage.
Detailed Remedial Action Plan for Stage 2	Viva Energy are proposing to stage the remediation of the Western Area as follows: • Stage 1 – Former Process West • Stage 2 – Former Utilities and Movements • Stage 3 – Former Process East. A Detailed Remedial Action Plan (RAP) has been prepared for Stage 2. This section outlines the approach to the remediation of the Stage 2 Area (former Utilities and Movements) as it applies to soil and water considerations. **Remediation Methodology for Stage 2** • The proposed remediation methodologies as stated in the Stage 2 RAP are as follows: – Excavation and off-site disposal of soils (asbestos removal); – Excavation for on-site bioremediation (biopiling); and – Excavation and on-site management (engineered capping). • These remedial technologies were selected for use in combination to address the source areas in the soil and to manage potential human health risks. A validation approach for assessment of excavations and beneficial re-use of material has been presented in the Stage 2 Detailed RAP. • Given the current assessment that hydrocarbon concentrations in groundwater are stable to decreasing, it is expected that the remediation works proposed will enhance the current natural attenuation processes to reduce residual groundwater impacts over time. • A detailed remediation works overview is provided in Section 9 of the Stage 2 Detailed RAP.

Excavation and off-site disposal of soils (asbestos removal)

- Asbestos identified in soils within AEC-1 and AEC-3B will be excavated and disposed off-site in line with the approach presented in the Stage 2 Detailed RAP. Various controls are to be implemented to manage potential risks. These controls would be detailed in the asbestos management plan required under Mitigation and Management Measure SWMP3 (refer to the Soil and Water Management Plan);
- Excavation works in these areas would involve:
  - Careful excavation of impacted materials using appropriate equipment (e.g. excavators /backhoes), from the AEC-1 and AEC-3B areas. Works will be conducted in accordance with the approved management plans with particular emphasis on dust mitigation;
  - A validation consultant shall observe the excavation and excavated materials for indicators of unexpected finds including visual (staining, discolouration) and olfactory (odours). If indicators of potential contamination that are inconsistent with identified Asbestos Containing Materials (ACM) impacts are observed, the Unexpected Finds Protocol (UFP) detailed within Appendix C of the Stage 2 Detailed RAP will be implemented;
  - Where practicable, to reduce the area of disturbed material, the number of areas subject to excavation works at any one time will be minimised and materials will be excavated and placed in temporary covered stockpiles (to eliminate dust/airborne particles) or placed directly into a truck for transport to an approved / suitably licensed off-site disposal location.;
- As offsite disposal of excavated ACM containing soils is required, these soils will be placed within a temporary stockpile in the vicinity of the excavation area for additional assessment and waste classification purposes or classified in-situ based on existing data. Where classification of materials is required to be undertaken prior to disposal, samples will be collected either in-situ or from stockpiled materials to determine the requirements for off-site disposal. Sampling densities and stockpile validation processes are documented in the Stage 2 Detailed RAP in accordance with the NSW EPA Waste Classification Guidelines (NSW EPA, 2014); and
- Where waste materials are not temporarily stockpiled on hardstand, following removal of stockpiled impacted materials, the footprint of the stockpile location may require validation to verify no cross contamination. The results of collected waste classification and stockpile footprint validation samples are to be collated and provided for inclusion into the final site validation report.

Excavation for on-site bioremediation (biopiling)

- Biopiles are constructed via placement of soil in 1 m layers with solid and perforated pipe being laid prior to the next layer being placed. The solid pipe will extend into the stockpile where it is attached to the perforated pipe and is adjoined to a piping manifold. The piping is connected to a Soil Vapour Extraction (SVE) system which extracts air (and soil vapour) from the stockpile (via a powered blower unit) into an air/water separator with ‘drop out’ tank for removal of moisture. The ‘drop out’ tank will be pumped (as required) to a holding tank prior to disposal off-site.
- The SVE system will be attached to vessels of granular activated carbon filter media, to treat contaminated air and remove odours prior to emission via an exhaust stack. A ‘lead’ and ‘lag’ vessel will be installed in a continuous circuit such that if breakthrough of contaminants occur through the lead vessel, it is captured via the lag vessel prior to emission.
- Biopiles will be covered with an impermeable cover to contain potential air emissions and odours from the stockpile, to prevent creation of leachate via rainfall, and to retain soil moisture and temperature to encourage biodegradation.
- Following completion of biopiling the treated material will be validated and re-used within the Western Area during future stages of remediation or disposed off-site to a suitably licensed receiving facility if unable to be treated to the re-use criteria outlined in the Stage 2 Detailed RAP.

Excavation and on-site management (engineered capping)

- The engineered cap will be constructed via excavations of soil up to 0.5 metres deep along the AEC-4 footprint to remove the existing asphalt hardstand. The existing asphalt hardstand that would be removed is currently in variable condition with unsealed sides and visible cracking throughout. Once excavated, this will be disposed off-site disposal or recycled.
- After the existing hardstand has been removed, re-work and re-grading of the soil, as well as waste classification sampling of soil material, will be completed in order to achieve the desired landform.

Soil and Water Management	
	• After the desired landform has been achieved, a capping layer will be placed in the AEC-4 footprint. This capping layer will manage direct contact with impacted soils. The AEC-4 area will be covered with appropriate backfill material before the placement of hardstand covering. The final relative levels of the cap will be confirmed within the Detailed Cap Design produced by the remediation contractor. **Stockpiling of Surplus Materials** The surplus material stockpile area is situated within the former soil screening/segregation areas (refer to Figure B.2-2). These areas will be used to store treated/validated soils that have been characterised as suitable for reuse on-site. The area may also store uncontaminated surplus materials such as virgin excavated natural material (VENM), as well as supplementary uncontaminated materials (e.g. sand, gravel, organic matter) that may be used in remediation and/or biopiling processes. To minimise potential erosion impacts, soil stockpiles are to be covered and silt fences will be installed around stockpile areas. Erosion and sediment control requirements (developed in accordance with Managing Urban Stormwater: Soils and Construction (Landcom, 2004)) are outlined in MMM SWMP4. **Wastewater** Wastewater from the remediation activities will primarily result from: • Impacted surface water runoff from contact with contaminated soils • Leachate from remediation technologies • Impacted groundwater infiltrating into excavations A leachate collection system is proposed to be incorporated in the event that moisture addition is required to biopile material undergoing treatment. It is noted that significant volumes of leachate are unlikely to be generated from biopiling operations associated with Stage 2 due to the following controls and conditions: • Covering of biopiles in impermeable sheeting which limits potential leachate generation via infiltration from rainfall events • Existing soil is expected to be within optimal moisture ranges without the need for significant moisture amendment. Soils are unlikely to be saturated following excavation and blending and would not provide a source of leachate once placed in the biopiling area. Given the small scale and short duration of excavation works and small volumes of wastewater expected during Stage 2, it is proposed to collect and test wastewater, including excavation water and leachate, and if necessary dispose of it off-site. **Subsurface Infrastructure** The current proposal is to leave subsurface drainage infrastructure in situ for the Stage 2 Area. As outlined in the Stage 2 Detailed RAP, this infrastructure has been decommissioned and left in a state that: • is not considered an ongoing primary source of soil and groundwater impact or a preferential pathway for migration of contaminants • does not present an unacceptable future safety risk via accumulation of gases in sub grade void spaces • cannot be recommissioned for use in future. Leaving this infrastructure in situ will result in reduced soil disturbance and reduced risk of mobilising contaminants. The subsurface drainage infrastructure has already been disconnected from the Site's WWTP.

Soil and Water Management	
Management Approach	**Soil and Water Management Overview** In general soil impacts will be managed by segregating material based on contamination status and preventing contamination of the land surface (e.g. through spills and leaks). Surface water flows will be managed by segregating surface water runoff from impacted water and preventing the inflow of surface water to excavation areas using surface bunds, silt fences and drainage diversions. Where remediation is not required, surface water flows will either continue in line with the current management practices or would be managed in line with the Erosion and Sediment Control Plan provided in Attachment A of this SWMP. Where excavations are required as part of the remediation, surface water captured within those excavations will be collected, tested and disposed of off-site. The approach to management of soil and water for the Project is based on the requirements of the EIS, the Stage 2 Detailed RAP, EPL 570 and this SWMP. This SWMP makes reference to other plans/reports which either will or may be prepared for the Project, including: • Acid Sulfate Soils Management Plans (ASSMP) (refer to SWMP2) • Asbestos Management Plans (refer to SWMP3) • a Validation Sampling and Analysis Quality Plan (SAQP) which outlines the validation criteria and testing requirements for the validation of remediated materials proposed for on-site reuse and for the acceptance of imported fill material to the Project Area • a Validation Report to be prepared in accordance with the NSW EPA Guidelines for Consultants Reporting on Contaminated Sites (NSW EPA, 2011) and reviewed/approved by the Auditor, confirming that the Western Area is suitable for commercial/industrial land use. The Validation Report may include progressive validation reports for separate portions of the Western Area to enable progressive validation of these areas. **Surface Water** • Fill within the Project Area is generally limited to a permeable layer of approximately 500 mm in thickness overlaying relatively impermeable silty clays. This mitigates the vertical and lateral infiltration and migration of surface water to the underlying groundwater system. • Excavations could penetrate the relatively impermeable silty clays in areas. Runoff trapped within bunded excavations will be collected, tested and, if required, disposed off-site. This would reduce the infiltration of surface water to groundwater by removing standing pools of water from within excavations. **Monitoring** *Excavation water and leachate*: Leachate and accumulated water in excavations will be collected, tested and disposed off-site. *Bioremediation area inspection:* A visual assessment of the biopiling area will be performed by the Contractor on a fortnightly basis to observe that the work area is secure, fencing is in place, bund is intact, covers over piles/windrows are secure and that the SVE system is functioning correctly. Monitoring of SVE system emissions to inform the change-out of filter media is specified in the AQMP and Stage 2 Air Emissions Verification Report (AEVR). *Soil treatment progress monitoring:* Monitoring will be performed by the Validation Consultant to assess the progress of biological treatment. The stabilisation of VOC inlet concentrations will provide a trigger for soil validation sampling to be undertaken by the validation consultant until remediation criteria are met. Progress monitoring requirements have been outlined in the Stage 2 Detailed RAP. Upon completion of treatment works, a final validation sampling event will be performed to demonstrate that soils are acceptable for re-use on-site under a commercial/ industrial land use scenario. *Erosion and sediment control*: Attachment A of this SWMP presents an Interim ESCP for the Stage 2 area. The ESCP presents a number of controls that will be implemented within the Stage 2 area to manage surface water run-off. Section 5 of this plan outlines the inspection and monitoring proposed for the erosion and sediment controls. In addition to the above, baseline monitoring (using existing data, where available) and post-decommissioning monitoring of native soils beneath the bioremediation area will be performed to assess whether bioremediation works have impacted the treatment site.

Equipment Decontamination and Wheel Wash

Equipment may come into contact with impacted soils during excavation and transport from the excavation to stockpiling or biopiling areas. As such, a wheel wash will be operated by the Remediation Contractor throughout remediation works.

Validation Strategy

The selected remedial approach will involve the excavation of impacted soils (fill and clay) and residual LNAPL. Soil material will be treated via biopiling for beneficial re-use within future stages of the Project.

Based on the remediation approach presented, the following conditions are expected at completion of excavation works across the Stage 2 area:

Remediation Area	Expected Conditions on Completion of Remediation
AEC-3A, AEC-3C, AEC-3D, AEC-3E, AEC-14A and AEC-14B	– Excavation to the required Relative Level (RL) exposing underlying natural clay material (not impacted with visible LNAPL) on base; – Where residual LNAPL cannot practically be removed via excavation, this impacted soil material must be sampled to facilitate further risk assessment; – Backfill of remedial excavation with imported fill material (certified as VENM or ENM) or suitable validated material from the Western Area; and – Characterisation of excavated materials for re-use, on-site treatment (via biopiling) or offsite disposal.
AEC-1 and AEC-3B	– Excavation of the fill material exposing underlying natural clay material (not impacted with visible ACM) on base; – Backfill of remedial excavation with imported fill material (certified as VENM or ENM); and – Classification of excavated materials in accordance with the NSW EPA (2014) Waste Classification Guidelines for offsite disposal.
AEC-4	– Completed capping layer present over the AEC-4 area to effectively mitigate direct contact risks and minimise potential infiltration which may mobilise contaminants in groundwater.

The table below summarises the methodology to be adopted for the Stage 2 Validation Strategy.

Area / Material	Remediation Approach	Validation Approach	Required Analysis	Sampling density
Hydrocarbon Remediation Excavations: • AEC-3a, • AEC-3c • AEC-3d, • AEC-3e, • AEC-14a; • AEC-14b	Complete excavation of impacted soil materials and potential LNAPL (where present)	Visual assessment of excavation surface on a systematic basis for the presence of LNAPL or soils with PID headspace screening results >100 ppm. The presence of LNAPL and/ or PID screening result >100 ppm should be used to guide further excavation to the extent practicable. Validation sampling from final excavation walls and floor surfaces.	BTEXN, TRH C6-C40, Carcinogenic PAHs (as B(a)P TEQ) And If field headspace screening with PID >100ppm and/or reported concentrations > SSTLs:	**Walls** • 1 sample per 10 lineal metres or 1 sample from each wall if excavation wall <10 m. • Additional sampling at the same frequency to be conducted for each material type present **Base** • 10 x 10m off-set grid (herringbone) pattern

Soil and Water Management					
				• TRH Specification (CWG fractions) If TRH C10-C40 fractions exceed NEPM TRH Management Limits then the silica gel clean-up analysis will be used to confirm the result	
	Stockpiled Excavated Soil Materials from Hydrocarbon Excavations: • AEC-3a, • AEC-3c • AEC-3d, • AEC-3e, • AEC-14a; • AEC-14b	Biopiling to treat soil materials for on-site beneficial re-use	Visual assessment of soil for the presence of LNAPL. Sampling of stockpiled soil to determine suitability for beneficial re-use or if further treatment is required.	As above	• 0-250 m^3 – 1 sample per 25 m^3 (minimum 3 per stockpile) • 250-2500 m^3 10 samples (minimum number for calculation of 95% UCL); and • >2500 m^3 – 1 sample per 250 m^3
	Asbestos Remediation Excavations: • AE-1; • AEC-3b	Complete excavation of ACM hotspot	• Visual assessment of excavation surface and walls on a systematic basis for the presence of ACM by a competent person. • Field sieving (to 7 mm) of 10 L samples for gravimetric assessment and calculation of %w/w of ACM. • Documentation of condition of ACM. • Based on the existing dataset, asbestos is expected to be present in the form of bonded ACM. Should ACM be identified as degraded with potential for AF/FA, collection of a 500 g sample of sieved soil material will be required for quantification of asbestos fines	• Confirmatory laboratory analysis (asbestos ID) or suspected ACM (if identified) If potential for asbestos fines identified: • Laboratory quantification for asbestos fines / Fibrous Asbestos (%w/w)	**Walls** • 1 sample per 10 lineal metres or 1 sample from each wall if excavation wall <10 m (targeted at fill material) **Base** • 10 x 10m off-set grid (herringbone) pattern
	Stockpiled Excavated Soil Materials from	Off-site disposal of excavated materials	Classification of soil in accordance with the NSW EPA (2014) Waste Classification Guidelines: Part	Use of existing in-situ data, plus the following: • BTEXN	• 0-250 m^3 – 1 sample per 25 m^3 (minimum 3 per stockpile)

Soil and Water Management						
	AEC-1 and AEC-3b		1: Classifying Waste and disposal to an appropriately licenced facility.	• TRH C6-C40, VOC, PAHs, Phenols, Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg, Cr6+), • PCBs • OCPs • OPPs	• 250-2500 m^3 10 samples (minimum number for calculation of 95% UCL); and • >2500 m^3 – 1 sample per 250 m^3
	Temporary stockpile footprint (if not conducted on hardstand)	Over-excavation of stockpiled materials.	Should a stockpile be placed on the footprint of a planned remediation to be undertaken at later stages of the Project, separate validation for residual stockpile impacts is not considered warranted.	• As per COPC of previously stockpiled material	• 10 x 10m off-set grid (herringbone) pattern
	Capping layer at AEC-4	Construction of an engineered cap to achieve the following: • **Physical Separation:** reduce potential for inadvertent direct contact with contaminated soils or disturbance of asbestos in soils by future on-site workers conducting excavations; • **Water Exclusion:** reduce potential for surface water infiltration at the ground surface, therefore reducing potential contaminant mass flux and LNAPL in groundwater from	Verification that capping layer construction has been completed in accordance with the detailed design • Review of contractor quality documentation (ITP/ ITRs) • Photographic evidence and inspection confirming installation of marker layers/liners as per Detailed design • Pre works comparison with Final surveyed RLs of completed capped surface to verify cap construction thickness • Geotechnical reports or testing certificates confirming compliance with Detailed design specification for permeability, material type and compaction • Groundwater monitoring at boundary locations to confirm continuation of no unacceptable impacts to off-site receptors (as detailed within Groundwater Monitoring Program).	As detailed within Groundwater Monitoring Program	As detailed within Groundwater Monitoring Program.

Soil and Water Management					
		the buried waste area			
	Imported Materials	-	Classified as VENM, ENM as defined under the Protection of the Environment Operations (POEO) Act 1997.	As required	As required
	Additional sampling along alignment of proposed roadway		Collection of additional samples to confirm suitability for proposed land use and/or LTEMP requirements	• BTEXN; • TRH C6-C40 • PAHs (50% of samples) • Metals (50% of samples) If building or demolition material noted within fill: • Field sieving for gravimetric quantification of ACM; and • AF + FA quantification (%w/w)	2 samples at each of 4 additional sample locations to reduce spatial gaps in the data
	Additional delineation sampling around TP21/79 (AEC-3e)		Collection of additional samples to refine remediation area AEC-3e.	• BTEXN, TRH C6-C40 • Carcinogenic PAHs (as B(a)P TEQ And if PID>100 ppm and/or reported concentrations > SSTLs or management limits then the following additional analysis will be required • TRH C10-C40 after silica gel clean-up • TRH Specification (CWG fractions)	2 samples at each of 4 additional sample locations to delineate impacts at AEC-3e.
	Waste		If off-site disposal of excavated materials is required, this will be undertaken in accordance with the NSW EPA (2014) Waste Classification Guidelines: Part 1: Classifying Waste.	As required	• 0-250 m^3 – 1 sample per 25 m^3 (minimum 3 per stockpile) • 250-2500 m^3 10 samples (minimum number for calculation of 95% UCL); and • >2500 m^3 – 1 sample per 250 m^3

Soil and Water Management					
	All excavated and placed impacted materials, imported materials, and waste	-	Material Tracking Register, as outlined in Section 12.3.8 of the Stage 2 Detailed RAP	-	-

Material Tracking

A Material Tracking Register will be maintained by the Validation Consultant on-site which will provide information regarding the source, characteristics, destination and quantities of material placed within containment locations, disposed off-site or imported to the Stage 2 Area for backfilling purposes.

The contractor's nominated site representative will collate all the required materials tracking information for material imported to site and material taken off-site as waste to the Validation Consultant for incorporation into subsequent validation reporting.

Soil Treatment Contingencies

Releases from bioremediation area: In the event of a release of impacted soil and/or storm water from the bioremediation area, measures will be taken as soon as reasonably practicable to stop the release, perform necessary repairs and collect released soil/stormwater. Areas affected by the release will be assessed and managed consistent with the requirements of EPL 570, POEO 1997 Act and Contaminated Land Management (CLM) Act 1997.

Soil and Water Management Plan- Mitigation and Management Measures					
Reference	Source Reference	Aspect	Mitigation and Management Measure	Responsibility	Frequency
SWMP1	DC: B19-B21, B26, C12 EPL 570: P1, L5, O4, O6, M1, M2, M3, M5 & M7, U1 MMM: SGC1, SGC2, SW1, SW2, SW4 & SW5	Soil and water management	The Project will be delivered to meet the objectives, performance criteria and key performance indicators outlined in this plan. Compliance with the objectives, performance criteria, key performance indicators and the mitigation and management measures will be demonstrated.	Remediation Contractor	At all times
SWMP2	MMM: SGC1	Acid sulfate soils management plan	The presence of acid sulfate soils at proposed excavation areas will be confirmed prior to undertaking excavation. Where the presence of ASS has been identified, the contractor will prepare an ASSMP for their respective work areas in accordance with the *Acid Sulfate Soils Assessment Guidelines* (NSW Acid Sulfate Soils Management Advisory Committee, 1998) to guide the ongoing monitoring and management of ASS within their respective work area. The ASSMP will include:	Remediation Contractor	Two weeks prior to commencement of preparation works, where required

Soil and Water Management Plan- Mitigation and Management Measures					
Reference	Source Reference	Aspect	Mitigation and Management Measure	Responsibility	Frequency
			• measures to manage ASS that may need to be excavated from the Project Area. These measures will be in accordance with the Waste Classification Guidelines Part 4: Acid Sulfate Soils (NSW EPA, 2014) • contingency measures to manage impacts that have the potential to occur if specified management strategies fail, and to outline remediation and restoration actions that may be required.		
SWMP3	MMM: SCG2	Asbestos management plan	The contractor will prepare an Asbestos Management Plan that: • is produced in line with the Work Health and Safety Act 2011 and supporting Regulations 2017, the PoEO (Waste) Regulation 2014 and NSW EPA Waste Classification Guidelines (NSW EPA, 2014a) • details how asbestos (i.e. in soils and unexpected materials) will be managed • includes an unexpected find procedure for asbestos material • includes management measures required for the appropriate handling of soils containing asbestos • identifies a dedicated area within the Project Area for storing asbestos waste prior to disposal.	Remediation Contractor	Two weeks prior to commencement of preparation works

Soil and Water Management Plan- Mitigation and Management Measures					
Reference	Source Reference	Aspect	Mitigation and Management Measure	Responsibility	Frequency
SWMP4	DC: B20(d) MMM: SGC2 & SW1, SW5	Progressive erosion and sediment control plans	The contractor will prepare Progressive Erosion and Sediment Control Plans (PESCPs) for each component (preparation, remediation and demobilisation) of the works to detail the implementation of measures to minimise erosion and movement of sediment due to remediation works. PESCPs will be prepared in accordance with Managing Urban Stormwater: Soils and Construction, 2004, or its latest version. PESCPs will include the following, with the aim of helping to segregate and manage stormwater runoff where existing systems have been removed: • the use of geotextile liners, temporary capping or other suitable measures to reduce infiltration of surface water runoff • installing silt fences around stockpiles to reduce erosion • installing silt and sediment traps across stormwater drains in proximity to excavation areas • placing stockpiles on impermeable sheeting to prevent infiltration, where possible • locating stockpiles away from council stormwater drainage systems • details of measures to divert clean surface water away from contaminated areas • details of settling ponds (if required) • progressive covering and vegetation of remediated areas. Attachment A of this SWMP provides a ESCP for the Stage 2 area. Future PESCPs for the Stage 2 area will be developed to integrate with this plan.	Remediation Contractor	Two weeks prior to commencement of preparation works, remediation works or landforming works as required.
SWMP5	DC: B20(f) EPL 570: L1 MMM: SCG2	Groundwater management method statement	The contractor will develop a groundwater management method statement (GMMS) to address the storage, movement and treatment of water encountered in excavations. This GMMS will be developed in accordance with the Stage 2 Detailed RAP and prepared by a suitably qualified expert in consultation with Viva Energy. Measures within the GMMS will include the collection, testing and disposal off-site of groundwater encountered during Stage 2 excavations.	Remediation Contractor	Two weeks prior to commencement of preparation works
SWMP6	DC: B20(e), B20(g), B20(h), B20(i) & B20(j) EPL 570: L1 MMM: SCG2	Surface water management method statement	The contractor will develop a surface water management method statement (SWMMS) developed in accordance with the Stage 2 Detailed RAP, prepared by a suitably qualified expert in consultation with Viva Energy. The SWMMS will outline measures to: • divert clean surface water away from excavated remediation areas and direct to existing stormwater/wastewater management systems • outline control measures for removing incidental rainfall from bunded remediation areas and transferring it to a holding tank prior to testing and off-site disposal	Remediation Contractor	Two weeks prior to commencement of preparation works

Soil and Water Management Plan- Mitigation and Management Measures					
Reference	Source Reference	Aspect	Mitigation and Management Measure	Responsibility	Frequency
			• detail the use of existing bunded areas and drainage systems for biopiling activities, as described by the Stage 2 Detailed RAP • describe the measures to manage surface water during excavation and removal of sub-surface infrastructure • manage the use of existing bunded areas and drainage systems for biopiling activities • cover contaminated stockpiles (i.e. where available soil data indicates that excavated fill material may generate impacted leachates), and biopiles with impermeable sheeting when not being actively managed (e.g. created, moved, turned etc.). The SWMMS will also include: • the design of any leachate collection systems around remediation areas • stockpile and biopile management measures to minimise the generation of leachate and include design specifications for any liners and impermeable covers such as polypropylene or similar and as described in the Stage 2 Detailed RAP.		
SWMP7	EPL 570: L1, MMM: SW5	Control of sediment dispersal	In the event that settling ponds are required, relevant design criteria from the Blue Book (Landcom, 2004) will be adopted. Key principles and practices for the control of sediment dispersal will include: • using settling ponds to collect runoff from excavation areas and settle out associated sediments and potential contaminants • settling ponds will be lined to avoid interactions with groundwater • if water from an overtopped excavation is captured in a settling pond, this water will be transferred to a holding tank prior to off-site disposal • the sediments settled in the ponds will be tested and characterised before disposal off-site or reuse on-site, either directly or following treatment. Depending on the characteristics of this sediment, these materials may need to be collected, appropriately stored and transported off-site to an appropriately licensed waste facility. Sections 5 and 6 of the ESCP (Attachment A) details how the sediment basin will be used to control sediment dispersal in the Stage 2 area.	Remediation Contractor	As required, if settling ponds are to be used
SWMP8	MMM: SCG2	Storage of chemicals	Potential chemical pollutants (e.g. fuels, additives, etc.), will be stored in appropriate containers and/or within bunded and lined areas to minimise the risk of spillages or mobilisation of these pollutants into soil and groundwater.	Remediation Contractor	At all times

Soil and Water Management Plan- Mitigation and Management Measures					
Reference	Source Reference	Aspect	Mitigation and Management Measure	Responsibility	Frequency
SWMP9	MMM: SCG2	Location of spill kits	Spill kits to be provided at locations where chemicals or fuels that could potentially be spilt or leaked are being stored.	Remediation Contractor	At all times
SWMP10	MMM: SCG2	Decontamination and wheel wash method statement	A wheel wash is to be installed, operated and maintained at site access points to reduce soil on roads and dust. The contractor will develop a method statement and methodology for wheel wash operations and outline decontamination procedures to reduce the inadvertent spreading of contaminated soil residues from excavation equipment and trucks both on- and off-site.	Remediation Contractor	At all times
SWMP11	DC: B20(b) EPL 570: L1, L3, L4 and L5.10 MMM: SW1	WWTP discharge limits	Discharges from the existing Clyde Terminal Wastewater treatment plant (WWTP) at the Site will be monitored in line with the requirements of EPL 570. Note: This measure is not relevant for the Stage 2 works as the Stage 2 area has been disconnected from the WWTP. The measure has been retained as it is a requirement of the development consent and the EPL.	Viva Energy Clyde Terminal Operations Manager	At all times
SWMP12	DC: B20(c) & B20(k) EPL 570: L5.10 MMM: SW1	Wastewater management method statement	The contractor will develop a Wastewater management method statement (WwMMS) in accordance with the Stage 2 Detailed RAP, prepared by a suitably qualified expert in consultation with Viva Energy to: • provide details of the control measures to be implemented to ensure wastewater generated by remediation activities will be disposed of off-site to an appropriately licensed facility • provide details of the control measures to be implemented to protect water quality in the Duck River during the Project, including measures to address any identified impacts to receiving waters and contingency measures for any unexpected pollutants • detail proposed monitoring to ensure the development complies with the discharge requirements of the EPL and the monitoring requirements of the SWMP.	Remediation Contractor	Two weeks prior to commencement of remediation works for each stage
SWMP13	DC: B19 EPL 570: L1	Pollution of waters	The development must comply with section 120 of the POEO Act, which prohibits the pollution of waters, except as expressly provided for in an EPL.	Remediation Contractor	At all times
SWMP14	MMM: SW1	Managing potential excavation overflows	If required, temporary settling ponds are to be located down gradient of remediation areas to manage potential excavation overflow events.	Remediation Contractor	As required, if settling ponds are to be used
SWMP15	MMM: SW1	Water reuse	Where appropriate, water collected in excavations or stormwater controls is to be reused for dust suppression or wheel washing.	Remediation Contractor	As appropriate

Soil and Water Management Plan- Mitigation and Management Measures					
Reference	Source Reference	Aspect	Mitigation and Management Measure	Responsibility	Frequency
SWMP16	MMM: SW1	Storage of materials	Storage of materials being utilised for the Project to be located away from Duck River and the surface water drains.	Remediation Contractor	At all times
SWMP17	EPL 570: L4 MMM: SW2	Storage of chemicals	Potential chemical pollutants (e.g. fuels, additives, etc.), to be stored in appropriate containers and/or within bunded and lined areas to minimise the risk of spillages, or mobilisation of these pollutants into aquatic environments in the event that a storm surge or flood event impacts the Project Area.	Remediation Contractor	At all times
SWMP18	MMM: SW4	Management of surface water flows	The site drainage network within the Stage 2 Area has been decommissioned and isolated from the Clyde Terminal Wastewater Treatment Plant (WWTP). Stormwater and wastewater can no longer flow from the Stage 2 area to the on-site WWTP. Surface water flows will be managed in line with the ESCP is provided in Attachment 1 of this SWMP. Any future PESCPs will be developed to integrate with this plan. Where excavations related to remediation activities are required, surface water captured within those excavations will be collected, tested and if it cannot be reused on-site, will be disposed off-site.	Remediation Contractor	As required and until the Stage 2 works are complete

Soil and Water - Monitoring Requirements			
Aspect	Description	Responsibility	Timing
EPL 570 Monitoring [SW1]	Monitoring requirements will be fulfilled as required in EPL 570.	Viva Energy Clyde Terminal Operations Manager	As required. In line with the EPL
Inspection of erosion and sediment controls [SW1]	Routine inspections to monitor the implementation and integrity of the erosion and sediment control structures, including: • routine inspections of excavations to instigate the pump out of water accumulating in excavations • inspections in line the ESCP provided in Attachment A to this SWMP.	Remediation Contractor	At all times or as detailed within the ESCP
Monitoring of groundwater [SCG2]	The proposed groundwater monitoring for the Stage 2 works is outlined in the Clyde Western Area Remediation Project Stage 2 Groundwater Monitoring and Management Plan (GMP) and Groundwater Monitoring Program (GWMP) attached to the Stage 2 REMP.	Western Area Remediation Project Manager and Validation Consultant	As outlined in the GMP and GWMP
Testing of hydrocarbon remediation excavations	Testing of excavation base and wall to validation remediation in line with the approach outlined in Section 12.3 of the Stage 2 Detailed RAP (ERM, 2021).	Validation Consultant	On completion of excavation
Testing of stockpiled excavated soil	Testing of stockpiled material to enable classification prior to reuse or disposal	Validation Consultant	As required, minimum of 3 per stockpile
Assessment of asbestos remediation excavations	Assessment and documentation of excavated surface material for the presence of ACM in line with the approach outlined in Section 12.3 of the Stage 2 Detailed RAP (ERM, 2021).	Validation Consultant	On completion of excavation
Assessment of capping layer	Verification that capping layer construction has been completed in accordance with the detailed design	Validation Consultant	On completion of construction
Testing of leachate and accumulated water in excavations	Leachate and accumulated water in excavations related to remediation activities will be collected and tested prior to off-site disposal.	Remediation contractor	As required
Inspection of bioremediation area	A visual assessment of the biopiling area to observe that the work area is secure, fencing is in place, bund is intact, and covers over piles/windrows are secure.	Remediation contractor	Minimum weekly basis
Soil treatment progress monitoring	Monitoring to assess the progress of biological treatment. Progress monitoring requirements have been outlined in the Stage 2 Detailed RAP (ERM, 2021). Once biopiling of soils has commenced, inlet concentrations of VOC, as measured at the pre-filter port of the SVE system with a PID will be used to determine timing for validation sampling of soil. This timing will be based on observed stabilisation of VOC concentrations for a period of 3 weeks. Upon completion of treatment works, a final validation sampling event will be performed to demonstrate that soils are acceptable for re-use on-site under a commercial/ industrial land use scenario.	Validation Consultant	As required. Sampling of soils undertaken based on stabilised inline concentration of VOCs, as measured from SVE system.

Soil and Water - Monitoring Requirements			
Baseline and post-decommissioning monitoring	Monitoring (using existing data, where available) of native soils beneath the bioremediation area to assess whether bioremediation works, including temporary stockpiles, have impacted the treatment site	Validation Consultant	On completion of remediation / on removal of temporary stockpile
Inspection of equipment and plant [SCG2]	Regular inspections of remediation equipment and plant to be carried out to ensure the potential for leaks are minimised and identified issues are rectified.	Remediation Contractor	At all times
General	Ad hoc visual observations to ensure compliance with soil and water management requirements	Remediation Contractor	At all times
General	Quarterly audits against the requirements of this SWMP and any active GMMS, SWMMS, WwMMS or DWWMS	Remediation Contractor and Viva Energy	Quarterly

Soil and Water – Reporting Requirements			
Aspect	Description	Responsibility	Frequency
Material tracking	A Material Tracking Register will be maintained by the validation consultant on-site which will provide information regarding the source, characteristics, destination and quantities of material placed within containment locations, disposed off-site or imported to the Stage 2 Area for backfilling purposes. The contractor's nominated site representative will collate all the required materials tracking information for material imported to site and material taken off-site as waste to the Validation Consultant for incorporation into subsequent validation reporting.	Remediation Contractor	At all times
Annual report	Provide input for the Annual Report regarding a comparison of water discharges with established discharge criteria for contaminants of concern.	Western Area Remediation Project Manager	Annually

Soil and Water – Reporting Requirements			
Clyde Soil and Groundwater Monitoring Program	In accordance with EPL 570 U1.1 and DC condition C12, Viva Energy will prepare a report, for submission to the EPA's Manager Sydney Industry. The report will include: (a) a summary of groundwater monitoring results for the previous 12 months; (b) details of any soil or groundwater investigations undertaken and the results of such investigations; (c) details of the progress against works proposed in the previous year's report; (d) an update of the conceptual site model (CSM) if conditions change significantly; (e) an update of the Soil and Groundwater Monitoring Program (SGMP) if required. (f) a comprehensive review of the monitoring results and complaints records of the remediation over the previous year, to demonstrate the effectiveness of the remediation works, including a comparison of water discharges with established discharge criteria for contaminants of concern. The Remediation Contractor must provide to Viva Energy the required data, to allow Viva Energy to complete the report.	Remediation Contractor and Viva Energy	Annually

Soil and Water - Corrective Action			
Aspect	Description	Responsibility	Frequency
Non-compliance with EPL570 limits, DC or MMMs	An investigation and as required, corrective action and update to the SWMP, will be undertaken in line with Section 4.6 and 6.4 of the REMP, should any of the following occur: • Non-compliance raised • Complaints from the local community; • Incident involving pollution of water or land (both on or off site) has occurred; or • Monitoring results above specific limits in the EPL of Detailed RAPs.	Project Environment Lead	Ongoing, as required

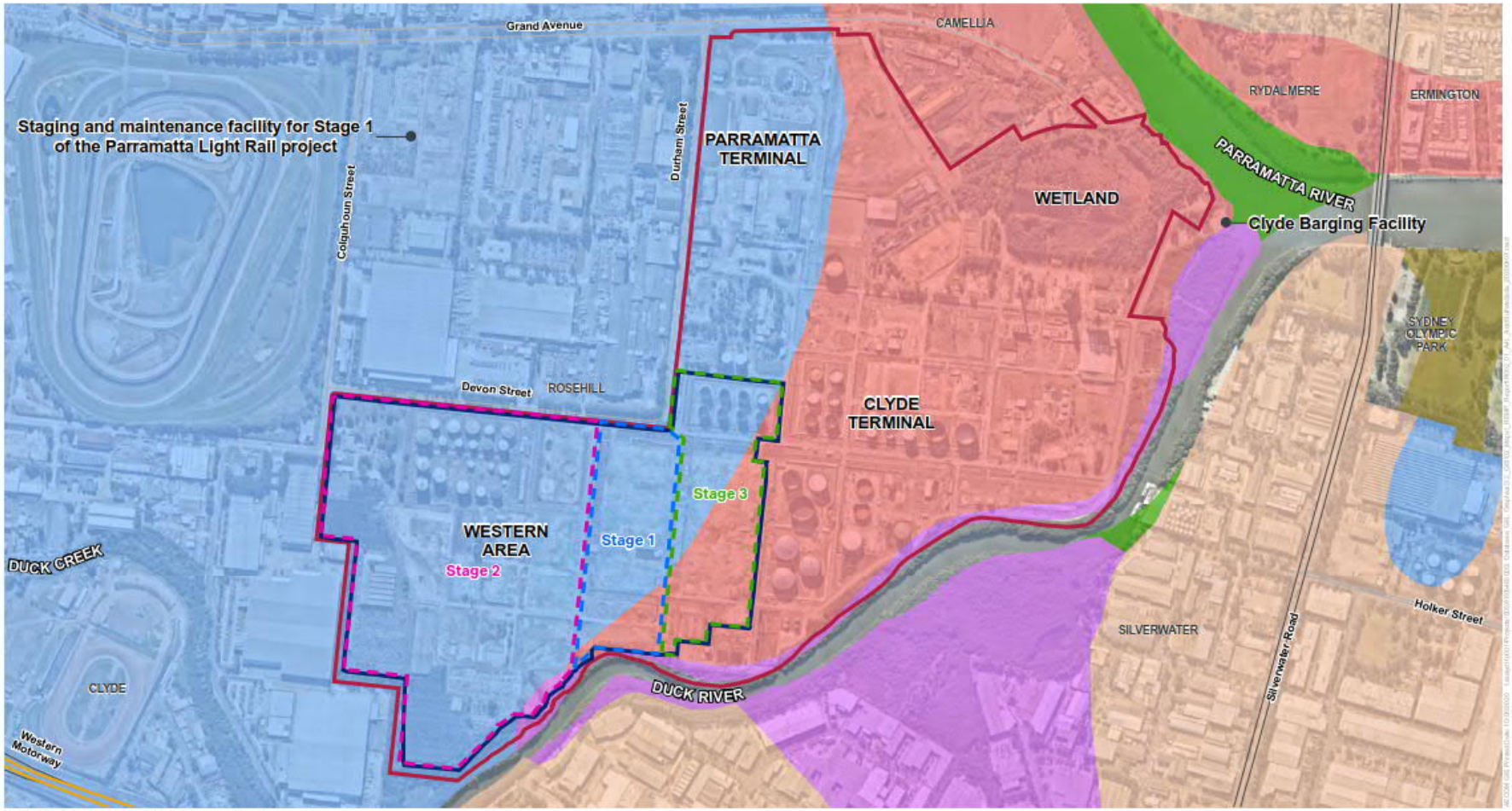
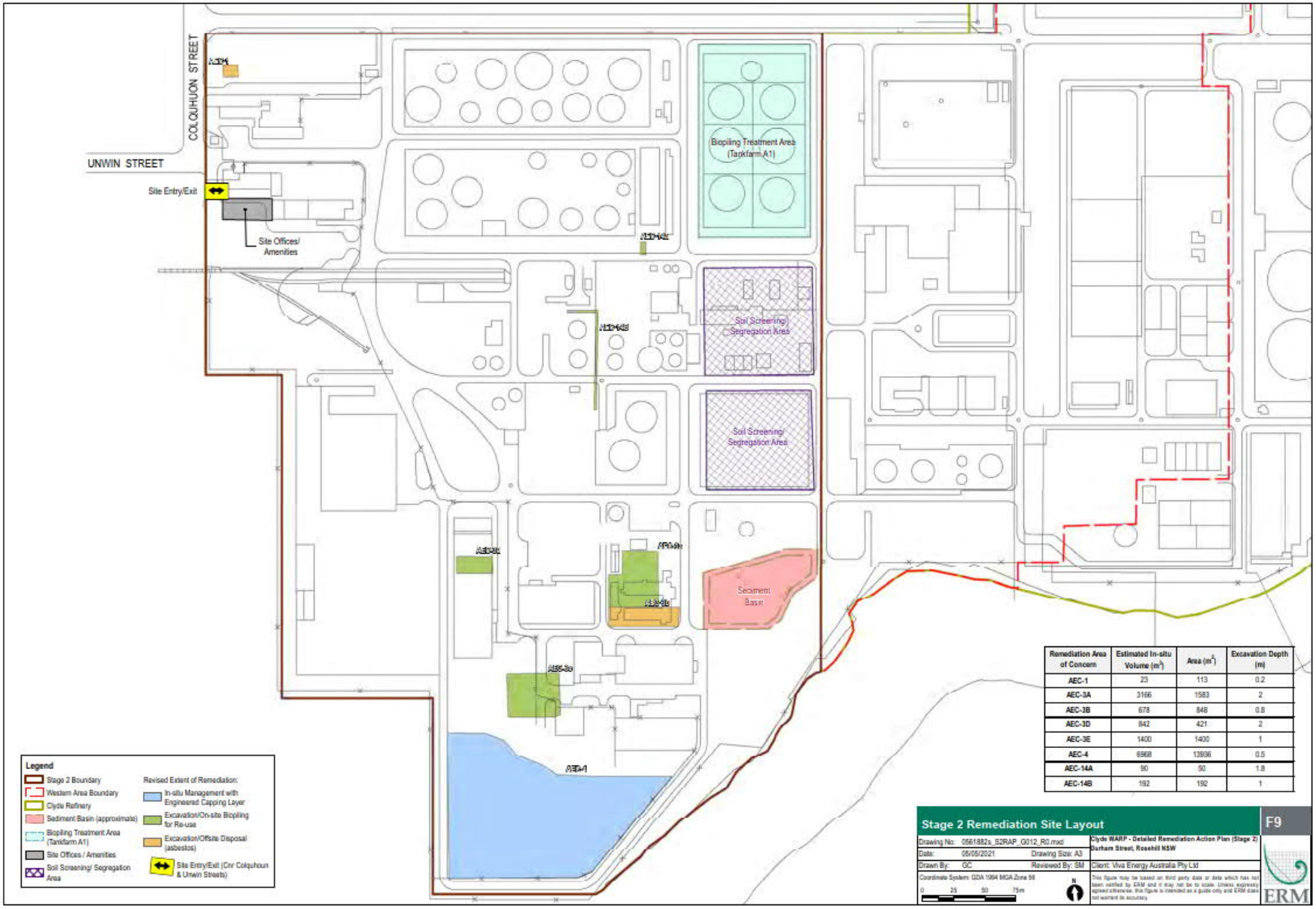


FIGURE B.2-1: ACID SULFATE SOILS

Figure B.2-1 – Potential Acid Sulphate Soils



Remediation Area of Concern	Estimated In-situ Volume (m^3)	Area (m^2)	Excavation Depth (m)
AEC-1	23	113	0.2
AEC-3A	3166	1583	2
AEC-3B	678	848	0.8
AEC-3D	842	421	2
AEC-3E	1400	1400	1
AEC-4	6968	13936	0.5
AEC-14A	90	50	1.8
AEC-14B	192	192	1

Figure B.2-2 Stage 2 Remediation Layout

Attachment A – Erosion and Sediment Control Plan

Soil and Water Management Plan

Soil and Water Management					
Document Control	Revision	Date	Description	Author	Approved
	5.0	21/07/2021	Final for consultation	AECOM	WM
Background	The Conditions of Consent for SSD 9302 require a Soil and Water Management Plan (SWMP) to be produced as a subplan to the Remediation Environmental Management Plan (REMP) for the Clyde Western Area Remediation Project (the Project). This document provides the SWMP for Stage 2 of the Project. This SWMP applies to the remediation phase for Stage 2, including preparation works, remediation works and demobilisation.				
Objectives	• Minimise and manage impacts to both soil and water during delivery of the Project • Ensure compliance with relevant legislative and other requirements including the Development Consent (DC) (SSD 9302) management and mitigation measures (MMMs) in Appendix 2 of the DC and the Environment Protection Licence (EPL) 570 • Manage soils and water in line with relevant controls in the Detailed Remedial Action Plan(s) (RAP(s)) or relevant Progressive Erosion and Sediment Control Plans (ESCPs).				
Performance Criteria	• No scouring or erosion caused by overland flows onto adjacent properties • Pollutant levels in discharged water are within the criteria contained in legislative and other requirements including DC and EPL 570.				
Key Performance Indicators	• No exceedances of EPL 570 water discharge limits due to surface water discharges from the Project • No environmental harm to ecological values close to the Western Area caused by spills or leaks • No prosecutions or Penalty Infringement Notices (PIN) associated with the Project.				
Legislative Requirements	Development Consent Conditions [Dated 7 May 2020]				
	Discharges	B19. The development must comply with section 120 of the POEO Act, which prohibits the pollution of waters, except as expressly provided for in an EPL.			
	Soil and Water Management Plan	B20. Prior to the commencement of preparation works, the Applicant must prepare a Soil and Water Management Plan (SWMP) to the satisfaction of the Site Auditor and the Planning Secretary. The SWMP must: (a) be prepared by a suitably qualified and experienced person(s), in consultation with the EPA (b) characterise the quality of discharges from the wastewater treatment plant during the development, including the concentrations and loads of all pollutants present at non-trivial levels for typical and worst-case conditions (c) describe the control measures to be implemented to protect water quality in the Duck River during the development, including measures to address any identified impacts to receiving waters and contingency measures for any unexpected pollutants (d) detail the erosion and sediment controls to be installed and maintained for the development, in accordance with the relevant requirements of *Managing Urban Stormwater: Soils and Construction – Volume 1: Blue Book* (Landcom 2004) (e) detail the measures to divert clean surface water away from contaminated areas (f) include a protocol for testing water accumulated in excavations and trigger levels for determining if it requires treatment or off-site disposal (g) detail the stockpile management measures to minimise the generation of leachate and include design specifications for any liners and impermeable covers (h) detail the design of any leachate collection systems around remediation areas			

Costin Roe Consulting

PRECISION | COMMUNICATION | ACCOUNTABILITY

INTERIM EROSION AND SEDIMENT CONTROL PLAN – STAGE 2 AREA

PART LOT 100 DP 1168951
9 DEVON STREET, CLYDE NSW

Prepared For:
VE Property Pty Ltd
Level 16, 720 Bourke Street
Docklands VIC 3008

Prepared by:
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Level 1, 8 Windmill Street
WALSH BAY NSW 2000

***Rev*: E**

DOCUMENT VERIFICATION

Project Title	Part Lot 100 DP1168951, 9 Devon Street, Clyde
Document Title	Interim Erosion and Sediment Control Plan – Stage 2 Area
Project No.	Co13919.03
Description	Interim Erosion and Sediment Control Plan - Stage 2 Area
Client Contact	VE Property c/- Mr Jeffrey Lord, DBL Property

	Name	**Signature**
Prepared by	Xavier Cure	XC
Checked by	Mark Wilson	MW
Issued by	Xavier Cure	XC
File Name	13919.03-01e.rpt	

Document History

Date	**Revision**	**Issued to**	**No. Copies**
30 Oct. 2020	A	Mr Jeffrey Lord, DBL Property	PDF
16 Nov 2020	B (Draft)	Mr Jeffrey Lord, DBL Property	PDF
4 Dec 2020	C (Draft)	Mr Jeffrey Lord, DBL Property	PDF
9 Dec 2020	D	Mr Jeffrey Lord, DBL Property	PDF
18 Mar 2021	E	Mr Jeffrey Lord, DBL Property	PDF

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APPENDICES

APPENDIX A Costin Roe Consulting ESCP drawings

1 INTRODUCTION

1.1 Background

Costin Roe Consulting Pty Ltd has been commissioned by VE Property Pty Ltd to prepare this *Interim Erosion and Sediment Control Plan (ESCP)* for the Stage 2 area (the site) as part of the Western Area Remediation Project (WARP). The Project (SSD_9302) was assessed by the NSW Department of Planning, Industry and Environment (DPIE) and approved by the Minister for Planning and Public Spaces on 7 May 2020.

This ESCP has been completed with consideration to the requirements of *Managing Urban Stormwater - Soils and Construction Volume 1 (Landcom 2004)* and is an appendix to the Stage 1 Soil and Water Management Plan (SWMP) for the WARP.

1.2 Scope

This ESCP provides details of;

- site erosion and sediment controls for the Stage 2 area after completion of the Stage 1 remediation and landforming works; and
- design principles and construction requirements for stormwater management controls, specifically for the construction of a sediment basin for the Stage 2 area as interim measures prior to the Stage 2 remediation works. Further erosion and sediment control plan/s will be developed as part of the planning for the Stage 2 remediation works.

The ESCP should be read in conjunction with the *Erosion and Sediment Control* (ESC) design package, drawings **Co13919.03-DA10, DA23, DA25** and **DA26** as included in **Appendix A**.

2 SITE DETAILS

2.1 Location & Site Description

The site is located on the western portion of Lot 100, DP 1168951, 9 Devon Street, Clyde, NSW.

The site is bounded by Duck River along its southern border, industrial developments along its western, northern border and Viva Clyde Terminal to the east. The Rosehill Gardens raceway is also located to the northwest of the site and the confluence of Duck River with the Parramatta River is approximately 1.4 km east of the site.

The site is located within the City of Parramatta Local Government Area (LGA).

The land was formerly used as part of the Shell Oil Refinery. It was recently cleared of refinery structures and infrastructure and is currently undergoing remediation works.

Existing levels through the site vary between RL 3.7m AHD and RL 6.5m AHD.

Surrounding levels on Colquhoun Street range from approximately RL 4.6m to 4.9m AHD. Surrounding levels on Devon Street range from approximately RL 4.5m to 5.1m AHD. Site grading is generally flat due to the former use of the land as the Shell Oil Refinery. Generally falls across the site is from north to south at grades of 0.5% to 1%.

2.2 Existing Geology & Soils

The geology of the Clyde Terminal including the former Western Area has been characterised into four units, based on investigations completed by ERM and interpretation of soil bore log data obtained during previous investigations. A summary of the strata identified during historical investigations is detailed below:

- Unit 1 (fill material) – this is a poorly compacted mixture of silt, clay and gravel, with localised areas of slag, furnace ash and concrete. This material was used to raise the level of the surface of the low-lying tidal swamp/mangrove area along the Parramatta and Duck rivers. The fill material pinches out to the west.
- Unit 2 (estuarine sediments) – comprises silty clay-clayey silt with occasional sandy lenses and shell fragments to a thickness of approximately 4 m. The unit generally thickens towards the Parramatta River and represents the natural profile prior to historic development and filling.
- Units 3 and 4 (alluvial sediments and residual clay) – Tertiary alluvial sediments (up to 20 m thick, including clay with sandy lenses) and residual Ashfield Shale were reported in previous investigations.

The average thickness of fill material within the Stage 1 & 2 Area is 0.6 m. Fill material is underlain by high plasticity clay (alluvial sediments) across the majority of these areas.

2.3 Groundwater

Discussion on groundwater is included in the ERM reports; Remedial Site Investigation (RSI) (ERM, 2020) and the Stage 1 Detailed Remedial Action Plan (ERM, 2020). A summary is detailed below:

Groundwater is represented as a shallow unconfined water zone within the fill material and estuarine alluvial sediments at depths between 1-3 m bgl. Investigations indicate there are semi-confined conditions in silts and sands at depths of 4 – 8.5 m bgl.

The hydraulic gradients calculated across the site indicate that the direction of groundwater flow may be subject to rainfall events and localised groundwater mounding, but has generally been established to the south and south-east towards the bounding Duck River. Average hydraulic gradients are to range between 0.003 m/m along the upgradient portion of the Western Area to 0.011 m/m across the southern portions of the Western Area.

Hydraulic conductivity has been established to be low across the large majority of the Site, with estimated hydraulic conductivity values estimated for wells that were screened across clay, sandy clay and gravelly clay typically ranging from 5x10-5 m / day to 6x10-3 m/day. Generally, hydraulic conductivity values increased from a minimum 5 x 10-5 m/day at the upgradient site boundary to up to 4 x 10-2 m/day closer to the southern site boundary due to the presence of sand/silt estuarine deposits closer to the Duck River.

ERM notes that during completion of the RSI, the potential for tidal influences were measured within boundary monitoring wells. Results of this investigation indicated no significant tidal interactions with groundwater.

3 GENERAL REQUIREMENTS

3.1 Reference Documents

This document has been completed in accordance with the guidelines in *Managing Urban Stormwater - Soils and Construction Volume 1 (Landcom 2004)*.

Erosion and sediment controls are shown on drawings **Co13919.03-DA10** and **DA23** with details of various measures shown on drawings **Co13919.03-DA25** and **DA26** (refer to **Appendix A**) for works within the project boundaries. This ESCP is to be read in conjunction with the provided drawings.

4 SEDIMENT BASIN CONSTRUCTION

4.1 Background

The ESCP includes designs, which will be implemented to minimise water quality impacts in terms of sediment loading. The erosion and sediment control design drawings are included in **Appendix A** and listed in **Section 3.1** of this plan. The plan details the construction of a sediment basin to capture potential sediment laden surface water runoff from the largely unsealed sections of the Stage 2 area that do not drain to the Council drain.

4.2 During Construction of the Sediment Basin

The following minimum requirements will be met:

- Construction activities will be confined to the necessary construction areas.
- The provision of a stabilised site access to minimise the tracking of debris from tyres of vehicles leaving the site onto public roads. Construction exits will be nominated to manage the movement of construction access to defined locations. Refer to *Blue Book Standard Drawing SD 6-14* on drawing **Co13919.03-DA25**.
- A sediment fence will be constructed around the downstream side of material stockpiles and a diversion drain at the upstream side if required.
- Regular inspection and maintenance of sediment fences, sediment basins and other erosion control measures will be made.

5 EROSION & SEDIMENT CONTROL

5.1 Land Disturbance

Where practicable, the soil erosion hazard on the site will be kept as low as possible and as recommended in **Table 5.1** and stabilisation requirements included in **Table 5.2**.

Table 5.1 Limitations to access

Land Use or Zone	Limitation	Comments
Construction areas	Limited to 5 (preferably 2) metres from the edge of any essential construction activity as shown on the ESCPs (**Appendix A**).	All site workers will clearly recognise these areas that, where appropriate, are identified with barrier fencing (upslope) and sediment fencing (downslope), or similar materials.
Access areas	Limited to a maximum width of 5 metres	The site manager will determine and mark the location of these zones on site. They can vary in position so as to best conserve existing vegetation and protect downstream areas while being considerate of the needs of efficient works activities. All site workers will clearly recognise these boundaries.
Remaining lands, No Go-Zones, areas outside approved construction or development areas.	Entry prohibited except for essential management works	
Riparian Corridors	No construction (including clearing and maintenance access) is permitted within the riparian corridor	

5.2 Site access

1. Site entry to be constructed in accordance with Blue Book Standard drawing SD 6-14. These are noted to already exist as hardstand areas.
2. Site access will be restricted to the minimum practical number of locations – for this project the proposed site access is shown on ESCP drawings in **Appendix A**.
3. Site exit points will be appropriately managed to minimise the risk of sediment being tracked onto sealed, public roadways.

5.3 Soil and stockpile management

1. Stockpiling of topsoil and imported fill will be necessary.
2. Reference to Bluebook Standard Drawing SD4-1 will be made for measures relating to both general fill and topsoil stockpiling. This measure will be implemented throughout the works period.
3. All measures shall be taken to obtain the maximum benefit from existing topsoil and vegetation, including:
   (i) Where the proposed area of soil disturbance does not exceed 2500m^2, and the topsoil does not contain undesirable weed seed, the top 100mm of soil located within areas of proposed soil disturbance (including stockpile areas) must be stripped and stockpiled separately from the remaining soil.
   (ii) Where the proposed area of soil disturbance exceeds 2500m^2, and the topsoil does not contain undesirable weed seed, the top 50mm of soil must be stripped and stockpiled separately from the remaining topsoil, and spread as a final surface soil.
   (iii) In areas where the topsoil contains undesirable weed seed, the affected soil must be suitably buried or removed from the site.
4. Stockpiles of erodible material that has the potential to cause environmental harm if displaced, will be:
   (i) Appropriately protected from wind, rain, concentrated surface flow and excessive up-slope stormwater surface flows.
   (ii) Located at least 2m from any hazardous area, retained vegetation, or concentrated drainage line, and separated by appropriate controls.
   (iii) Located up-slope of an appropriate sediment control measure.
   (iv) Provided with an appropriate protective cover (synthetic, mulch, vegetative, or spray on polymer) if the materials are likely to be stockpiled for more than 20 days during construction.
   (v) Provided with an appropriate protective cover (synthetic, mulch or vegetative) if the materials are likely to be stockpiled for more than 10 days during those months that have a high erosion risk.
   (vi) Provided with an appropriate protective cover (synthetic, mulch or vegetative) if the materials are likely to be stockpiled for more than 5 days during those months that have an extreme erosion risk.
5. A suitable flow diversion system will be established immediately up-slope of a stockpile of erodible material that has the potential to cause environmental harm if displaced, if the up-slope catchment area draining to the stockpile exceeds 1500m^2 or unless otherwise suggested by the environmental representative or the site manager based on site-specific risk.

5.4 Drainage control

1. "Clean" surface waters will be diverted away from sediment control devices and untreated, sediment-laden waters.
2. Proper drainage will be maintained and drains will be checked to ensure that they are operating as intended.

5.5 Erosion control

1. All temporary earth banks, flow diversion systems, and embankments associated with constructed sediment basin or other flow diversion measures will be machine-compacted and stabilised per details. Bases of diversion drains to be geotextile protected, batters and embankments can be seeded and mulched for the purpose of establishing a temporary vegetative cover within 10 days after grading. Short term drains or embankments should consider other acceptable stabilisation measures to suit construction program.
2. Unprotected slope lengths will not exceed an LS-Factor of 0.27 and nominal values as noted below (per *Blue Book Table A1*):
    a. 300m at 1%
    b. 80m at 1.5%
    c. 30m at 2%
    d. 12m at 3%
    e. 5m at <6%
    f. All slopes >6% to be stabilised.
3. The construction and stabilisation of earth batters steeper than 6:1 (H:V) must be staged such that no more than 3 vertical-metres of any batter is exposed to rainfall at any instant and that upstream water is diverted away from batters.
4. All upstream catchments to be diverted (or otherwise managed) so that stormwater runoff does not flow directly down or across batter slopes. This could be achieved by diverting water around the batter or past the batter via an appropriately designed drainage chute.
5. Synthetic reinforced erosion control mats and blankets will not be placed within, or adjacent to, riparian zones and watercourses if such materials are likely to cause environmental harm to wildlife or wildlife habitats.

5.6 Sediment control

1. Optimum benefit must be made of every opportunity to trap sediment within the site, and as close as practicable to its source. Sediment controls are to be installed prior to the commencement of work in the contributing catchment area. Sediment control is to be managed using the primary measures as set out in **Sections 5.1-5.6**, with controls to be used as secondary measures to the practices set out in this ESCP and Landcom Blue Book;
2. Sediment fences and basins will be installed and operated to both collect and retain sediment.
3. The potential safety risk of a proposed sediment trap to site workers will be given appropriate consideration.

4. The measures detailed within this ESCP will be taken to prevent, or at least minimise, the release of sediment from the site.
5. Suitable all-weather maintenance access will be provided to all sediment control devices.
6. Sediment control devices will be de-silted and made fully operational after a sediment-producing event, whether natural or artificial, if the device's sediment retention capacity falls below 70% of its design retention capacity.
7. Materials, whether liquid or solid, removed from sediment control devices during maintenance or decommissioning, will be disposed of in a manner that does not cause ongoing soil erosion or environmental harm.

6 SEDIMENT BASIN OPERATION AND MANAGEMENT

6.1 General

1. This section of the report describes the general requirements for sediment basin, sizing and operation and management.
2. Sediment basins Type D (Soil Hydrological Group) construction.
3. Basin to operate as wet basin and 5-day cycle. The basin is designed to retain sediment-laden water allowing adequate time for the gravitational settlement of fine sediment particles.
4. Refer drawing **Co13919.03-DA23** for basin sizing calculations and basin location and drawings **Co13919.03-DA25** and **DA26** for basin details.
5. Basin sizing based on Landcom Blue Book and following parameters.
   a. Soil Hydrological Group D
   b. Design Rainfall Depth 5 days
   c. 5-day, 85% percentile Rainfall event 33.1mm
   d. Volumetric Runoff Coefficient 0.64
6. Required short-term sediment control measures will be installed downstream of the proposed earthworks to control sediment runoff during construction of the basin.
7. The area to be covered by the embankment, and incidental works, together with an area extending beyond the limits of each for a distance not exceeding five (5) metres all around will be cleared of all trees, scrub, stumps, roots, dead timber and rubbish and disposed of in a suitable manner.
8. All holes made by grubbing within the embankment footprint will be filled with sound material, adequately compacted, and finished flush with the natural surface.
9. Spillway sizing has been provided to accommodate capacity for storm flows to the 1 in 20-year ARI storm event.
10. Site personnel will be educated to the sediment and erosion control measures implemented on site.

6.2 Sediment Basin Operation

1. Type D basins will be operated as wet basins with the settled and/or treated (using flocculants) water removed from the basin as soon as suitable.
2. Type D basin based on a maximum 5-day cycle such that the filling, treatment and discharge of the basin is completed within a 5-day period following cessation of rainfall.
3. Appropriate coagulation of the sediment basis can be undertaken if the contained water does not achieve TSS<50mg/L within the 5-day period. Refer notes on drawing **Co13919.03-DA23**.
4. Recommended coagulant/ flocculant is gypsum at a dose rate between 32-50kg/ 100m^3 of sediment water. Dosage rates will be determined on site as

required to achieve desired water quality. Alternate flocculant products can be considered.

5. Settled sediment will be removed from the sediment basin when the volume of the sediment exceeds the designated sediment storage volume (as nominated on the ESCP drawings), or the design maximum sediment storage elevation. Sediment marker and water level indicators to be provided in accordance with Landcom Blue Book requirements as detailed on drawing **Co13919.03-DA25** and **DA26** in **Appendix A**.

6.3 Sediment Basin Maintenance

1. The sediment basin will be inspected during the following periods:
   a. After each runoff event. Inspect the erosion damage at flow entry and exit points. If damage has occurred the necessary repairs will be made.
   b. At least fortnightly in the absence of (a) above.
2. Accumulated sediment will be cleaned out when it reaches the marker board/post, and restore the original storage volume restored. Sediment will be placed in a disposal area or dispose offsite.
3. Sediment will not be disposed of in a manner that will create an erosion or pollution hazard.
4. Any sediment intended for re-use should be confirmed as acceptable by the validation consultant. Alternatively, sediment removed from the basin shall be disposed of from site in an approved manner. The material shall be tested for likely contaminants and be classified, in accordance with EPA Waste Classification Guidelines, prior to disposal.
5. Fill material in the basin will be checked for excessive settlement, slumping of the slopes and any necessary repairs made.
6. All litter and other debris will be removed from the basin and riser.

6.4 Sediment basin rehabilitation

1. Required drainage, erosion and sediment control measures during the decommissioning and rehabilitation of the sediment basin will comply with the same standards specified for the normal construction works.
2. Upon decommissioning of a sediment basin, all water and sediment will be removed from the basin prior to removal of the embankment (if any). Any such material, liquid or solid, will be disposed of in a manner that will not create an erosion or pollution hazard.
3. A basin's catchment conditions associated with the staged decommissioning of the basin will comply with the specified sediment control standard.
4. A sediment basin will not be decommissioned until all up-slope site stabilisation measures have been implemented and are appropriately working to control soil erosion and sediment runoff in accordance with the specified ESC standard and minimum permanent stabilisation works.

6.5 Core Riparian Zone (CRZ) Works

No works are proposed within the core riparian zone as part of the proposed sediment basin construction works.

APPENDIX A

COSTIN ROE CONSULTING ESC DESIGN DRAWINGS

INTERIM EROSION & SEDIMENT CONTROL DRAWINGS

9 DEVON STREET, CLYDE NSW 2142

PART LOT 100 DP1168951

DRAWING LIST:

DRAWING NO.	DRAWING TITLE
C013919.03-DA10	DRAWING LIST & GENERAL NOTES
C013919.03-DA23	EROSION AND SEDIMENT CONTROL PLAN - STAGE 2 AREA
C013919.03-DA25	EROSION AND SEDIMENT CONTROL DETAILS - SHEET 1
C013919.03-DA26	EROSION AND SEDIMENT CONTROL DETAILS - SHEET 2

LOCALITY PLAN
NOT TO SCALE

ELECTRONIC INFORMATION NOTES:

1. THE ISSUED DRAWINGS IN HARD COPY OR PDF FORMAT TAKE PRECEDENCE OVER ANY ELECTRONICALLY ISSUED INFORMATION, LAYOUTS OR DESIGN MODELS.
2. THE CONTRACTOR'S DIRECT AMENDMENT OR MANIPULATION OF THE DATA OR INFORMATION THAT MIGHT BE CONTAINED WITHIN AN ENGINEER-SUPPLIED DIGITAL TERRAIN MODEL AND ITS SUBSEQUENT USE TO UNDERTAKE THE WORKS WILL BE SOLELY AT THE DISCRETION OF AND THE RISK OF THE CONTRACTOR.
3. THE CONTRACTOR IS REQUIRED TO HIGHLIGHT ANY DISCREPANCIES BETWEEN THE DIGITAL TERRAIN MODEL AND INFORMATION PROVIDED IN THE CONTRACT AND/OR DRAWINGS AND IS REQUIRED TO SEEK CLARIFICATION FROM THE SUPERINTENDENT.
4. THE ENGINEER WILL NOT BE LIABLE OR RESPONSIBLE FOR THE POSSIBLE ON-GOING NEED TO UPDATE THE DIGITAL TERRAIN MODEL, SHOULD THERE BE ANY AMENDMENTS OR CHANGES TO THE DRAWINGS OR CONTRACT INITIATED BY THE CONTRACTOR.

GENERAL NOTES:

G1 THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL AND OTHER CONSULTANTS' DRAWINGS AND SPECIFICATIONS AND WITH SUCH OTHER WRITTEN INSTRUCTIONS AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT. ANY DISCREPANCY SHALL BE REFERRED TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

G2 ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE RELEVANT AND CURRENT STANDARDS AUSTRALIA CODES AND WITH THE BY-LAWS AND ORDINANCES OF THE RELEVANT BUILDING AUTHORITIES EXCEPT WHERE VARIED BY THE PROJECT SPECIFICATION.

G3 ALL DIMENSIONS SHOWN SHALL BE VERIFIED BY THE BUILDER ON SITE.
ENGINEER'S DRAWINGS SHALL NOT BE SCALED FOR DIMENSIONS.
ENGINEER'S DRAWINGS ISSUED IN ANY ELECTRONIC FORMAT MUST NOT BE USED FOR DIMENSIONAL SETOUT.
REFER TO THE ARCHITECT'S DRAWINGS FOR ALL DIMENSIONAL SETOUT INFORMATION.

G4 DURING CONSTRUCTION THE STRUCTURE SHALL BE MAINTAINED IN A STABLE CONDITION AND NO PART SHALL BE OVERSTRESSED. TEMPORARY BRACING SHALL BE PROVIDED BY THE BUILDER TO KEEP THE WORKS AND EXCAVATIONS STABLE AT ALL TIMES.

G5 UNLESS NOTED OTHERWISE ALL LEVELS ARE IN METRES AND ALL DIMENSIONS ARE IN MILLIMETRES.

G6 ALL WORKS SHALL BE UNDERTAKEN IN ACCORDANCE WITH ACCEPTABLE SAFETY STANDARDS & APPROPRIATE SAFETY SIGNS SHALL BE INSTALLED AT ALL TIMES DURING THE PROGRESS OF THE JOB.

G7 ALL SERVICES ARE BASED ON 'DIAL BEFORE YOU DIG' INFORMATION. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT ALL SERVICES ARE IDENTIFIED PRIOR TO THE COMMENCEMENT OF ANY WORKS.

G8 ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE RELEVANT DEVELOPMENT CONSENT CONDITIONS AND/OR APPROVED MANAGEMENT PLANS.

DUST CONTROL NOTES:

1. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE DUST CONTROL MEASURES ARE APPLIED AND MAINTAINED IN ACCORDANCE WITH THE CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN.
2. THE APPLICATION OF LIQUID BASED DUST SUPPRESSION MEASURES MUST BE SUCH THAT SEDIMENT LADEN RUNOFF RESULTING FROM SUCH MEASURES DOES NOT CREATE A TRAFFIC OR ENVIRONMENTAL HAZARD. ALL DUST CONTROL MEASURES TO COMPLY WITH THE APPROVED DUST CONTROLS IN THE AIR QUALITY MANAGEMENT PLAN. (EG USING STRAW BALES)
3. DUST GENERATION ASSOCIATED WITH WIND EROSION TO BE CONTROLLED USING WATER TRUCKS, DUST SUPPRESSING FOG, MIST GENERATORS, SEALANT PLACED OVER THE SOIL, SURFACE ROUGHENING OR RE-VEGETATION.
4. THE FOLLOWING ACTIVITIES SHALL BE ADOPTED, IF NECESSARY, TO MANAGE DUST CONTROL ON SITE:
   - LIMITING THE AREA OF SOIL DISTURBANCE AT ANY GIVEN TIME
   - REPLACING TOPSOIL AFTER COMPLETION OF EARTHWORKS.
   - PROGRAMMING WORK TO MINIMISE THE LIFE OF STOCKPILES.
   - TEMPORARILY STABILISING LONG-TERM STOCKPILES.
   - GRAVELLING UNSEALED ACCESS AND HAUL ROADS.
   - MINIMISING TRAFFIC MOVEMENT ON EXPOSED SURFACES.
   - LIMITING VEHICULAR TRAFFIC TO 15km/h.
   - RETAINING EXISTING VEGETATION AS WIND BREAKS.
5. OIL, LANDFILL GAS CONDENSATE OR ANY CONTAMINATED LEACHATE OR STORMWATER IS NOT TO BE USED FOR DUST SUPPRESSION.

SITE PREPARATION NOTES:

1. ALL EARTHWORKS SHALL BE COMPLETED GENERALLY IN ACCORDANCE WITH THE GUIDELINES SPECIFIED BY THE GEOTECHNICAL REPORT.
2. EXISTING LEVELS ARE BASED ON INFORMATION PROVIDED BY LANDPARTNERS TITLED AS0205 Clyde_BE_200620 TIN DATED 08/07/20.
3. STRIP ANY TOP SOIL OR DELETERIOUS MATERIAL AND DISPOSE OF FROM SITE OR STORE AS DIRECTED.
4. COMPLETE CUT TO FILL EARTHWORKS TO ACHIEVE THE REQUIRED LEVELS AS INDICATED ON THE DRAWINGS WITHIN A TOLERANCE OF +0mm/-10mm THROUGH BUILDING PADS/PAVEMENTS AND +0mm/-20mm ELSEWHERE.
5. PREPARE STEEP BATTERS TO RECEIVE FILL BY CONSTRUCTING BENCHING TO FACILITATE FILL PLACEMENT AND COMPACTION.
6. AREAS TO RECEIVE FILL (THAT ARE NOT ON BENCHED BATTERS) AND AREAS IN CUT SHALL BE PROOF ROLLED TO IDENTIFY ANY SOFT HEAVING MATERIAL. SOFT MATERIAL SHALL BE BOXED OUT AND REMOVED PRIOR TO FILL PLACEMENT. PROOF ROLLING TO BE INSPECTED BY A GEOTECHNICAL ENGINEER OR THE EARTHWORKS DESIGNER.
7. SITE WON & IMPORTED FILL SHALL BE PREPARED IN ACCORDANCE WITH RMS R44 SPECIFICATIONS.
8. ALL ENGINEERED FILL PARTICLES SHALL BE ABLE TO BE INCORPORATED WITHIN A SINGLE LAYER. FURTHER, LESS THAN 30% OF PARTICLES SHALL BE RETAINED ON THE 37.5 MM SIEVE. ENGINEERED FILL SHALL BE ABLE TO BE TESTED IN ACCORDANCE WITH THE STANDARD COMPACTION METHOD (AS1289.5.4.1) OR HILF TEST METHOD (AS1289.5.7.1). THESE METHODS REQUIRE LESS THAN 20% RETAINED ON THE 37.5 MM SIEVE. WHERE BETWEEN 20% AND 30% OF PARTICLES ARE RETAINED ON THE 37.5 MM SIEVE THE ABOVE TEST METHODS SHALL STILL BE ADOPTED AND TEST REPORTS ANNOTATED APPROPRIATELY. THESE REQUIREMENTS SHOULD BE MET BY THE MATERIAL AFTER PLACEMENT AND COMPACTION
9. ALL THE EARTHWORKS UNDERTAKEN AND THE SUBGRADE CONDITION IN THE CUT AREAS (IN THE STATED PERIOD) ARE DOCUMENTED IN THE REPORTS AND HAVE BEEN UNDERTAKEN IN ACCORDANCE WITH THE SPECIFICATION.
10. PRIOR TO ANY EARTHWORKS, EROSION CONTROL AS OUTLINED IN THE EROSION AND SEDIMENTATION CONTROL PLAN SHALL BE COMPLETED.
11. EXISTING ROCK, IF ANY, SHALL BE REMOVED BY HEAVY ROCK BREAKING OR RIPPING.
12. MATCH EXISTING LEVELS AT BATTER INTERFACE.
13. CONTRACTOR TO MATCH EXISTING LEVELS AT THE INTERFACE OF EARTHWORKS AND EXISTING SURFACE AT BATTER LOCATIONS OR WHERE NO RETAINING WALLS ARE PRESENT. ANY DISCREPANCY BETWEEN DESIGN AND EXISTING LEVELS TO BE REFERRED TO THE ENGINEER FOR DIRECTION OR ADJUSTMENTS TO DESIGN LEVELS.
14. DURING EARTHWORKS THE CONTRACTOR IS TO ENSURE ALL AREAS ARE FREE DRAINING & WILL NOT RETAIN WATER DURING RAINFALL. PROVIDE TEMPORARY MEASURES AS REQUIRED TO ENSURE FREE FLOWING RUNOFF THROUGH MANAGED DRAINAGE PATHS, DIVERSION DRAINS OR OTHER SUITABLE DISPOSAL METHOD AS AGREED DURING THE WORKS. REFER ANY CONCERNS TO THE ENGINEER. REFER TO EROSION AND SEDIMENT CONTROL DRAWINGS AND NOTES.

EROSION CONTROL NOTES :

ALL CONTROL WORK INCLUDING DIVERSION BANKS AND CATCH DRAINS, V-DRAINS AND SILT FENCES SHALL BE COMPLETED DIRECTLY FOLLOWING THE COMPLETION OF THE EARTHWORKS.

1. SILT FENCES AND SILT FENCE RETURNS SHALL BE ERECTED CONVEX TO THE CONTOUR TO POND WATER.
2. STRAW BALE BARRIERS AND GEOFABRIC FENCES ARE TO BE CONSTRUCTED TO TOE OF BATTER, PRIOR TO COMMENCEMENT OF EARTHWORKS, IMMEDIATELY AFTER CLEARING OF VEGETATION AND BEFORE REMOVAL OF TOP SOIL.
3. ALL TEMPORARY EARTH BERMS, DIVERSION AND SILT DAM EMBANKMENTS ARE TO BE MACHINE COMPACTED, SEEDED AND MULCHED FOR TEMPORARY VEGETATION COVER AS SOON AS THEY HAVE BEEN FORMED.
4. CLEAR WATER IS TO BE DIVERTED AWAY FROM DISTURBED GROUND AND INTO THE DRAINAGE SYSTEM.
5. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING AND PROVIDING ON GOING ADJUSTMENT TO EROSION CONTROL MEASURES AS REQUIRED DURING CONSTRUCTION.
6. ALL SEDIMENT TRAPPING STRUCTURES AND DEVICES ARE TO BE INSPECTED AFTER STORMS FOR STRUCTURAL DAMAGE OR CLOGGING, TRAPPED MATERIAL IS TO BE REMOVED TO A SAFE, APPROVED LOCATION.
7. ALL FINAL EROSION PREVENTION MEASURES INCLUDING THE ESTABLISHMENT OF GRASSING ARE TO BE MAINTAINED UNTIL THE END OF THE DEFECTS LIABILITY PERIOD.
8. ALL EARTHWORKS AREAS SHALL BE ROLLED ON A REGULAR BASIS TO SEAL THE EARTHWORKS.
9. ALL FILL AREAS ARE TO BE LEFT WITH A BUND AT THE TOP OF THE SLOPE AT THE END OF EACH DAYS EARTHWORKS. THE HEIGHT OF THE BUND SHALL BE A MINIMUM OF 200MM.
10. ALL CUT AND FILL SLOPES ARE TO BE SEEDED AND HYDROMULCHED WITHIN 10 DAYS OF COMPLETION OF FORMATION.
11. AFTER REVEGETATION OF THE SITE IS COMPLETE AND THE SITE IS STABLE IN THE OPINION OF A SUITABLY QUALIFIED PERSON ALL TEMPORARY WORK SUCH AS SILT FENCE, DIVERSION DRAINS ETC SHALL BE REMOVED.
12. ALL TOPSOIL STOCKPILES ARE TO BE SUITABLY COVERED TO THE SATISFACTION OF THE SITE MANAGER TO PREVENT WIND AND WATER EROSION.
13. ANY AREA THAT IS NOT APPROVED BY THE CONTRACT ADMINISTRATOR FOR CLEARING OR DISTURBANCE BY THE CONTRACTOR'S ACTIVITIES SHALL BE CLEARLY MARKED AND SIGN POSTED, FENCED OFF OR OTHERWISE APPROPRIATELY PROTECTED AGAINST ANY SUCH DISTURBANCE.
14. ALL STOCKPILE SITES SHALL BE SITUATED IN AREAS APPROVED FOR SUCH USE BY THE SITE MANAGER. A 6m BUFFER ZONE SHALL EXIST BETWEEN STOCKPILE SITES AND ANY STREAM OR FLOW PATH. ALL STOCKPILES SHALL BE ADEQUATELY PROTECTED FROM EROSION AND CONTAMINATION OF THE SURROUNDING AREA BY USE OF THE MEASURES APPROVED IN THE EROSION AND SEDIMENTATION CONTROL PLAN.
15. ACCESS AND EXIT AREAS SHALL INCLUDE SHAKE-DOWN OR OTHER METHODS APPROVED BY THE SITE MANAGER FOR THE REMOVAL OF SOIL MATERIALS FORM MOTOR VEHICLES.
16. THE CONTRACTOR IS TO ENSURE RUNOFF FROM ALL AREAS WHERE THE NATURAL SURFACE IS DISTURBED BY CONSTRUCTION, INCLUDING ACCESS ROADS, DEPOT AND STOCKPILE SITES, SHALL BE FREE OF POLLUTANTS BEFORE IT IS EITHER DISPERSED TO STABLE AREAS OR DIRECTED TO NATURAL WATERCOURSES.
17. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN SLOPES, CROWNS AND DRAINS ON ALL EXCAVATIONS AND EMBANKMENTS TO ENSURE SATISFACTORY DRAINAGE AT ALL TIMES WATER SHALL NOT BE ALLOWED TO POND ON THE WORKS UNLESS SUCH PONDING IS PART OF AN APPROVED ESCP / SWMP.

TABLE 1 - STABILISATION REQUIREMENTS AND TREATMENT METHODS

DURING CONSTRUCTION - TEMPORARY STABILISATION
(DURING PERIODS OF INACTIVITY OR WHEN WORKS ARE ON HOLD)

LANDS	STABILISATION REQUIREMENT	TIMEFRAMES	TREATMENT METHODS - PRODUCTS	REMARKS
ALL LANDS	C-FACTOR = 0.15 (50% EQUIVALENT GROUND COVER[1])	APPLIES AFTER 20 WORKING DAYS OF INACTIVITY (EVEN THOUGH WORKS MIGHT CONTINUE LATER)	SOIL BINDER (I.E. VITAL P47/STONEWALL OR EQUIVALENT[1])	- SPRAY ALL SURFACES WITH VITAL P47/STONEWALL OR EQUIVALENT[1] - VITAL DILUTION RATE = 1:10(VITAL:WATER). -RE-APPLY/MAINTAIN AS NECESSARY (APPROX. EVERY 3-6 MONTHS WITHOUT SUITABLE VEGETATION COVER) TO ENSURE THE REQUIRED COVER IS PROVIDED.
			GEOTEXTILE, JUTE MATTING, BLACK PLASTIC OR EQUIVALENT[1]	- COVER ALL EXPOSED SOILS. - RE-APPLY/MAINTAIN AS NECESSARY TO ENSURE THE REQUIRED COVER IS PROVIDED.
WATERWAYS, DRAINAGE LINES AND CONCENTRATED FLOW AREAS	C-FACTOR = 0.05 (70% GRASS COVER OR EQUIVALENT GROUND COVER[1])	APPLIES AFTER 10 WORKING DAYS FROM COMPLETION OF FORMATION AND BEFORE THEY ARE ALLOWED TO CARRY CONCENTRATED FLOWS.	REFER TO THE DRAIN SPECIFICATIONS DETAILED ON THE PLAN FOR SPECIFIC LINING/STABILISATION REQUIREMENTS. EXAMPLE TREATMENT METHODS ARE SHOWN BELOW.	
			TEMPORARY LINING - GEOTEXTILE (I.E. BIDIM A24 OR EQUIVALENT[1])	- COMPLETE ANY SUBSOIL TREATMENT BEFORE LAYING THE MATTING. - INSTALL MATTING IN ACCORDANCE WITH SD 5-7. - RE-APPLY/MAINTAIN AS NECESSARY TO ENSURE THE REQUIRED COVER IS PROVIDED.
			JUTE MESH, SEEDING AND SOIL BINDER (I.E. VITAL P47/STONEWALL OR EQUIVALENT[1]) - LOW FLOWS TO MODERATE	- COMPLETE SUBSOIL TREATMENT (I.E. GYPSUM LIGHTLY RIPPED INTO SUBGRADE AT A RATE OF 5 TONNES/Ha). - PLACE TOPSOIL TO A DEPTH OF AT LEAST 75mm. - COMPLETE ANY FERTILISATION AND SEEDING BEFORE LAYING THE MATTING. - INSTALL MATTING IN ACCORDANCE WITH SD 5-7. - SPRAY ALL SURFACES WITH VITAL P47/STONEWALL OR EQUIVALENT[1]. - VITAL DILUTION RATE = 1L / m² OF DILUTED VITAL MIXTURE. - RE-APPLY/MAINTAIN AS NECESSARY TO ENSURE THE REQUIRED COVER IS PERMANENTLY MAINTAINED.
			JUTE MATTING (~350gsm) AND SEEDING OR EQUIVALENT[1] - LOW FLOWS TO MODERATE	- COMPLETE SUBSOIL TREATMENT (I.E. GYPSUM LIGHTLY RIPPED INTO SUBGRADE AT A RATE OF STONNES/Ha). - PLACE TOPSOIL TO A DEPTH OF AT LEAST 75mm. - COMPLETE ANY FERTILISATION AND SEEDING BEFORE LAYING THE MATTING. - INSTALL MATTING IN ACCORDANCE WITH SD 5-7. - RE-APPLY/MAINTAIN AS NECESSARY TO ENSURE THE REQUIRED COVER IS PERMANENTLY MAINTAINED.
			TURF REINFORCEMENT MATTING (TRM) (E.G. TERRAMAT OR EQUIVALENT[1]) - MODERATE FLOWS	- COMPLETE SUBSOIL TREATMENT (I.E. GYPSUM LIGHTLY RIPPED INTO SUBGRADE AT A RATE OF STONNES/Ha). - PLACE TOPSOIL TO A DEPTH OF AT LEAST 75mm. - COMPLETE ANY FERTILISATION AND SEEDING BEFORE LAYING THE MATTING. - INSTALL MATTING IN ACCORDANCE WITH SD 5-7. - RE-APPLY/MAINTAIN AS NECESSARY TO ENSURE THE REQUIRED COVER IS PERMANENTLY MAINTAINED.
			ROCK LINING - HIGH FLOWS	- COMPLETE SUBSOIL TREATMENT (I.E. GYPSUM LIGHTLY RIPPED INTO SUBGRADE AT A RATE OF STONNES/Ha). - INSTALL GEOTEXTILE UNDERLAY (IF SPECIFIED) IN ACCORDANCE WITH SD 5-7. - INSTALL ROCK ARMOURING (TO THE DEPTH AND SIZE AS SPECIFIED ON THE PLAN). - RE-APPLY/MAINTAIN AS NECESSARY TO ENSURE THE REQUIRED COVER IS PROVIDED.
STOCKPILES	C-FACTOR = 0.10 (60% GRASS COVER OR EQUIVALENT GROUND COVER[1])	APPLIES AFTER 10 WORKING DAYS FROM COMPLETION OF FORMATION	SEEDING AND SOIL BINDER (I.E. VITAL P47/STONEWALL OR EQUIVALENT[1])	- APPLY SEED TO ALL STOCKPILE SURFACES (NOTE: SEEDING MAY NOT BE REQUIRED IF EXISTING SEEDBED IS PRESENT). -SPRAY ALL STOCKPILE SURFACES WITH VITAL P47/STONEWALL OR EQUIVALENT[1]. - VITAL DILUTION RATE = 1:10 (VITAL:WATER). - APPLICATION RATE = 1L / m2 OF DILUTED VITAL MIXTURE. - RE-APPLY/MAINTAIN AS NECESSARY TO ENSURE THE REQUIRED COVER IS PERMANENTLY MAINTAINED.
			GEOTEXTILE, JUTE MATTING, BLACK PLASTIC OR EQUIVALENT[1]	- COVER ALL EXPOSED SOILS. - RE-APPLY/MAINTAIN AS NECESSARY TO ENSURE THE REQUIRED COVER IS PROVIDED.
GENERAL SURFACES	C-FACTOR = 0.10 / 0.05 (60% / 70% GRASS COVER OR EQUIVALENT GROUND COVER[1])	C-FACTOR = 0.1 APPLIES AFTER 10 WORKING DAYS FROM COMPLETION OF FORMATION AND C-FACTOR = 0.05 APPLIES WITHIN A FURTHER 60 DAYS	TOPSOIL, SEEDING AND SOIL BINDER (I.E. VITAL P47/STONEWALL OR EQUIVALENT[1])	- REFER TO SD 7-1 - COMPLETE SUBSOIL TREATMENT (I.E. GYPSUM LIGHTLY RIPPED INTO SUBGRADE AT A RATE OF STONNES/Ha). - PLACE GYPSUM TREATED TOPSOIL TO A DEPTH OF AT LEAST 75mm. - APPLY ANY FERTILISERS REQUIRED. - APPLY SEED TO ALL SURFACES. - SPRAY ALL SURFACES WITH VITAL P47/STONEWALL OR EQUIVALENT[1]. - VITAL DILUTION RATE = 1:10 (VITAL:WATER). - APPLICATION RATE = 1L / m2 OF DILUTED VITAL MIXTURE. - RE-APPLY/MAINTAIN AS NECESSARY TO ENSURE THE REQUIRED COVER IS PERMANENTLY MAINTAINED.
			HYDROMULCH OR EQUIVALENT[1]	- REFER TO SD 7-1 - COMPLETE SUBSOIL TREATMENT (I.E. GYPSUM LIGHTLY RIPPED INTO SUBGRADE AT A RATE OF STONNES/Ha). - PLACE GYPSUM TREATED TOPSOIL TO A DEPTH OF AT LEAST 75mm. - APPLY HYDROMULCH WITH APPROVED SEED MIX TO SOIL SURFACE. - RE-APPLY/MAINTAIN AS NECESSARY TO ENSURE THE REQUIRED COVER IS PERMANENTLY MAINTAINED.

[1] - EQUIVALENT COVER/PRODUCT MUST ACHIEVE THE EQUIVALENT C-FACTOR WITH PROVEN RESEARCH/DOCUMENTATION TO VERIFY THIS.
STANDARD DRAWINGS REFERENCED CAN BE LOCATED IN THE 'SOILS & CONSTRUCTION, MANAGING URBAN STORMWATER - VOLUME 1' BOOK BY LANDCOM. ALTERNATIVE DETAILS MAY BE SOUGHT IN CONSULTATION WITH THE ENGINEER

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR INFORMATION	18.03.21	C
ISSUED FOR INFORMATION	01.12.20	B
ISSUED FOR INFORMATION	30.10.20	A

CLIENT: DBL PROPERTY PTY LTD
SUITE 2, UPPER GROUND FLOOR
437 KENT STREET
SYDNEY NSW 2000

PROJECT: EROSION & SEDIMENT CONTROL
9 DEVON STREET, CLYDE NSW

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
XC	HU	OCT		A0	AS SHOWN	C013919.03-DA10

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PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE: DRAWING LIST & GENERAL NOTES
DRAWING No: C013919.03-DA10
ISSUE: C

THE HATCHED AREA DENOTES SEVERAL INDIVIDUALLY BUNDED AREA, WHICH ACTS AS RETENTION AND SEDIMENT CATCHMENTS

STAGE 2 | STAGE 1

DEVON STREET

COLQUHOUN STREET

STABILISED CONSTRUCTION ENTRY. REFER TO DETAIL ON DA25

CLEAN WATER FROM UPSTREAM CATCHMENT

NO LAND DISTURBED. EXISTING GRASS AND PAVEMENT TO REMAIN IN PLACE TO MINIMISE SEDIMENT RUNOFF.

EXISTING 900Φ PIPE TO REMAIN IN PLACE TO DIVERT CLEAN WATER FROM UPSTREAM CATCHMENT.

LAND DISTURBED. ALL RUNOFF TO BE DIVERTED TO SEDIMENT STORAGE VIA EXISTING OVERLAND FLOW PATHS.

SUBDIVISION

STAGE 2

STABILISED CONSTRUCTION ENTRY. REFER TO DETAIL ON DA25

ROADWAY ACTS AS SEPARATION BETWEEN CLEAN WATER CATCHMENTS AND FORMER OPERATIONAL AREAS.

ROAD NO 2

KEEP EXISTING HEADWALL AND CLEAN WATER DRAIN TO DISCHARGE INTO EXISTING SWALE

LAND DISTURBED. ALL RUNOFF TO BE DIVERTED TO SEDIMENT STORAGE VIA EXISTING OVERLAND FLOW PATHS.

PROPOSED 5m WIDE SERVICES EASEMENT

AE9 AREA

(APPROXIMATE LOCATION OF AUSGRID LINE)

5 WIDE LANDSCAPE SET BACK

DRAINAGE EASEMENT 5m WIDE

BELOW GROUND CONCRETE PIT

AUSGRID LINE

OPEN DRAINAGE CHANNEL

SEDIMENT BASIN (STAGE 2):

CATCHMENT AREA	= 16.8ha
REQUIRED BASIN VOLUME	= 5338m³
DIMENSIONS AS NOTED ON PLAN	
MAX SIDE SLOPE	= 1V:3H
DEPTH	= 1.5m
PROVIDED BASIN VOLUME	= 5650m³

NO LAND DISTURBED. EXISTING GRASS AND PAVEMENT TO REMAIN IN PLACE TO MINIMISE SEDIMENT RUNOFF.

EXISTING GRASSED SWALE REMAINS IN PLACE.

NO WORKS THROUGH 30m RIPARIAN SETBACK

EMERGENCY OVERFLOW WEIR LENGTH = 12.0m. REFER DETAILS ON DA25

RIPARIAN SETBACK

APPROXIMATE 30m

APPROXIMATE EXTENT OF TREE LINE

TOE

RIPARIAN CORRIDOR

NO LAND DISTURBED. EXISTING GRASS AND PAVEMENT TO REMAIN IN PLACE TO MINIMISE SEDIMENT RUNOFF.

EXISTING GRASSED SWALE REMAINS IN PLACE.

DUCK RIVER

SEDIMENTATION BASIN NOTE:

FOR SEDIMENT & EROSION CONTROL DETAILS REFER TO DRAWING C013919.03-DA25.
SEDIMENTATION BASIN SIZING BASED ON RECOMMENDATIONS OF 'SOILS AND CONSTRUCTION, MANAGING URBAN STORMWATER-THE BLUE BOOK'. CAPACITY BASED UPON 5 DAY RAINFALL DEPTH AT 85th PERCENTILE INTENSITY (33.1mm).

SEDIMENTATION BASINS TO COLLECT RUN-OFF IN EXTREME RAINFALL EVENTS. COLLECTED WATER IS TO BE REUSED ON SITE.

EACH BASIN IS TO HAVE A MARKER PLACED AS PER THE DETAIL TO INDICATE WHEN SEDIMENT IS TO BE REMOVED. REMOVED SEDIMENT IS TO BE CLASSED AND DEWATERED PRIOR TO REMOVAL FROM SITE.

NOTES:
1. ASSUME TYPE D SOIL (CLAY)
2. ASSUME GROUP D SOIL (HIGH PLASTICITY AND SHRINK/SWELL PROPERTIES)

LEGEND:

PROVIDE 1m RETURNS TO SILT FENCE AT 30m MAX. INTERVALS. TYPICAL (N.S.O.P.)

- SITE BOUNDARY
- SW> - CLEAN WATER STORMWATER DRAIN
- OVERLAND FLOW DIRECTION
- APPROXIMATE EXTENT OF TREE LINE
- RIPARIAN SETBACK
- EXISTING BUNDED AREAS
- NO LAND DISTURBED. EXISTING GRASS AND PAVEMENT TO REMAIN

SEDIMENT BASIN SIZING CALCULATION

PER BLUE BOOK GUIDELINES SECTION 6.3.4.

V_{SET}= 10 x Cv x A x R (y%ile, 5 day)

1. RAINFALL DEPTH [R (85%ile, 5 day)] = 33.1 m
2. VOLUMETRIC RUNOFF COEFFICIENT (Cv) = 0.64
3. CATCHMENT AREA = 16.8 HA
4. SETTLING ZONE (V_{SET}) = 3559 m³

V_{STO}= 50% x V_{SET}
SEDIMENT STORAGE ZONE (V_{STO}) = 1779 m³

V_{TOTAL} = V_{SET} + V_{STO}
REQUIRED SEDIMENT BASIN VOLUME (V_{TOTAL}) = 5338m³

EROSION & SEDIMENT CONTROL NOTE:

REFER TO DA10 FOR EROSION & SEDIMENT CONTROL NOTES

EROSION & SEDIMENT CONTROL PLAN - STAGE 2
SCALE 1:1000

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT A0 SIZE SHEET

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR INFORMATION	18.03.21	E
ISSUED FOR INFORMATION	09.12.20	D
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PROJECT: EROSION & SEDIMENT CONTROL
9 DEVON STREET, CLYDE NSW

DESIGNED XC | DRAWN HU | DATE OCT | CHECKED | SIZE A0 | SCALE AS SHOWN | CAD REF: C013919.03-DA23

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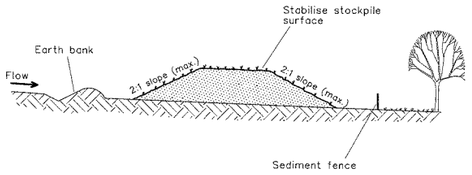
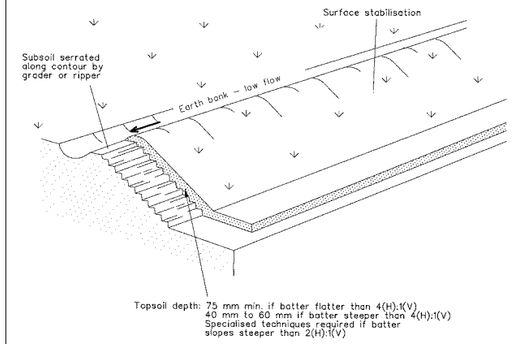
DRAWING TITLE: EROSION & SEDIMENT CONTROL PLAN - STAGE 2 AREA
DRAWING No: C013919.03-DA23
ISSUE: E



Construction Notes

1. Place stockpiles more than 2 (preferably 5) metres from existing vegetation, concentrated water flow, roads and hazard areas.
2. Construct on the contour as low, flat, elongated mounds.
3. Where there is sufficient area, topsoil stockpiles shall be less than 2 metres in height.
4. Where they are to be in place for more than 10 days, stabilise following the approved ESCP or SWMP to reduce the C-factor to less than 0.10.
5. Construct earth banks (Standard Drawing 5-5) on the upslope side to divert water around stockpiles and sediment fences (Standard Drawing 6-8) 1 to 2 metres downslope.

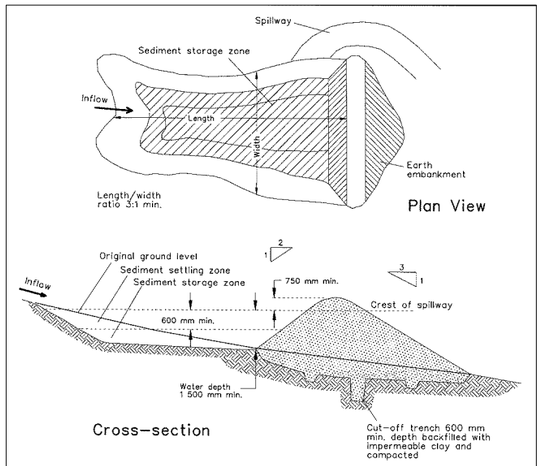
STOCKPILES — SD 4-1



Construction Notes

1. Scarify the ground surface along the line of the contour to a depth of 50 mm to 100 mm to break up any hardsetting surfaces and to provide a good bond between the respread material and subsoil.
2. Add soil ameliorants as required by the ESCP or SWMP.
3. Rip to a depth of 300 mm if compacted layers occur.
4. Where possible, replace topsoil to a depth of 40 to 60 mm on lands where the slope exceeds 4(H):1(V) and to at least 75 mm on lower gradients.

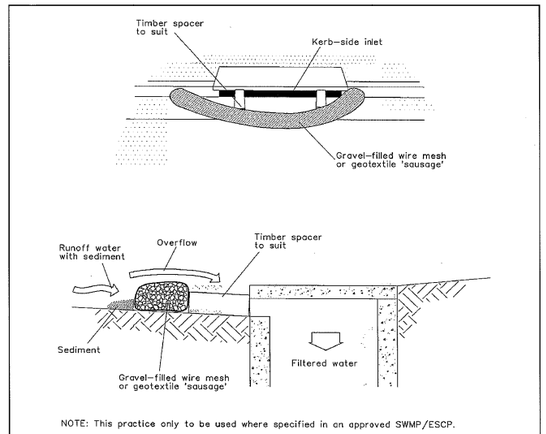
REPLACING TOPSOIL — SD 4-2



Construction Notes

1. Remove all vegetation and topsoil from under the dam wall and from within the storage area.
2. Construct a cut-off trench 500 mm deep and 1,200 mm wide along the centreline of the embankment extending to a point on the gully wall level with the riser crest.
3. Maintain the trench free of water and recompact the materials with equipment as specified in the SWMP to 95 per cent Standard Proctor Density.
4. Select fill following the SWMP that is free of roots, wood, rock, large stone or foreign material.
5. Prepare the site under the embankment by ripping to at least 100 mm to help bond compacted fill to the existing substrate.
6. Spread the fill in 100 mm to 150 mm layers and compact it at optimum moisture content following the SWMP.
7. Construct the emergency spillway.
8. Rehabilitate the structure following the SWMP.

EARTH BASIN - WET — SD 6-4
(APPLIES TO 'TYPE D' AND 'TYPE F' SOILS ONLY)

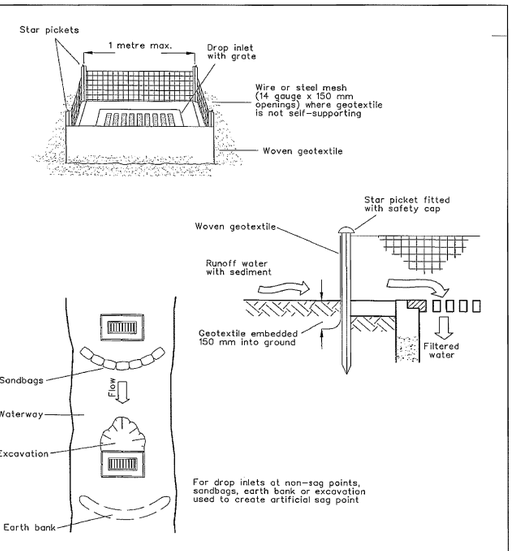


NOTE: This practice only to be used where specified in an approved SWMP/ESCP.

Construction Notes

1. Install filters to kerb inlets only at sag points.
2. Fabricate a sleeve made from geotextile or wire mesh longer than the length of the inlet pit and fill it with 25 mm to 50 mm gravel.
3. Form an elliptical cross-section about 150 mm high x 400 mm wide.
4. Place the filter at the opening leaving at least a 100-mm space between it and the kerb inlet. Maintain the opening with spacer blocks.
5. Form a seal with the kerb to prevent sediment bypassing the filter.
6. Sandbags filled with gravel can substitute for the mesh or geotextile providing they are placed so that they firmly abut each other and sediment-laden waters cannot pass between.

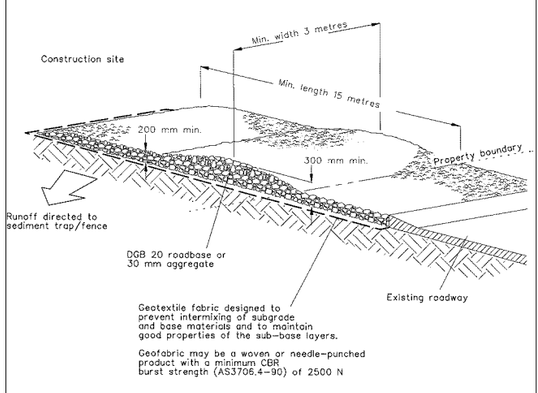
MESH AND GRAVEL INLET FILTER — SD 6-11



Construction Notes

1. Fabricate a sediment barrier made from geotextile or straw bales.
2. Follow Standard Drawing 6-7 and Standard Drawing 6-8 for installation procedures for the straw bales or geofabric. Reduce the picket spacing to 1 metre centres.
3. In waterways, artificial sag points can be created with sandbags or earth banks as shown in the drawing.
4. Do not cover the inlet with geotextile unless the design is adequate to allow for all waters to bypass it.

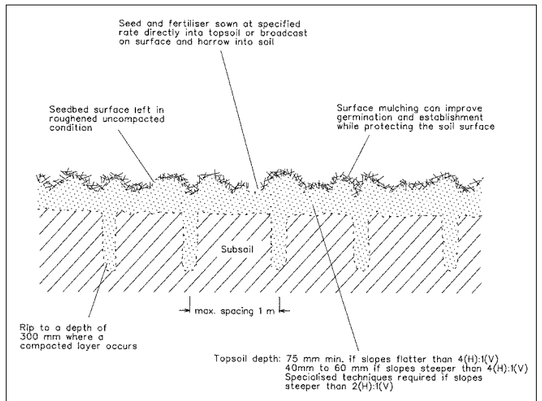
GEOTEXTILE INLET FILTER — SD 6-12



Construction Notes

1. Strip the topsoil, level the site and compact the subgrade.
2. Cover the area with needle-punched geotextile.
3. Construct a 200-mm thick pad over the geotextile using road base or 30-mm aggregate.
4. Ensure the structure is at least 15 metres long or to building alignment and at least 3 metres wide.
5. Where a sediment fence joins onto the stabilised access, construct a hump in the stabilised access to divert water to the sediment fence

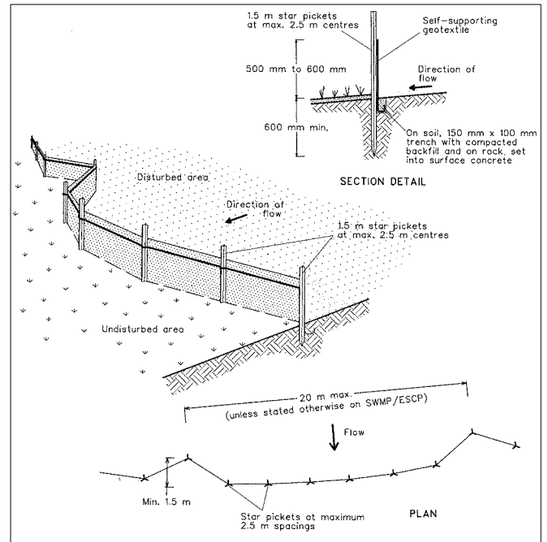
STABILISED SITE ACCESS — SD 6-14



Construction Notes

1. Loosen compacted soil before sowing any seed. If necessary, rip the soil to a depth of 300 mm. Avoid rotary hoe cultivation.
2. Work the ground only as much as necessary to achieve the desired tilth and prepare a good seedbed.
3. Avoid cultivation in very wet or very dry conditions.
4. Cultivate on or close to the contour where possible, not up and down the slope.

SEEDBED PREPARATION — SD 7-1



Construction Notes

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.
2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.
4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.
5. Join sections of fabric at a support post with a 150-mm overlap.
6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.

SEDIMENT FENCE — SD 6-8

FOR INFORMATION

ISSUED FOR INFORMATION	30.10.20	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE

CLIENT
DBL PROPERTY PTY LTD
SUITE 2, UPPER GROUND FLOOR
437 KENT STREET
SYDNEY NSW 2000

PROJECT
EROSION & SEDIMENT CONTROL
9 DEVON STREET, CLYDE NSW

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
XC	HU	OCT		A0	AS SHOWN	C013919.03-DA25

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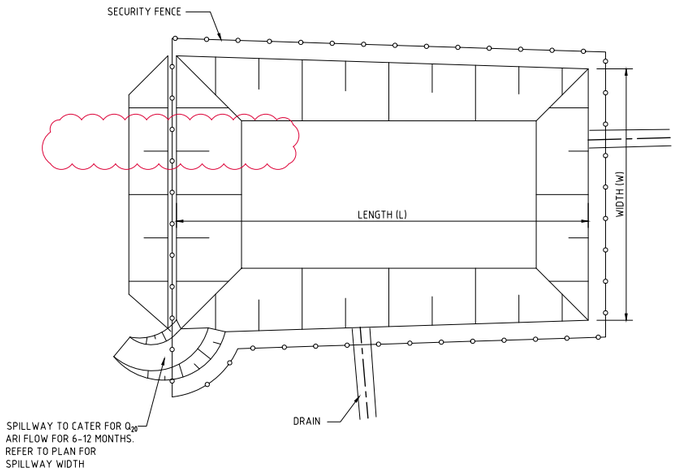
Costin Roe Consulting

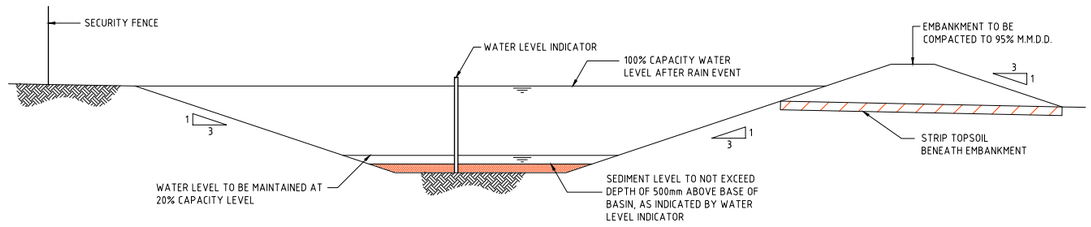
PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE
EROSION AND SEDIMENT CONTROL DETAILS - SHEET 1

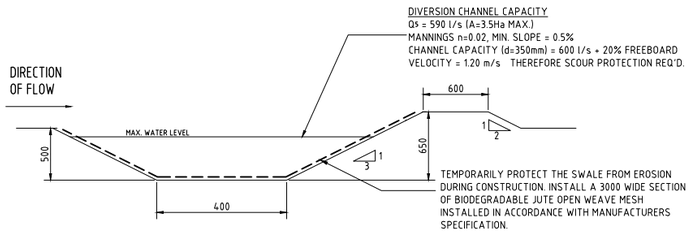
DRAWING No. C013919.03-DA25 ISSUE A



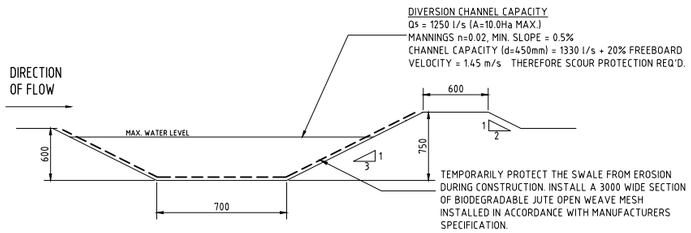
TYPICAL SEDIMENT CONTROL POND PLAN
SCALE 1:250



TYPICAL SEDIMENT CONTROL BASIN SECTION
SCALE 1:50



DIVERSION DRAIN SECTION (STAGE 1)
SCALE 1:20



DIVERSION DRAIN SECTION (STAGE 2)
SCALE 1:20

2m 0 5 10 15 20 25m
SCALE 1:250 AT A0 SIZE SHEET

500mm 0 1 2 3 4 5m
SCALE 1:50 AT A0 SIZE SHEET

200mm 0 500 1000 1500 2000mm
SCALE 1:20 AT A0 SIZE SHEET

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR INFORMATION	18.03.21	B
ISSUED FOR INFORMATION	30.10.20	A

CLIENT
DBL PROPERTY PTY LTD
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PROJECT
EROSION & SEDIMENT CONTROL
9 DEVON STREET, CLYDE NSW

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD. REF:
XC	HU	OCT		A0	AS SHOWN	C013919.03-C26

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DRAWING TITLE
EROSION AND SEDIMENT CONTROL DETAILS - SHEET 2

DRAWING No C013919.03-C26 ISSUE B

Groundwater Monitoring and Management Plan

<table>
<tr><td colspan="6">Groundwater Monitoring and Management</td></tr>
<tr><td rowspan="2">Document Control</td><td>Revision</td><td>Date</td><td>Description</td><td>Author</td><td>Approved</td></tr>
<tr><td>6.0</td><td>21/07/2021</td><td>Final for consultation</td><td>AECOM</td><td>WM</td></tr>
<tr><td>Background</td><td colspan="5">The Conditions of Consent for SSD 9302 require a Groundwater Monitoring and Management Plan (GMP) to be produced as a subplan to the Remediation Environmental Management Plan (REMP) for the Clyde Western Area Remediation Project (the Project). This document provides the GMP for Stage 2 of the Project. This GMP applies to the remediation phase for Stage 2, including preparation works, remediation works and demobilisation.
The conditions of consent also require a separate Groundwater Monitoring Program (GWMP) once the active remediation works are complete. GWMPs will be provided as part of the Long Term Environmental Management Plans (LTEMPs) for the Western Area.</td></tr>
<tr><td>Objectives</td><td colspan="5">• Minimise and manage potential impacts to groundwater throughout the Project.
• Ensure compliance with relevant legislative and other requirements including the Development Consent (DC) (SSD 9302) conditions, mitigation and management measures in Appendix 2 of the DC conditions and Environment Protection Licence (EPL) 570.
• Manage groundwater in line with relevant controls in the Stage 2 Detailed Remediation Action Plan (RAP).</td></tr>
<tr><td>Performance Criteria</td><td colspan="5">• Continued monitoring of groundwater quality during the remediation phase to identify any potential for adverse impacts to Duck River.
• No mobilisation of contaminated groundwater.</td></tr>
<tr><td>Key Performance Indicators</td><td colspan="5">• No environmental harm to ecological values close to the Western Area caused by mobilisation of contaminated groundwater as per key performance indicators outlined in the GWMP.
• No prosecutions or Penalty Infringement Notices (PIN) associated with the Project.</td></tr>
<tr><td rowspan="2">Legislative Requirements</td><td colspan="5">Development Consent (DC) (SSD 9302) conditions [Dated 7 May 2020]</td></tr>
<tr><td>Groundwater Monitoring and Management Plan</td><td colspan="4">B22. Prior to the commencement of remediation works, the Applicant must prepare a Groundwater Monitoring and Management Plan (GMP) to the satisfaction of the Site Auditor and the Planning Secretary. The GMP must form part of the REMP required by Condition C2 and must:
(a) be prepared by a suitably qualified and experienced person(s), in consultation with the EPA and DPIE – Water;
(b) include a program to monitor groundwater levels and quality during remediation works and following demobilisation;
(c) include a decision protocol for determining appropriate management measures for groundwater during remediation works, including but not limited to, pre-treatment, treatment, discharge or off-site disposal;
(d) detail ongoing monitoring following demobilisation, to verify that natural attenuation of groundwater contamination is occurring over time;
(e) include trigger levels for investigating potential adverse impacts to the Duck River, including triggers for indicating if further remediation of groundwater is required;
(f) outline contingency actions to be implemented if monitoring indicates that natural attenuation is not occurring, or groundwater is having an adverse impact on the Duck River;
(g) monitor the effectiveness of management measures and contingency actions for reducing impacts;
(h) procedures for reporting changes to groundwater conditions that have the potential to create unacceptable risks to the Duck River.</td></tr>
</table>

Groundwater Monitoring and Management		
		B23. The Applicant must: (a) not commence remediation works until the GMP is approved by the Planning Secretary; (b) submit any subsequent revisions of the GMP to the EPA for comment prior to the commencement of remediation works; and (c) submit the approved GMP to the EPA prior to the commencement of remediation works; and (d) implement the most recent version of the GMP approved by the Planning Secretary for the duration of the development.
	Annual Report	C12. Within 12 months of the commencement of remediation works, and every year thereafter until the completion of demobilisation, or other timing as may be agreed by the Planning Secretary, the Applicant shall review and report on the environmental performance of the development. The report shall: (c) include a comprehensive review of the monitoring results and complaints records of the development over the previous year, to demonstrate the effectiveness of the remediation works, including a comparison of: (iii) groundwater monitoring data with background data and trigger levels established in accordance with condition B22;
	Environnent Protection Licence EPL 570 [25 February 2020]	
	3 Limit Conditions L1 Pollution of waters	L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997 [Prohibition of pollution of waters]
	4 OPERATING CONDITIONS O1 Activities must be carried out in a competent manner	O1.1 Licensed activities must be carried out in a competent manner. This includes: a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity. O4.4 The licensee must store all chemicals, fuels and oils used for the development in appropriately bunded areas in accordance with the requirements of all relevant Australian Standards, and/or EPA's *Storing and Handling of Liquids: Environmental Protection – Participants Manual* (Department of Environment and Climate Change, 2007).
	5 MONITORING AND RECORDING CONDITIONS M1 Monitoring records	M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition. M1.2 All records required to be kept by this licence must be: a) in a legible form, or in a form that can readily be reduced to a legible form b) kept for at least 4 years after the monitoring or event to which they relate took place c) produced in a legible form to any authorised officer of the EPA who asks to see them. M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence: a) the date(s) on which the sample was taken b) the time(s) at which the sample was collected c) the point at which the sample was taken d) the name of the person who collected the sample.

Groundwater Monitoring and Management		
	8 POLLUTION STUDIES AND REDUCTION PROGRAMS U1 Soil and Groundwater monitoring program	U1.1 On or before 31 March 2011 and annually thereafter, a report must be submitted to the EPA's Manager Sydney Industry (RegOps.MetroRegulation@epa.nsw.gov.au). The report must include: (a) a summary of groundwater monitoring results for the previous 12 months; (b) details of any soil or groundwater investigations undertaken and the results of such investigations; (c) details of the progress against works proposed in the previous year's report; (d) an update of the conceptual site model (CSM) if conditions change significantly; (e) an update of the Soil and Groundwater Monitoring Program (SGMP) if required.
Activities	The Project activities which are likely to cause impacts on groundwater include: • Any activities involving excavations penetrating the impermeable silty clay layer leading to increased infiltration of surface water and therefore increased groundwater volumes and potential migration of contamination off-site • Dewatering of excavations potentially leading to mobilisation of contaminated groundwater • Spills and leaks during the Project which could contaminate the ground and groundwater.	
Predicted Impacts discussed in the EIS and RtS	• Existing groundwater monitoring data indicates that contamination plumes in the Western Area, and therefore the Stage 2 area, are stable and not posing a significant residual risk to human health or ecological receptors. Active remediation of groundwater is therefore not considered necessary to address residual petroleum hydrocarbon impacts in groundwater. Furthermore, it is anticipated that groundwater conditions are likely to improve further following remediation works. • It is anticipated that groundwater conditions are likely to improve further prior to, during and following remediation works based on the following: – Primary sources (e.g. above ground storage tanks) have been removed prior to the soil remediation commencing as part of the Clyde Terminal Conversion Project (SSD 5147), with the remnant subsurface infrastructure (such as below ground pipework) to be removed or left in situ (refer to the Detailed RAPs). – Shallow and Light Non-Aqueous Phase Liquid (LNAPL) impacts will be addressed as part of the remediation works by the excavation of LNAPL impacted soil to the extent practicable where potential risks are identified. As part of these works, impacted water may accumulate in these excavations and will be removed via pumping. – The soil remediation process itself is likely to significantly improve groundwater conditions over the long term, assisted by natural attenuation (this process involves allowing naturally occurring micro-organisms in the ground to biodegrade hydrocarbon contamination). • The removal of existing infrastructure during remediation works, including hardstand material within the Project Area, has the potential to result in increased infiltration of surface water within the Project Area. • There is a risk of potential impacts to the nearby Duck River should: – surface water or groundwater come into contact with ASS and migrate into the river (note that that initial investigations have confirmed that it is unlikely that ASS will be intercepted during the Stage 2 works (refer to Stage 2 Detailed RAP)) – dewatering result in mobilisation of LNAPL or contaminated groundwater across the site or to Duck River and associated riparian areas (note that large amounts of dewatering during the Stage 2 works are unlikely and this water would collected and disposed offsite (refer to Stage 2 Detailed RAP)) • Other potential groundwater impacts include contamination of groundwater from contaminated soils, equipment, existing infrastructure, or leaks and spills.	
Detailed Remedial Action Plan for Stage 2	Viva Energy are proposing to stage the remediation of the Western Area as follows: • Stage 1 – Former Process West • Stage 2 – Former Utilities and Movements • Stage 3 – Former Process East.	

Groundwater Monitoring and Management	
	A Detailed Remedial Action Plan (RAP) has been prepared for Stage 2. This section outlines the approach to the remediation for the Stage 2 Area (Former Utilities and Movements) as it applies to groundwater considerations. **Remediation Methodology for Stage 2** • The proposed remediation methodologies as stated within the Stage 2 RAP are as follows: o Excavation and off-site disposal of soils (asbestos removal); o Excavation for on-site Bioremediation (biopiling); and o Excavation and on-site management (engineered capping) • These remedial technologies were selected for use in combination to address the source areas in the soil and to manage potential human health risks. A validation approach for assessment of excavations and beneficial re-use of material has been presented in the Stage 2 Detailed RAP. • Given the current assessment that hydrocarbon concentrations in groundwater are stable to decreasing, it is expected that the remediation works proposed will enhance the current natural attenuation processes to reduce residual groundwater impacts over time. • A detailed remediation works overview is provided in Section 9 of the Stage 2 Detailed RAP. **Excavation and off-site disposal of soils (asbestos removal)** • Asbestos identified in soils within AEC-1 and AEC-3B will be excavated and disposed off-site in line with the approach presented in the Stage 2 Detailed RAP. Various controls are to be implemented to manage potential risks. These controls would be detailed in the asbestos management plan required under Mitigation and Management Measure SWMP3 (refer to the Soil and Water Management Plan); • Excavation works in these areas would involve: o Careful excavation of impacted materials using appropriate equipment (e.g. excavators /backhoes), from the AEC-1 and AEC-3B areas. Works will be conducted in accordance with the approved management plans with particular emphasis on dust mitigation; o A validation consultant shall observe the excavation and excavated materials for indicators of unexpected finds including visual (staining, discolouration) and olfactory (odours). If indicators of potential contamination that are inconsistent with identified Asbestos Containing Materials (ACM) impacts are observed, the Unexpected Finds Protocol (UFP) detailed within Appendix C of the Stage 2 Detailed RAP will be implemented; o Where practicable, to reduce the area of disturbed material, the number of areas subject to excavation works at any one time will be minimised and materials will be excavated and placed in temporary covered stockpiles (to eliminate dust/airborne particles) or placed directly into a truck for transport to an approved / suitably licensed off-site disposal location.; • As offsite disposal of excavated ACM containing soils is required, these soils will be placed within a temporary stockpile in the vicinity of the excavation area for additional assessment and waste classification purposes or classified in-situ based on existing data. Where classification of materials is required to be undertaken prior to disposal, samples will be collected either in-situ or from stockpiled materials to determine the requirements for off-site disposal. Sampling densities and stockpile validation processes are documented in the Stage 2 Detailed RAP in accordance with the NSW EPA Waste Classification Guidelines (NSW EPA, 2014); and • Where waste materials are not temporarily stockpiled on hardstand, following removal of stockpiled impacted materials, the footprint of the stockpile location may require validation to verify no cross contamination. The results of collected waste classification and stockpile footprint validation samples are to be collated and provided for inclusion into the final site validation report. **Excavation for on-site bioremediation (biopiling)** • Biopiles are constructed via placement of soil in 1 m layers with solid and perforated pipe being laid prior to the next layer being placed. The solid pipe will extend into the stockpile where it is attached to the perforated pipe and is adjoined to a piping manifold. The piping is connected to a Soil Vapour Extraction (SVE)

Groundwater Monitoring and Management	
	system which extracts air (and soil vapour) from the stockpile (via a powered blower unit) into an air/water separator with 'drop out' tank for removal of moisture. The 'drop out' tank will be pumped (as required) to a holding tank prior to off-site disposal. • The SVE system will be attached to vessels of granular activated carbon filter media, to treat contaminated air and remove odours prior to emission via an exhaust stack. A 'lead' and 'lag' vessel will be installed in a continuous circuit such that if breakthrough of contaminants occur through the lead vessel, it is captured via the lag vessel prior to emission. • Biopiles will be covered with an impermeable cover to contain potential air emissions and odours from the stockpile, to prevent creation of leachate via rainfall, and to retain soil moisture and temperature to encourage biodegradation. • Following completion of biopiling the material will be re-used within the Western Area during future stages of remediation or disposed off-site to a suitably licensed receiving facility if unable to be treated to the re-use criteria outlined in the Stage 2 Detailed RAP. **Excavation and on-site management (engineered capping)** • The engineered cap will be constructed via excavations of soil up to 0.5 metres deep along the AEC-4 footprint to remove the existing asphalt hardstand. The existing asphalt hardstand that would be removed is currently in variable condition with unsealed sides and visible cracking throughout. Once excavated, this will be disposed off-site disposal or recycled. • After the existing hardstand has been removed, re-work and re-grading of the soil, as well as waste classification sampling of soil material, will be completed in order to achieve the desired landform. • After the desired landform has been achieved, a capping layer will be placed in the AEC-4 footprint. This capping layer will manage direct contact with impacted soils. The AEC-4 area will be covered with appropriate backfill material before the placement of a hardstand covering. The final relative levels of the cap will be confirmed within the Detailed Cap Design produced by the remediation contractor.

Management Approach	**Groundwater Management Overview**
	• Groundwater within the Stage 2 area is present at depths generally between 1 – 3 mbgs.
	• Based on the proposed shallow depths of excavation for Stage 2, low transmissivity within the clay lithology and observations of little water ingress being observed during previous works, groundwater ingress into excavations is expected to be minor and is unlikely to require dewatering of significant volumes to safely complete excavations
	• Given the relatively small volume of excavation water expected to be generated during Stage 2 excavation works, it is anticipated that water from excavations could be temporarily pumped and stored within a holding tank pending characterisation.
	Licence and Approval Requirements
	• The Western Area is within the Sydney Basin Central Water Source of the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011. The *NSW Aquifer Interference Policy* (DPI, 2012) outlines the requirement for approval of 'aquifer interference activities' under the *Water Management Act 2000* (WM Act). As excavations and remediation activities could penetrate the aquifer associated with the Sydney Basin Central Water Source, the need for an aquifer interference approval under section 91 of the WM Act was discussed with the NSW Natural Resource Access Regulator. These discussions confirmed that an aquifer interference approval is only required if the works will dewater more than 3 megalitres of groundwater per annum. It is unlikely that more than 3 megalitres of groundwater per annum would be dewatered during the Stage 2 works. Therefore an aquifer interference approval for Stage 2 is not required.
	Decision Protocols and Contingency Measures
	• Given the small scale and short duration of excavation works and small volumes of wastewater expected during Stage 2, it is proposed to collect and test this wastewater prior to disposal off-site. This will mean wastewater streams will not be sent to the WWTP and, therefore, the SWMP has not included the characterisation of the expected quality of discharges from the WWTP or a protocol for testing water accumulated in excavations to determine whether it will be sent off-site (refer to Condition B20 (c) and (f)).
	Groundwater Monitoring Program (GWMP) (ERM, 2021)
	• Groundwater conditions within the Site are monitored through an established groundwater monitoring well network (refer to the GWMP in Attachment A for details) that includes wells in internal operational areas and adjacent to the Site boundary.
	• Previous groundwater monitoring undertaken throughout the Western Area has indicated stable to decreasing concentrations of TRH and BTEX in groundwater over time within monitoring wells. Risks to human health and ecological receptors from dissolved phase groundwater concentrations have not been identified in the Western Area based on the current commercial/industrial land-use. Following source removal (residual LNAPL and residual soil contamination), concentrations are expected to show a continual reduction. The current CSM for the AEC-4 area has not identified risks to on-site or off-site receptors from groundwater. However, given the proximity of off-site receptors, the design and construction of the cap will provide additional confidence into the future regarding in ongoing stability of LNAPL and groundwater impacts identified as confined to the AEC4 buried waste mound.
	• The groundwater monitoring program (refer to Attachment A) will be implemented during remediation works.
	• Existing groundwater monitoring wells have been selected for gauging and sampling based on the following objectives:
	  • Monitoring during remediation - to demonstrate remediation works do not have short-term adverse effects on localised groundwater quality or Duck River and implement contingency actions (if required).
	  • Monitoring post-remediation - to verify that concentrations of contaminants of concern continue to pose no unacceptable risks to future on-site receptors or the Duck River following completion of remediation activities and that groundwater management via natural attenuation remains an appropriate approach.
	• Existing monitoring wells will be used for the proposed groundwater monitoring. Should these monitoring wells be damaged, or unable to be located, an assessment of the adequacy of the monitoring well network to meet the objectives of the GWMP will be undertaken. The re-installation of monitoring wells will only be considered if the existing network becomes unsuitable for its intended purpose.

- The locations of selected monitoring wells are shown in the GWMP (refer to Attachment A). Note that wells designated for monitoring during remediation will only be applicable to where active remediation is being undertaken. For instance, only wells nominated within AEC-3A will be monitored throughout the duration of excavation works in this area.
- The focus for post-remediation monitoring will be to assess groundwater flux and boundary conditions. The boundary monitoring well network is expected to be unaffected by the works undertaken during the Project.
- Ongoing monitoring will be the responsibility of Viva Energy, with specific details provided within the Groundwater Monitoring Program (GWMP) (refer to Attachment A). The requirement to provide access for ongoing monitoring following completion of remediation would be outlined within the LTEMPs.

Groundwater monitoring requirements are outlined in the tables below.

Groundwater Monitoring Requirements – During Remediation			
Monitoring Area	Rationale	**Frequency**	**Data Collected**
Excavation Areas (nearby wells)	• Sampling for adverse changes in dissolved phase COPC concentrations from remediation activities • Although considered unlikely to occur, an indication of potential ASS issues created during remediation may be assessed via collection of field parameters	• Baseline sampling prior to commencement of remediation works • Within 3 months following completion of remediation works	• laboratory analysis for target COPCs (excavation specific) • collection of field parameters (including pH)
Excavation Areas (nearby wells)	• Gauging to monitor potential alteration to groundwater levels/ flow regime • Monitor potential for LNAPL mobilisation	• Gauging weekly during excavation and/or dewatering	• Gauging Data (water levels, LNAPL presence/ thickness)
Down-gradient boundary	• Demonstrate groundwater at the boundary is not adversely impacted by remediation works or causing environmental harm to the Duck River; • Monitor potential for LNAPL mobilisation from remediation works	• monthly during active remediation conducted up-gradient	• Gauging data (water levels, LNAPL presence/ thickness) • grab sample for collection of field parameters (including pH)

Groundwater Monitoring Requirements – Post Remediation			
Monitoring Area	**Rationale**	**Frequency**	**Data Collected**
Excavation Areas (nearby wells)	• Gauging to monitor potential for alteration to groundwater levels/ flow regime or LNAPL mobilisation	• Completion of a single post-remediation sampling event (within 3 months of completion of remediation work)	• laboratory analysis for TRH, BTEXN and MNA parameters • collection of field parameters • Gauging Data (water levels, LNAPL presence/ thickness).

Down-gradient boundary	• Demonstrate groundwater at the boundary is not impacted by remediation works or causing environmental harm to the Duck River • Monitor potential for LNAPL mobilisation from remediation works	• Biannually (every 6 months) following completion of post remediation sampling event • Requirement for ongoing sampling is to be reviewed annually (i.e. every two GMEs) based on trend analysis and reported concentrations	• laboratory analysis for TRH, BTEXN and MNA parameters • collection of field parameters • Gauging Data (water levels, LNAPL presence/ thickness) • collection of field parameters (including pH)
Downgradient boundary (AEC-4)	• Demonstrate groundwater at the site boundary does not present an unacceptable risk to offsite receptors (Duck River) via mobilisation of contaminants from by in-situ managed buried waste material; • Monitor potential for LNAPL mobilisation and groundwater flow alteration following installation of surface capping.	• Biannually (every 6 months) following completion of post remediation sampling event • Requirement for ongoing sampling is to be reviewed annually (i.e. every two GMEs) based on trend analysis and reported concentrations	• Laboratory analysis for Contaminants of concern specific to AEC-4: o TRH C6-C40, BTEXN and MNA parameters o PAHs o Hexavalent Chromium o PFAS • Collection of field parameters • Gauging Data (water levels, LNAPL presence/ thickness)

Acid Sulfate Soils

- The *Acid Sulfate Soil (ASS) Risk Map for Parramatta/Prospect* (scale 1:25,000) produced by the Department of Land and Water Conservation (1997) identified the Western Area as having a high probability of ASS in estuarine sediments adjacent to the Duck River. The nominated remediation areas are classified predominantly as Class 4 with a small area of Class 2 situated at the south-eastern extent of Stage 2 boundary. No estuarine sediments have been identified within soils during previous investigations.
- Given the absence of such sediments across the Western Area and the proposed scale of the works, the probability of encountering Actual ASS (AASS) or Potential Acid Sulphate Soils (PASS) during remediation works is considered low. Despite this, the collection of field parameters (including pH) during groundwater sampling have been incorporated into the scope of this GWMP to monitor for adverse effects associated with excavation of ASS.

Subsurface Infrastructure

The current proposal is to leave subsurface drainage infrastructure in situ for the Stage 2 Area. As outlined in the Stage 2 Detailed RAP, this infrastructure has been decommissioned and left in a state that:

- is not considered an ongoing primary source of soil and groundwater impact or a preferential pathway for migration of contaminants;
- does not present an unacceptable future safety risk via accumulation of gases in sub grade void spaces; and
- cannot be recommissioned for use in future.

Leaving this infrastructure in situ will result in reduced soil disturbance and reduced risk of mobilising contaminants. The subsurface drainage infrastructure has already been disconnected from the Site's WWTP. The former drainage lines will be managed via the LTEMP(s) as required.

Groundwater Monitoring and Management Plan - Mitigation and Management Measures					
Reference	Source Reference	Aspect	Mitigation and Management Measure	Responsibility	Timing
GMP1	DC: B22, B23 & C12 EPL 570: U1 MMM: SGC2, SW5	Groundwater management	The Project will be delivered to meet the objectives, performance criteria and key performance indicators outlined in this plan. Compliance with the objectives, performance criteria, key performance indicators and the mitigation and management measures will be demonstrated.	Remediation Contractor	At all times
GMP2	DC: B22(b), B22(d), B22(e), B22(f), B22(g), B22(h) & MMM: SGC2 & SGC6	Groundwater Monitoring Program	A groundwater monitoring program (GWMP) has been developed to outline the approach to monitor groundwater across the Western Area to assess natural attenuation processes of groundwater contamination during the remediation phase. This program forms an attachment to this GMP (refer to Attachment A). This program: • outlines the approach to monitoring groundwater across the Western Area to demonstrate that ground water quality is being maintained or improved • includes procedures for reporting changes to groundwater conditions that have the potential to create unacceptable risks to the Duck River • includes trigger levels for investigating potential adverse impacts to the Duck River • outlines contingency actions to be implemented if monitoring indicates that groundwater is having an adverse impact on the Duck River • monitors the effectiveness of management measures and contingency actions for reducing impacts • includes annual reporting requirements for the groundwater monitoring program, including: – a discussion of the efficacy of relevant mitigation measures – a summary of groundwater monitoring data including updated groundwater trends.	Western Area Remediation Project Manager	Prior to commencement of remediation works
GMP3 (also SWMP2)	MMM: SGC1	Management of Acid Sulfate Soils	The presence of Acid Sulfate Soils at proposed excavation areas will be confirmed prior to undertaking excavation. Where the presence of ASS has been identified an Acid Sulfate Soils Management Plan (ASSMP) will be prepared. If an ASSMP is required, it will be prepared in accordance with the Acid Sulfate Soils Assessment Guidelines (NSW Acid Sulfate Soils Management Advisory Committee, 1998) and will guide the ongoing monitoring and management of ASS for the specific works. The ASSMP will include: • measures to manage ASS that need to be excavated from the Project Area. These measures will be in accordance with the Waste Classification Guidelines Part 4: Acid Sulfate Soils (NSW EPA, 2014); and • contingency measures to manage impacts that have the potential to occur if specified management strategies fail, and to outline remediation and restoration actions that may be required.	Remediation Contractor	Two weeks prior to commencement of preparation works, where required

Groundwater Monitoring and Management Plan - Mitigation and Management Measures					
Reference	Source Reference	Aspect	Mitigation and Management Measure	Responsibility	Timing
			Note: Investigations for the Stage 2 works have been completed and confirmed that ASS are unlikely to be encountered during the Stage 2 works.		
GMP4 (also SWMP5)	DC: B22(c), B20(f) MMM: SCG2	Groundwater management method statement	A groundwater management method statement (GMMS) will be developed by a suitably qualified expert to address the storage, movement and treatment of groundwater encountered in excavations. This GMMS will be developed in accordance with the relevant Detailed RAP and prepared by a suitably qualified expert in consultation with Viva Energy. Measures within the GMMS will include the collection, testing and disposal off-site of groundwater encountered during Stage 2 excavations.	Remediation Contractor	Two weeks prior to commencement of remediation works
GMP5 (also SWMP8)	MMM: SCG2 EPL 570: O4.4	Storage of chemicals	Potential chemical pollutants (e.g. fuels, additives, etc.), will be stored in appropriate containers and/or within bunded and lined areas to minimise the risk of spillages or mobilisation of these pollutants into soil and groundwater.	Remediation Contractor	At all times
GMP6 (also forms part of SWMP25)	MMM: SW5	Control of sediment dispersal	In the event that settling ponds are required, these will be lined to avoid interactions with groundwater.	Remediation Contractor	As required

GROUNDWATER - Monitoring Requirements			
Aspect	Description	Responsibility	Frequency
Monitoring groundwater levels and quality	Groundwater monitoring in line with EPL 570	Western Area Remediation Project Manager and Validation Consultant	At all times
Groundwater monitoring during remediation - Excavation Areas (nearby wells) - Sampling	Groundwater monitoring in line with this GMP	Western Area Remediation Project Manager and Validation Consultant	• Baseline sampling prior to commencement of remediation works • Within 3 months following completion of remediation works
Groundwater monitoring during remediation - Excavation Areas (nearby wells) - Gauging	Groundwater monitoring in line with this GMP	Western Area Remediation Project Manager and Validation Consultant	• Gauging weekly during excavation and/or dewatering
Groundwater monitoring during remediation - Down-gradient boundary	Groundwater monitoring in line with this GMP	Western Area Remediation Project Manager and Validation Consultant	• Monthly during active remediation conducted up-gradient
Groundwater monitoring post remediation - Excavation Areas (nearby wells)	Groundwater monitoring in line with this GMP	Western Area Remediation Project Manager and Validation Consultant	• Completion of a single post-remediation sampling event (within 3 months of completion of remediation work)
Groundwater monitoring post remediation - Down-gradient boundary	Groundwater monitoring in line with this GMP	Western Area Remediation Project Manager and Validation Consultant	• Biannually (every 6 months) following completion of post remediation sampling event • Requirement for ongoing sampling is to be reviewed annually (i.e. every two GMEs) based on trend analysis and reported concentrations
Excavation water and discharge monitoring	Water removed from excavations and leachate will be collected and tested prior to off-site disposal.	Remediation Contractor for removal, testing and disposal Validation Consultant for testing	As required
General	Ad hoc visual observations to ensure compliance with groundwater management requirements	Remediation Contractor	At all times
General	Quarterly audits against the requirements of this GMP and GWMP and any active GMMS	Remediation Contractor and Viva Energy	Quarterly

GROUNDWATER – Reporting Requirements			
Aspect	Description	Responsibility	Frequency
KPI and compliance reporting	Reporting of key performance indicator(s) and compliance quarterly, including a summary of any visual observations and audits undertaken in the period.	Remediation Contractor	Quarterly

GROUNDWATER – Reporting Requirements			
Complaints	Register of complaints will be maintained and updated.	Viva Energy	As required
Clyde Soil and Groundwater Monitoring Program	In accordance with EPL 570 U1.1 and DC condition C12, Viva Energy will prepare a report, for submission to the EPA's Manager Sydney Industry. The report will include: (a) a summary of groundwater monitoring results for the previous 12 months; (b) details of any soil or groundwater investigations undertaken and the results of such investigations; (c) details of the progress against works proposed in the previous year's report; (d) an update of the conceptual site model (CSM) if conditions change significantly; (e) an update of the Soil and Groundwater Monitoring Program (SGMP) if required. (f) a comprehensive review of the monitoring results and complaints records of the remediation over the previous year, to demonstrate the effectiveness of the remediation works, including a comparison of groundwater monitoring data with background data and trigger levels. The Remediation Contractor must provide to Viva Energy the required data, to allow Viva Energy to complete the report.	Western Area Remediation Project Manager	Annually

GROUNDWATER - Corrective Action			
Aspect	Description	Responsibility	Frequency
Non-compliance with EPL 570 limits, DC or MMM	An investigation and as required, corrective action and update to the GMP, will be undertaken in line with Section 4.6 and 6.4 of the REMP, should any of the following occur: • Non-compliance raised • Incident involving pollution of groundwater has occurred.	Project Environment Lead	Ongoing, as required

Attachment A – Groundwater Monitoring Program – Stage 2

Clyde Western Area Remediation Project

Groundwater Monitoring Program – Stage 2

14 July 2021

Project No.: 0561882

The business of sustainability

ERM

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14 July 2021

Clyde Western Area Remediation Project

Groundwater Monitoring Program – Stage 2

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Glossary

Glossary Term	Definition
the Site	Viva Energy owned land on the Camellia Peninsula consisting of the following Lots: Lot 398 DP41324, Lots 100 and 101 of DP 1168951, Lot 101 DP809340, Lot 2 DP 224288, and Lot 1 DP 383675. It includes the Clyde Terminal, the Parramatta Terminal, the Wetland, the Western Area and other land that is currently vacant or leased to third parties
the Western Area	A largely vacant area of land, approximately 40 Ha in size, located in the south western part of the Site. The land previously contained a variety of refinery assets that have now been removed.
the Clyde Terminal	A part of the Site currently operating as an import, storage and distribution terminal for finished petroleum products including diesel, jet and gasoline fuels. The Clyde Terminal makes up the majority of the central part of Site and operates under SSD 5147 and NSW EPL 570
the Parramatta Terminal	A part of the Site Currently used for distribution activities involving bulk road transport. The Parramatta Terminal is located in the north western part of the Site and operates under EPL 660.
the Wetland	A large undeveloped wetland area in the north-eastern part of the Site close to the confluence of the Parramatta and Duck Rivers.
the Project	The proposal to remediate the contaminated soils in the Western Area to a commercial/industrial standard alongside associated infrastructure removal, waste management, soil and groundwater management, land forming and storm water management activities.
the Project Area	The Project Area is the land within the Western Area where the Project will occur. The extent of the Project Area, within the Western Area, is shown on Figure 1, Appendix A.
The Stage 2 Area	The Stage 2 Area encompasses all areas within the Western Area situated to the west of the Stage 1 Area. The Stage 2 Area extends from Devon Street in the North to the Duck River at the southern boundary of the Western Area, the extent of which is shown on Figure 1 and 2.
AEC-4	Area of Environmental Concern 4 (Southern Buried Waste Area). AEC-4 forms part of the extent of remediation and management required within the Stage 2 Area of the WARP, and is situated within the southern portion of the Stage 2 Area. AEC-4 is shown on Figure 1 and 2.

1. INTRODUCTION

Viva Energy Australia Pty Ltd. (Viva Energy) contracted Environmental Resources Management Australia Pty Ltd (ERM) to prepare a Groundwater Monitoring Program (GWMP) to supplement the Groundwater Monitoring and management Plan (GMP) which has been prepared for the Clyde Western Area Remediation Project ('the Project').

This GWMP has been specifically prepared for 'Stage 2' of the Western Area, as defined in the following sections.

1.1 Background

Viva Energy owns the land associated with the former Clyde Refinery, located at Durham Street, Rosehill on the Camellia Peninsula, NSW ('the Site'). Viva Energy currently operates the Clyde Terminal on part of the former Refinery footprint; however a large part of the former refinery land in the south-western portion (the 'Western Area') is no longer required for operational purposes. As such, Viva Energy is proposing to remediate contaminated soils (as required) within the majority of the Western Area, as shown on Figure 2.

Viva Energy intends to remediate the Western Area to a standard suitable to facilitate future commercial / industrial land use. Due to the scale of remedial works, the Project was declared State Significant Development (SSD) and as such, to assess the potential environmental impacts associated with remediation, an Environmental Impact Statement (EIS) containing a Conceptual Remedial Action Plan (RAP) was prepared (AECOM, 2019a).

Based on correspondence between various Project stakeholders, Viva Energy is proposing to stage the remediation of the Western Area as follows:

- Stage 1 – Former Process West;
- Stage 2 – Former Utilities, Movements and Southern Buried Waste Area; and
- Stage 3 – Former Process East.

This groundwater monitoring program presents the groundwater monitoring requirements to be implemented across Stage 2 of the Project.

A GWMP has previously been developed (ERM, 2021a) to be implemented across all stages of the project. However, given the GWMP is associated with a Long Term Environmental Management Plan (LTEMP) for the 'Stage 1 Area', a separate GWMP has been prepared for the Stage 2 Area such that discrete revisions may be made without impacting upon the management of unrelated portions of land.

This GWMP has been developed in accordance with the consent conditions associated with approval SSD 9302 for the Project. Post remediation groundwater monitoring requirements are detailed within this GWMP and will be appended as a requirement of the Long Term Environmental Management Plans (LTEMPs) prepared for portions of the Western Area. The GMP and GWMP will be subject to Site Auditor review and approval.

1.2 Project Objectives

Viva Energy has developed three main project objectives as follows:

- Ensure on-going operational viability of Clyde Terminal assets and associated licences to operate (including but not limited to Safework NSW Major Hazard Facility (MHF) Licence, Environment Protection Licence (EPL) 570 and the SSD 5147 consent conditions).
- Ensure any future redevelopment decisions are considerate of the operational requirements of the existing terminal.
- Meet applicable regulatory requirements.

1.3 Remediation Objectives and Strategy

The remediation objectives for the Project, as defined within the Conceptual RAP (AECOM, 2019b) are as follows:

- *"Remediate the soil and manage groundwater within the appropriate parts of the Western Area (i.e. the Project Area), to enable the land to be used for commercial / industrial purposes in the future, thereby reducing the risk of contamination from the land adversely affecting human health and the environment;*
- *Ensure any approved remediation process that is implemented adheres to all applicable regulatory requirements so as to limit or eliminate (where possible) adverse effects to human health or ecological receptors..."*

These overarching remediation objectives are applicable to all stages of the Project. Where remediation is required, the focus of the works are:

- Addressing petroleum hydrocarbon impacts on shallow soil horizons;
- Addressing soil/sludge impacts in the drainage network and surrounds;
- Removing Light Non-Aqueous Phase Liquid (LNAPL) trapped within shallow soils to the extent practicable[1]; and
- Facilitating the effective removal or mitigation of short or long-term contamination risks to the environment.

The requirement to remove LNAPL would be based on the level of potential human health risk for the proposed commercial/ industrial end use. Given the established stability of LNAPL and associated dissolved phase impacts, removal of LNAPL to reduce groundwater migration is not a key driver. As such, the below risk-based approach, forms the basis for the remediation extents and volumes provided for the Western Area:

- Hydrocarbon impacted soils and LNAPL which have been assessed as posing a risk to future commercial/industrial receptors (via vapour intrusion) are proposed to be removed via excavation of shallow soils to the extent practicable;
- LNAPL which has been assessed as not posing a risk to human health, and immobile is proposed to be managed in-situ via Long Term Environmental Management Plans;
- Previous groundwater monitoring undertaken throughout the Western Area has indicated stable to decreasing concentrations of petroleum hydrocarbons, including Total Recoverable Hydrocarbons and Benzene, Toluene, Ethylbenzene and Xylenes (BTEX) in groundwater over time. Risks to human health and ecological receptors from dissolved phase groundwater

[1] Removal of LNAPL 'to the extent practicable' is defined as whereby that residual risks are mitigated or able to be managed passively under a Long Term Environmental Management Plan (LTEMP)

concentrations have not been identified in the Western Area based on the current commercial/industrial land-use.

Given the current assessment that hydrocarbon concentrations are stable to decreasing, it is expected that the remediation works proposed will enhance the current natural attenuation processes. The ongoing groundwater management approach presented within this GWMP is therefore aimed at demonstrating the ongoing stability of groundwater conditions and that residual groundwater impacts do not present a risk to the ecological values of receptors, specifically Duck River.

1.4 Stage 2 Remediation Works Overview

The scope of remediation works based on the remediation strategy and objectives for the project is provided within the Stage 2 RAP (ERM, 2021b) and summarised below.

The proposed remediation methodologies were selected for remediation of contaminated soil and LNAPL within the Stage 2 Area:

1) Excavation and on-Site bio-piling (hydrocarbon impacted areas); and/or
2) Excavation and off-site disposal of soils (for asbestos impacted soils or as a contingency measure).
3) On-site management under a constructed engineered cap (specific approach to AEC-4)
4) On-site management with management control outlined within an Long Term Environmental Management Plan (LTEMP) (direct contact risks and residual LNAPL)

Table 1-1 Remediation Methodology Summary

Remediation Methodology	Combined Estimated In-situ Volume (m3)	Remediation Area(s) of Environmental Concern
Excavation and on-Site bio-piling (hydrocarbon impacted areas)	5690	■ AEC-3A, ■ AEC-3D, ■ AEC-3E, ■ AEC-14A, ■ AEC-14B
Excavation and off-site disposal of soils (for asbestos impacted soils or as a contingency measure)	701	■ AEC-1 ■ AEC-3B
On-site management under a constructed engineered cap (Specific to AEC-4)	6968 [1]	■ AEC-4
On-site management with management controls outlined within an LTEMP (direct contact risks and residual LNAPL)	-	■ AEC-2, ■ AEC-3C, ■ AEC-5, ■ AEC-8, ■ AEC-11, ■ AEC-14, ■ AEC-15

Notes: 1. AEC-4 excavation volume refers to anticipated volume of uncontaminated surface material required to be re-worked for capping construction

1.5 Objectives of this GWMP

The objective of the GWMP is to meet the requirements of the Development Consent for the WARP (SSD 9302), and supplement the management and mitigation measures provided in the Groundwater Monitoring and Management Plan (GMP), prepared by AECOM (AECOM, 2020).

This groundwater monitoring program (GWMP) has been developed by a suitably qualified expert to monitor changes in groundwater levels and quality during and following completion of the remediation works. The plan addresses the below specific items requested in the conditions of consent:

SSD Condition	Objective	Relevant Section of this GWMP
B22 (b)	include a program to monitor groundwater levels and quality during remediation works and following demobilisation;	Section 3
B22 (d)	detail ongoing monitoring following demobilisation, to verify that natural attenuation of groundwater contamination is occurring over time;	Section 3.5 and Table 2, Appendix B
B22 (e)	include trigger levels for investigating potential adverse impacts to the Duck River, including triggers for indicating if further remediation of groundwater is required;	Section 3.3
B22 (f)	outline contingency actions to be implemented if monitoring indicates that natural attenuation is not occurring, or groundwater is having an adverse impact on the Duck River;	Section 3.7
B22 (g)	monitor the effectiveness of management measures and contingency actions for reducing impacts	Section 3.5 and 3.7
B22 (h)	procedures for reporting changes to groundwater conditions that have the potential to create unacceptable risks to the Duck River.	Section 3.6

2. CONCEPTUAL SITE MODEL AND RISK ASSESSMENT SUMMARY

2.1 Introduction

The detailed Conceptual Site Model (CSM) in relation to soil and groundwater conditions within the Western Area is presented in the Remediation Site Investigation Report (ERM, 2020a) and Human Health and Ecological Risk Assessment (HHERA) (ERM, 2020b). The CSM has been further refined based on supplementary investigations undertaken in the Stage 2 Area as detailed within the Stage 2 Remediation Action Plan ('the Stage 2 RAP', ERM 2021b) and therefore has not been reproduced in full within this GWMP. A brief summary of the environmental setting and nature and extent of groundwater impacts has been provided below for context.

2.2 Geology

The geology of the Site, including the Western Area has been characterised into four units, based on investigations completed by ERM and interpretation of soil bore log data obtained during previous investigations. A summary of the strata identified during historical investigations is detailed below:

- **Unit 1 (Fill Material)** - This material is described as a poorly compacted mixture of silt, clay and gravel, with localised areas of slag, furnace ash and concrete. This material was used to raise the level of the surface of the low-lying tidal swamp/mangrove area along the Parramatta and Duck Rivers. The fill material pinches out to the west;
- **Unit 2 (Estuarine Sediments)** - This unit is comprised of silty clay – clayey silt with occasional sandy lenses and shell fragments to a thickness of approximately 4 m. The unit generally thickens towards the Parramatta River and represents the natural profile prior to development and filling; and
- **Units 3 and 4 (Alluvial Sediments and Residual Clay)** - Tertiary alluvial sediments (up to 20 m thick, including clay with sandy lenses) and residual Ashfield Shale were reported in previous investigations.

With the exception of AEC-4, the average thickness of fill material within the Stage 2 Area is 0.6 m and this thickens to between 1.2- 1.5 m further south in proximity to the Duck River. Fill material is underlain by high plasticity orange red and grey clay (alluvial sediments) across the majority of the Stage 2 Area. Localised areas of backfill sand have been identified surrounding subsurface features (pipework) to depths of up to of 2 m bgl.

During historical site investigations, the following ground conditions were identified specific to AEC-4:

- Heterogeneous fill materials were identified to a depth of 4.0 m bgl. ERM notes that previous test pitting was terminated within fill materials in AEC-4 and as such the potential for deeper fill was noted to exist.
- The fill material is described as poorly compacted mixture of silt, clay and gravel, with localised areas of slag, furnace ash, black sludge and concrete. The RSI specifically identified anthropogenic waste such as bricks, timber, metal pipes, tiles and glass.
- LNAPL and "sludge materials" were identified at variable depths and locations throughout the fill materials.
- Field observations (and subsequent laboratory analysis) identified ACM and fibrous asbestos at a number of locations. Based on the nature and extent of fill within AEC-4, it was considered asbestos may be widely distributed throughout the fill matrix.

The Acid Sulfate Soil (ASS) Risk Map for Parramatta/Prospect (scale 1:25,000) produced by the Department of Land and Water Conservation (1997) identified the Western Area as having a high probability of ASS in estuarine sediments adjacent to the Duck River. The Stage 2 Area is classed

predominantly as Class 4. A small portion of Class 2 area is noted to be present at the south-eastern extent of the Stage 2 area.

Recent investigation within AEC-4 has indicated that PASS conditions may exist in natural soils below the depth of fill material in AEC-4. Other parts of the Stage 2 Area are considered to have low potential for PASS/ ASS to be present.

Despite the low potential for ASS/ PASS presence, the collection of field parameters (including pH) during groundwater sampling has been incorporated into the scope of this GWMP (provided in Section 3) to monitor for potential adverse effects associated with excavation of ASS.

2.3 Hydrogeology

A detailed summary of hydrogeology across the wider Western Area has been provided within the RSI Report (ERM, 2020a). A summary relevant to the Stage 2 Area is provided in Table 2-1 below.

Table 2-1 Hydrogeology Summary (Stage 2 Area)

Stage	Comment
Groundwater Depth	Groundwater is represented as a shallow unconfined water bearing zone within the fill material and estuarine-alluvial sediments at depths between 1-3 m bgl. Preferential pathways for groundwater flow have been identified as being present within sandy lenses within the fill and estuarine units along with anthropogenic structures, such as the on-site storm water drainage network.
Groundwater Flow Direction	Direction of groundwater flow may be subject to fluctuation following rainfall events and localised groundwater mounding, but has generally been established to be towards the bounding Duck and Parramatta Rivers. Inferred groundwater flow direction based upon recent gauging activities since demolition works in 2016 is towards the Duck River, to the south and south-east. Within AEC-4, groundwater flows radially in line with site topography from the central northern portion of the buried waste mound towards the Duck River in the south and south east. Groundwater contours indicate a westerly to south-westerly flow towards an unlined drainage channel west of the buried waste mound. Groundwater flow in the north east is effected by the localised mounding of groundwater associated with unsealed ground.
Hydraulic Gradient	Average hydraulic gradients calculated parallel to groundwater flow direction indicated the hydraulic gradient to range between 0.003 m/m along the up gradient portion of the Western Area to 0.011 m/m across the southern portions of the Western Area. Hydraulic gradients were found to increase with proximity to the Duck River (ERM, 2018).
Hydraulic Conductivity	Based on historical assessments undertaken: ■ Hydraulic conductivity has been established to be low across the large majority of the Site, with estimated hydraulic conductivity values estimated for wells that were screened across clay, sandy clay and gravelly clay typically ranging from $5x10^{-5}$ m / day to $6x10^{-3}$ m/day. ■ Higher hydraulic conductivity values were reported for wells screened across coarser grained sandy clay soils within the southern portion of the Site and are consistent with the more transmissive nature of these geologies. ■ Generally, hydraulic conductivity values increased from a minimum 5 x 10^{5} m/day at the up gradient site boundary to up to 4 x 10^{-2} m/day closer to the southern site boundary due to the presence of sand/silt estuarine deposits closer to the Duck River. ■ laterally continuous higher hydraulic conductivity lithological units are not expected to be encountered within the Stage 2 Area. Specifically to AEC-4: ■ estimated hydraulic conductivity values estimated for wells that were screened across fill (gravelly clay), sandy clay and clay ranged from $1x10^{-3}$ m / day to 3 m/day.
Tidal Influence	On the basis of static water level data obtained from monitoring wells adjacent to the Duck River (including AEC-4), tidal interaction of surface water within the Duck River with groundwater within is not considered likely to be occurring, and is consistent with tidal assessments undertaken within other area of the Clyde Terminal.

- The focus of investigation activities and resulting refinement of the CSM has been on assessment of the shallow water bearing unit. This is due to the nature of soil and groundwater sources within the Stage 2 Area being at or near surface (historical aboveground storage and pipework and near surface drainage). The presence of fill material underlain by impermeable clay lithology has limited vertical migration and confined impacts in soil and groundwater to within the surficial shallow water bearing unit. This is supported by soil analytical results indicating that COPCs in soil samples collected from within the clay layer (or at depths greater than 2 m bgl) do not exceed the applicable screening criteria.
- Based upon the understanding of geology and hydrogeology at the site, the lateral migration potential of COPCs in groundwater is limited by the low permeability of the lithology, relatively flat hydraulic gradient and low average groundwater velocity. This is supported by the limited extent of impacted groundwater reported, indicating that, where present, areas of impacted groundwater are relatively stable and do not appear to be migrating; and

Given the nature of soil and groundwater sources within the Stage 2 Area (aboveground storage and pipework and near surface drainage), the low permeability clay layer underlying fill material appears to have limited the vertical migration of COPCs. This is supported by the analytical results indicating that COPCs in soil samples collected from within the clay layer (or at depths greater than 2 m bgl) do not exceeded applicable screening criteria, with only a few exceptions (i.e. the Southern Buried Waste Area). This is further supported by soil data obtained from depths greater than 2 m bgl.

2.4 Conceptual Site Model Summary

The Western Area has been previously divided into Areas of Environmental Concern (AECs) based on spatial location, contaminants of potential concern (COPCs) and historical land-uses.

The CSM presented below was developed within the ERM (2020) HHERA based on information collected during previous investigations summarised within the RAP (ERM 2021b).

Area Of Environmental Concern	Potential Sources/ Assessed COPCs	Remaining COPCs	Potentially Complete SPR Linkages	
			Human Health	Ecological
AEC-1 Old Administration Area	Primary source areas within AEC-1 included former administration buildings and the former substation (11) which has been decommissioned and demolished. Potential sources of contamination are considered to be limited to on-site burial of fill materials. CoPCs assessed included: ■ TRH C6-C40, Metals, PAH, Phenols, Asbestos (fill) ■ PFAS (groundwater only)	Soil ■ Asbestos (ACM)	■ Inhalation of dusts or potential asbestos fibres from isolated ACM impacted soils (TP19/01) during excavation by current and future on-site intrusive maintenance workers or construction workers undertaking earthworks.	■ No potentially complete SPR linkages to ecological receptors identified
AEC-2 Buried Waste Area 8 – CDU tank farm sludge	Primary sources within AEC-2 include buried waste materials associated within the CDU tank farm sludge that at the time of this RSI remain in-situ. CoPCs assessed included: ■ TRH C6-C40, BTEXN, Metals, PAH, Phenols.	Soil ■ LNAPL	■ No exceedances of tier 1 screening criteria are noted for this AEC; ■ Based on the observed presence of LNAPL within the soil profile at TP18/29 within this AEC, aesthetics (odour/staining encountered during future earthworks) and the potential effects of hydrocarbons on future buried infrastructure should be considered within the detailed RAP and/or future Long Term Environmental Management Plans.	■ No potentially complete SPR linkages to ecological receptors identified

Area Of Environmental Concern	Potential Sources/ Assessed COPCs	Remaining COPCs	Potentially Complete SPR Linkages	
			Human Health	Ecological
AEC-3 Southern Contractor Area Including the following sub-areas refined based on SPR linkages: ■ AEC-3A (Former Laboratory Area) ■ AEC-3B (Former Laboratory Area – Asbestos impacts) ■ AEC-3C (Former Contactor Warehouse (PAH hotspot)) ■ AEC-3D (Former Contactor Warehouse) ■ AEC-3E (TRH hotspot TP21/79)	Potential historical sources of impacts which have been decommissioned / removed from AEC-3 included: ■ sample store and laboratory area (AEC-3A and 3B); ■ storage and handling of AFFF products around the former location of Tank 24 and the Former Fire Station area; ■ contractor warehouse (AEC-3D); ■ workshop area; ■ Epoxy resins Plant. Secondary sources include subsurface soils containing LNAPL and surface / surface materials potentially impacted with PFAS CoPCs assessed included: ■ TRH C6-C40, BTEXN, Metals, PAH, Phenols, VOC/SVOC, Asbestos Specific to the Epoxy resins plant area: ■ Epichlorohydrin ■ bisphenol-a (BPA) ■ SVOC, VOC. Specific to the Fire Station area: ■ PFAS	<u>Soil</u> ■ LNAPL ■ TRH C6-C10 (F1) ■ Asbestos (ACM) ■ Carcinogenic PAHs <u>Groundwater</u> ■ LNAPL <u>Soil Vapour</u> AEC-3D (SV19/03): ■ TRH >C8-C10 Aliphatic; ■ TRH >C10-C12 Aliphatic; ■ Naphthalene; ■ Methane (associated with LNAPL source) AEC-3A (SV19/05): ■ TRH >C6-C8 Aliphatic; ■ TRH >C8-C10 Aliphatic; ■ TRH >C8-C10 Aromatic; ■ Benzene; ■ Naphthalene; and	■ Inhalation of vapours from hydrocarbon impacted soil, and LNAPL within the soil profile by future on site commercial workers in indoor air (AEC-3A, AEC-3D, AEC-3E); ■ Inhalation of dusts or potential asbestos fibres from isolated ACM in soils (AEC-3B - TP19/32) during excavation by current and future on-site intrusive maintenance workers or construction workers undertaking earthworks. ■ Direct contact or ingestion of soils impacted with carcinogenic PAHs (AEC-3C - TP19/16) or TRH C16-C34 fractions by on-site intrusive maintenance workers or construction workers undertaking earthworks. ■ Based on the observed presence of LNAPL within soil/ and groundwater wells screening LNAPL soil sources within AEC-3A and AEC-3D, soil vapour and ground gas assessment undertaken, elevated LEL/ methane readings in soil vapour there is potential for pooling of ground gases within future excavations. Infiltration of ground gases (methane) into future indoor air spaces is to be addressed via source removal of LNAPL. ■ The potential effects of hydrocarbons on future buried infrastructure and aesthetics should also be considered within the detailed RAP and/or future Long Term Environmental Management Plans.	■ No potentially complete SPR linkages to ecological receptors identified

Area Of Environmental Concern	Potential Sources/ Assessed COPCs	Remaining COPCs	Potentially Complete SPR Linkages	
			Human Health	Ecological
		■ Methane (associated with LNAPL source)		
AEC-4 Southern Buried Waste Area	Primary sources within AEC-4 include buried waste materials that at the time of this remain in-situ. CoPCs assessed included: ■ TRH C6-C40, BTEXN, Metals, PAH, Phenols, SVOC, pH (associated with acids), Dioxins, PFAS, Asbestos	<u>Soil</u> ■ LNAPL ■ TRH C6-C40 ■ Benzene ■ Asbestos (ACM and fibres within fill) ■ Metals (hexavalent chromium) ■ Carcinogenic PAHs ■ PFAS <u>Groundwater</u> ■ LNAPL	<u>Soil</u> ■ Indoor inhalation of vapours by future commercial/industrial workers (benzene, TRH C6-C10 (F1) fractions) from LNAPL and hydrocarbon impacted soil. ■ Inhalation of dusts or potential asbestos fibres from ACM and fibrous asbestos and asbestos fines within soil in soils during excavation by current and future on-site intrusive maintenance workers or construction workers undertaking earthworks. ■ Direct contact or ingestion of impacted soils (TRH >C10-C16 (F2) Fraction, TRH >C16-C34 Fraction, carcinogenic PAHs, hexavalent chromium), by on-site intrusive maintenance workers or construction workers undertaking earthworks. ■ Based on the observed presence of LNAPL within soil/ and groundwater within this AEC, there is potential for pooling of ground gases within future excavations undertaken by on-site intrusive maintenance or construction workers as well in enclosed air spaces in future development of buildings. The potential effects of LNAPL on future buried infrastructure and aesthetics (particularly odour generation) should also be considered within the detailed RAP and/or future Long Term Environmental Management Plans for this AEC. <u>Groundwater</u> ■ No potentially complete SPR linkages were identified for on-site or off-site human health receptors	No potentially complete SPR linkages to ecological receptors identified. ■ PAHs (including naphthalene, anthracene, benzo(a)pyrene, fluoranthene, phenanthrene) exceeding ecological criteria in groundwater have been identified within the northern portion of AEC-4 but have been laterally delineated to below assessment criteria within the Site. ■ PFAS (specifically PFOS) has been identified in soil and soil leachate samples within the which within the northern portion of AEC-4 and given high solubility may contribute to future offsite groundwater migration. Requires ongoing monitoring as part of the groundwater monitoring program.

Area Of Environmental Concern	Potential Sources/ Assessed COPCs	Remaining COPCs	Potentially Complete SPR Linkages	
			Human Health	Ecological
AEC-5 Platformer 3	■ Primary sources areas within AEC-5 (platformer 3) have been decommissioned / removed. ■ Secondary sources include subsurface soils/groundwater containing LNAPL CoPCs assessed included: ■ TRH C6-C40, BTEXN, Metals, PAH, Phenols	Groundwater ■ LNAPL (MW11/17)	■ No exceedances of screening criteria are noted for this AEC; Based on the observed presence of LNAPL within shallow groundwater at MW11/17 within this AEC, aesthetics (odour/staining encountered during future earthworks) and the potential effects of hydrocarbons on future buried infrastructure should be considered within the detailed RAP and/or future Long Term Environmental Management Plans.	■ No potentially complete SPR linkages to ecological receptors identified
AEC-8 Tank farm J	■ Primary sources areas within AEC-8 included former fuel storage infrastructure, which has been decommissioned / removed. ■ Secondary sources include subsurface soils containing LNAPL CoPCs assessed included: ■ TRH C6-C40, BTEXN, PFAS	Soil ■ LNAPL	■ Based on the isolated presence of LNAPL within the soil profile at TP18/31 within this AEC, there is potential for pooling of ground gases within future excavations undertaken by on-site intrusive maintenance or construction workers. The potential effects of hydrocarbons on future buried infrastructure and aesthetics should also be considered within the detailed RAP and/or future Long Term Environmental Management Plans for this area.	■ No potentially complete SPR linkages to ecological receptors identified
AEC-11 Tank farms A1, A2, A3	■ Primary sources areas within AEC-11 included fuel storage infrastructure, which at the time of this RSI remain onsite. ■ Secondary sources include subsurface soils containing LNAPL and surface / surface materials potentially impacted with PFAS CoPCs assessed included: ■ TRH C6-C40, BTEXN, Metals, PCB, PFAS, Dioxins	Soil ■ LNAPL	■ Based on the observed presence of LNAPL within soil within this AEC, there is potential for pooling of ground gases within future excavations undertaken by on-site intrusive maintenance or construction workers. The potential effects of hydrocarbons on future buried infrastructure and aesthetics should also be considered within the detailed RAP and/or future Long Term Environmental Management Plans.	■ No potentially complete SPR linkages to ecological receptors identified.

Area Of Environmental Concern	Potential Sources/ Assessed COPCs	Remaining COPCs	Potentially Complete SPR Linkages	
			Human Health	Ecological
AEC-13 Substation Areas and Transformer Yards	■ Primary sources areas within AEC-13 include former substation infrastructure, which has been decommissioned / removed. Substation areas assessed include substation and transformer footprints, as identified on Figure 6 of the RSI Report (ERM, 2020a). ■ Substations 9 and 23 were unable to be sampled due to their ongoing operation at the time of the investigation. CoPCs assessed included: ■ BTEXN, Metals, PCBs, Asbestos	Nil	■ No potentially complete SPR linkages to human health receptors identified.	■ No potentially complete SPR linkages to ecological receptors identified.
AEC-14 Subsurface drainage network Including the following sub-areas refined based on SPR linkages: ■ AEC-14A (Compromised Pipe 18D300-5) ■ AEC-14B (Compromised Pipes 15D100-4, 15D100-5)	■ Primary sources areas within AEC-14 include compromised or leaking subsurface drainage infrastructure, which contained hydrocarbon/oily water from product storage and handling areas. ■ Secondary sources include subsurface soils containing LNAPL and surface materials potentially impacted with PFAS CoPCs assessed included: ■ TRH C6-C40, BTEXN, Metals, PAH, Phenols, SVOC, pH (associated with acids), Dioxins, PFAS, Asbestos	Soil ■ LNAPL ■ TRH C6-C10 ■ TRH >C10-C12 (Aliphatic) ■ TRH >C12-C16 (Aromatic) ■ Carcinogenic PAHs	■ Indoor inhalation of vapours from volatile TRH fractions (C6-C16) by future on site commercial workers from hydrocarbon impacted soils at: ▪ AEC-14A (TP20/28) ▪ AEC-14B (TP20/29a, TP20/29b, TP20/29c, TP20/30, TP21/07) ■ Direct contact with contaminated soils (carcinogenic PAHs) by future on-site construction workers undertaking intrusive works: ▪ AEC14B (TP20/30, TP21/07) The presence of LNAPL and soils exceeding TRH management limits associated with the drainage network in Stage 2 as shown on Figures 6A-6C requires management under a LTEMP for aesthetic/ odour impacts identified during future works.	■ No potentially complete SPR linkages to ecological receptors identified.
AEC-15 General Site Areas (not	■ Primary sources areas within AEC-15 include a range of former processing and fuel	Soil ■ LNAPL	■ No exceedances of screening criteria are noted for this AEC;	■ No potentially complete SPR linkages to ecological receptors identified.

Area Of Environmental Concern	Potential Sources/ Assessed COPCs	Remaining COPCs	Potentially Complete SPR Linkages	
			Human Health	Ecological
covered within other AECs)	storage infrastructure, which has been removed. ■ Secondary sources include subsurface soils containing LNAPL CoPCs assessed included: ■ BTEXN, TRH C6-C40, Metals, PAH, Phenols, Asbestos (fill)		The presence of LNAPL of management limit exceedances for TRH fractions as shown on Figures 6A-6C will require management under a LTEMP for aesthetic/ odour impacts potentially encountered during future excavation works. As identified in the HHERA, inhalation of dusts or potential asbestos fibres from isolated ACM in soils (MW11/14) was conservatively identified as a potential risk based on the presence of asbestos (which was not quantified). Further investigation and quantification in this area was undertaken and it was subsequently found to be compliant with commercial/ industrial criteria (TP21/12).	

2.4.1 Groundwater Impacts

2.4.1.1 LNAPL

LNAPL has been identified during previous groundwater monitoring events at the following monitoring wells located within the Stage 2 Area:

- MW11/17 (AEC-5) – located immediately south of former Platformer 3 Location;
- MW12/01 (AEC-4) – situated within the Southern Buried Waste Area;
- MW20/06 (AEC-4) – situated within the Southern Buried Waste Area;
- MW18/24 (AEC-3A) – situated within the footprint of the former laboratory.

Groundwater monitoring of nearby wells has demonstrated no downgradient migration of LNAPL from these isolated areas. Associated dissolved phase concentrations are limited in extent and are delineated to within the Stage 2 boundary.

2.4.1.2 Dissolved Phase

Concentrations of COPCs in groundwater have been reported below the adopted SSTLs for on-site human health. The following exceedances of off-site criteria for human health and ecological receptors have been reported in the groundwater monitoring dataset during groundwater monitoring events undertaken in the last 5 years (2016 – 2021):

- Naphthalene exceeding offsite ecological criteria at MW12/03 (AEC-3D), MW20/03 and MW20/13 (AEC-4);
- Polycyclic Aromatic Hydrocarbons (PAHs) including phenanthrene, fluoranthene, anthracene and benzo(a)pyrene MW20/01A, MW20/03, MW20/06, MW20/07, BH116, MW20/13 (AEC-4):;
- Hexavalent chromium exceeding ecological criteria at MW11/06; and
- Benzene exceeding offsite recreational (human health) criteria at MW20/03 and MW20/13 (AEC-4).

Within soil leachate analysed from soil samples collected within the buried waste mound within AEC-4, naphthalene and zinc were identified to exceed the adopted ecological water criteria in leachate samples collected. Perfluorooctanesulfonic acid (PFOS) and TRH C10-C40 fractions were detected at concentrations exceeding the laboratory Limit of Reporting (LOR) in ASLP analysis conducted on soils but were less than the assessment criteria in groundwater.

Down gradient delineation of the above COPCs has been demonstrated through monitoring data to below relevant criteria in groundwater and therefore potential risks to offsite receptors (Duck River) have not been identified.

2.4.1.3 Baseline Sampling Results

The Quarter 4 2020 Groundwater Monitoring Event (ERM, 2021b) represents the baseline understanding of groundwater conditions within the Western Area at the time of Detailed RAP preparation. The following conclusions were made regarding groundwater conditions within the Western Area:

- The direction of groundwater flow in the Western Area is generally consistent with previous GMEs and flows to the south east towards the bounding Duck River. Localised radial flow towards the south-west has been identified in the south-west portion of the Western Area (AEC-4) following recent investigation;

- LNAPL observed within the monitoring well network is considered to be consistent in spatial extent with previous groundwater monitoring undertaken. Lateral delineation of LNAPL to within the site boundary has been achieved via gauging and sampling of down gradient wells;
- No exceedances of risk-based SSTLs were reported for on-site receptors in any groundwater monitoring wells sampled as part of the Q4 2020 GME;
- No exceedances of offsite ecological criteria were reported at the site boundary;
- Evidence of stable groundwater conditions and natural attenuation processes continue to be identified as per previous monitoring events, including:
  - No statistically significant increasing trends of key petroleum hydrocarbon contaminants of concern identified during the Q4 2020 GME;
  - The presence of a high proportion of polar compounds in groundwater samples, as indicated by widespread detections of TRH C10-C40 fractions versus non-detect following silica gel clean-up analysis. Polar metabolites are formed via microbial degradation of petroleum hydrocarbon source areas;
- Potential for adverse changes in groundwater conditions (migration or increased contaminant concentrations) are considered to be low given the removal of primary sources from the site and that sources of groundwater impacts are limited to residual impacted soils and highly weathered and immobile LNAPL in the subsurface; and
- The nature and extent of LNAPL and dissolved phase hydrocarbon impacts are currently considered to be stable, well characterised in the context of the current approved land use and the monitoring well network is considered suitable to assess potential changes in environmental conditions as well as source/pathway/receptor linkages.

Groundwater monitoring undertaken as part of the Q4 2020 GME was focused on petroleum hydrocarbons and demonstration of stable to decreasing trends. However, the following was noted with regard to other COPCs during the Q4 2019 GME:

- Concentrations of heavy metals were reported within the Western Area exceeding adopted ecological screening criteria for copper, lead, mercury, nickel and zinc. The distribution of metals exceedances did not appear to be confined to a particular portion of the Western Area, and were considered likely to be related to regional background water quality, associated with imported fill materials across the camellia peninsula.
- Based on the groundwater dataset for Per- and Polyfluoroalkyl Substances (PFAS) in groundwater in the Western Area, ecological exceedances for PFAS (specifically PFOS) in individual wells were considered consistent with the findings of previous sampling events and were not considered to alter the existing findings of the CSM and mass flux assessment previously undertaken (ERM, 2018). Specifically:
  - Recreational water quality criteria for PFOS + PFHxS were also exceeded in monitoring wells in the following areas of the Western Area:
    - Nearby Former AFFF foam storage Tank 24, (north of AEC-3);
  - Ecological direct toxicity trigger values were exceeded for PFOS in the following areas of the Western Area:
    - At the up-gradient site boundary (AEC-1) and within AEC-3; and
    - MW12/23 on the southern site boundary.

3. GROUNDWATER MONITORING PROGRAM

Existing groundwater monitoring wells have been selected for gauging and sampling based on the following objectives:

- **Monitoring during remediation** – to demonstrate remediation works do not have short-term adverse effects on localised groundwater quality or the Duck River and implement contingency actions (if required); and
- **Monitoring post-remediation –** To demonstrate ongoing stability of groundwater conditions and that residual groundwater impacts do not present a risk to the ecological values of receptors, specifically the Duck River.

3.1 Monitoring During Remediation

Project activities identified in the EIS which have potential to cause impacts on groundwater include:

- Excavations which penetrate the impermeable silty clay layer leading to increased infiltration of surface water and therefore increased groundwater volumes and potential migration of contamination off-site;
- Dewatering of excavations potentially leading to mobilisation of contaminated groundwater or LNAPL;
- Spills and leaks during the Project which could contaminate the ground and groundwater;
- dewatering activities which result in PASS being exposed, oxidising and generating acidic conditions which have the potential to impact the Duck River and cause ecological harm (either directly or indirectly eg via mobilisation of metals).

While potential for ASS/PASS is considered to be low based on recent assessment, collection of pH readings will be used to demonstrate no acidification of groundwater to have occurred from the works.

Groundwater within the Western Area is present at depths generally between 1 – 3 m bgl. Remediation works may require excavation and/or in-situ remediation to a maximum depth of 2 m bgl in AEC-3A and 3D and will be less than 2m bgl in other excavations completed across the Western Area.

Excavations proposed to extend below the water table may require management of groundwater which will be limited to excavations of depths greater than 1 m bgl.

Based on hydraulic testing data summarised in Section 3.2, hydraulic conductivity values for wells within the vicinity of proposed excavations AEC-3A and AEC-3D, including MW11/18 (6×10^{-3} m/day) and MW11/19 (9×10^{-4} m/day) indicate low potential for groundwater infiltration into excavations associated with clay lithologies.

Although there has been identified low potential for infiltration, due to excavation below the minimum depth of measured groundwater table, these excavations represent highest potential for altered groundwater flow regimes which may lead to mobilisation of contaminants in the subsurface. As such, groundwater monitoring during remediation works will focus on monitoring wells within or adjacent to the following excavations:

- AEC-3A (Former Laboratory Area) – proposed remediation depth of 2 m bgl;
- AEC-3D (Former Contractor Warehouse) - proposed remediation depth of 2 m bgl; and

While excavation AEC-14A has a proposed remediation depth of 1.8 m bgl, the overall footprint of this excavation is minor at $50m^2$ and anticipated to have no notable affect on overall groundwater conditions at the Site which may be measured by the existing monitoring well network.

The proposed extent of these excavations is shown on Figure 1, Appendix A.

Viva Energy and an appropriately qualified validation consultant will be responsible for ensuring the completion of groundwater monitoring requirements during execution of remediation.

Specific groundwater monitoring wells selected for monitoring during remediation are shown on Figure 1, Appendix A.

3.2 Monitoring Post Remediation

Monitored natural attenuation of petroleum hydrocarbon impacts in groundwater has been proposed as a passive management strategy following the active remediation of source areas at the site which have been identified as driving risk to receptors. It is anticipated that groundwater conditions are likely to improve further prior to, during and following remediation works based on the following:

- Primary sources (e.g. above ground storage tanks) have been removed prior to the soil remediation commencing as part of the Clyde Terminal Conversion Project (SSD 5147). Remnant subsurface infrastructure (such as below ground pipework) has been decontaminated and decommissioned, with residual impacts assessed as providing negligible risk to groundwater when managed under an LTEMP;
- Shallow and Light Non-Aqueous Phase Liquid (LNAPL) impacts within the soil profile would be addressed as part of the remediation works by the excavation of LNAPL impacted soil to the extent practicable where potential risks are identified. As part of these works, impacted water may accumulate in these excavations and may be removed via pumping from excavations. LNAPL impacted water would be required to be disposed offsite;
- LNAPL and dissolved phase hydrocarbon impacts which are proposed to be managed in-situ have been assessed as stable and having no current or future migration or exposure pathways when managed passively in accordance with a future LTEMP; and
- The source removal and soil remediation process itself is likely to significantly improve groundwater conditions over the long term, assisted by natural attenuation (this process involves allowing naturally occurring micro-organisms in the ground to biodegrade hydrocarbon contamination).

Viva Energy will remain responsible for ensuring the completion of ongoing groundwater monitoring requirements. The requirement for future occupiers of portions of the Western Area to provide access for ongoing monitoring following completion of remediation will be outlined within relevant Long-Term Environmental Management Plans prepared following completion of remediation activities.

The objectives of the post remediation groundwater monitoring program are as follows:

- Provide confirmation of no ongoing risk to receptors, including future site users and Duck River by residual groundwater impacts following remediation;
- Demonstrate natural attenuation processes via continued stable to decreasing concentrations of petroleum hydrocarbons in groundwater.

Given the current assessment that hydrocarbon concentrations are stable to decreasing, it is expected that the remediation works proposed will enhance the current natural attenuation processes.

3.3 Groundwater Assessment Criteria

The groundwater assessment criteria outlined below represent trigger levels for the contingency actions outlined within Section 3.7 of this GWMP.

Assessment Criteria to be utilised as part of this GWMP are provided in Appendix C. The rationale for selection of assessment criteria is provided in the following subsections.

3.3.1 On-Site Monitoring

Groundwater data obtained as part of this GWMP will primarily be assessed against the Tier 2 Site Specific Target Levels (SSTLs) for groundwater, which were developed within the HHERA (ERM, 2020b) to target COPCs which exceeded tier 1 screening values for human health based on the consolidated historical dataset. Specific assumptions and input parameters used in development of these values are provided within the HHERA (ERM, 2020b). Adopted Groundwater SSTLs are provided as Appendix C.

In lieu of SSTLs for a particular COPC, groundwater data will be assessed against the 'Tier 1' investigation criteria published in *Schedule B1 Guideline on the Investigation Levels for Soil and Groundwater* of the ASC NEPM, which references the following guidance for protection of human health receptors:

- Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE), *Technical Report No. 10: Health Screening Levels in Soil and Groundwater (2011)*. Health Screening Levels (HSLs) for vapour intrusion – Commercial/Industrial 'D' and HSLs for Intrusive Maintenance Workers (shallow trench).

The human health assessment criteria adopted assumes no future beneficial groundwater use, potable or non –potable, based on the saline nature of groundwater generally encountered and the low yields expected. As such, drinking water guidelines are not relevant for tier 1 screening of groundwater.

3.3.2 Boundary Monitoring

Assessment Criteria protective off-site ecological and recreational users of the Duck and Parramatta River systems have been sourced from the below guidance:

- National Health and Medical Research Council (NHMRC), *Guidelines for Managing Risk in Recreational Waters (2008)*, to assess potential direct contact risks to recreational users of the Parramatta and Duck Rivers; and
- Australian and New Zealand Governments (ANZG) (2018), Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Trigger values for marine water, level of protection 95% species and trigger values for marine water.
- The PFAS National Environmental Management Plan, Version 2.0 ('the NEMP'), prepared by the Heads of EPA (HEPA, 2020) for Tier 1 screening values for offsite human health and ecological receptors for groundwater.

It is noted that PFAS assessment for groundwater has been undertaken within the Western Area and was not identified as a target contaminant of concern for remediation within the Auditor endorsed RSI report (ERM, 2020a). As such, further PFAS assessment is limited to monitoring within and around AEC-4, given detections in soils identified to remain in-situ. Ongoing monitoring outside of this area is not proposed to be undertaken to meet the objectives of this GWMP given the existing CSM which indicates negligible risk from the flux assessment undertaken (ERM, 2018).

A summary of Tier 1 screening criteria for PFAS is provided below in Table 3-1.

Table 3-1 Adopted Groundwater Screening Criteria (PFAS)

Receptor	Adopted Screening Criteria	Source	Comments
Off-site recreational users of the Parramatta and Duck River (via direct contact)	Recreational Water Quality Guideline	Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water (NHMRC, 2019)	The recreational values are conservative for the activities down gradient of the site (primarily boating and rowing). The recreational values assume swimming activities with much higher direct contact rates.
On-site and offsite Ecological receptors (via direct contact)	Freshwater Trigger Values (95% Species Protection – slightly to moderately disturbed systems)	ANZECC – technical draft guideline values (as referenced in PFAS NEMP (HEPA, 2020))	Freshwater values used in lieu of regulator endorsed Marine Criteria, as per the guidance in the NEMP.
Indirect exposure for off-site ecological receptors (via consumption of PFAS containing biota (bioaccumulation)).	Freshwater Trigger Values (99% Species Protection – high conservation value systems)	ANZECC – technical draft guideline values (as referenced in PFAS NEMP (HEPA, 2020))	The ANZG (2018) Water quality guidelines advise the use of the 99% trigger value for slightly to moderately disturbed systems for chemicals which bio accumulate and bio magnify in wildlife. It is noted that the 99% protection value for PFOS is below the laboratory limit of reporting.

ERM has adopted the above ecological guidelines based on the assumption that the upper Parramatta River catchment is a moderately disturbed ecosystem, as it receives road and storm water runoff from adjacent industry and residential properties. Additionally, the rivers within this area are considered to be within an upper estuarine environment, therefore receiving ecosystem is considered marine.

The boundary monitoring assessment criteria adopted are consistent with routine groundwater monitoring undertaken (formerly under the requirements of EPL570).

3.4 Data Quality Objectives

3.4.1 Step 1 - State the Problem

Collection of appropriate groundwater monitoring data is required to evaluate the following in accordance with the conditions of consent for the Clyde Western Area Remediation Project (SSD 9302):

- groundwater levels and quality during remediation works and following demobilisation;
- verify that natural attenuation of groundwater contamination is occurring over time following demobilisation.

A GWMP is required to:

- include trigger levels for investigating potential adverse impacts to the Duck River, including triggers for indicating if further remediation of groundwater is required;
- outline contingency actions to be implemented if monitoring indicates that natural attenuation is not occurring, or groundwater is having an adverse impact on the Duck River;
- monitor the effectiveness of management measures and contingency actions for reducing impacts;
- Document procedures for reporting changes to groundwater conditions that have the potential to create unacceptable risks to the Duck River.

3.4.2 Step 2 – Identify the Decisions/Goal of the Study

The data is required to enable a decision to be made that:

- mitigation measures for protection of groundwater during remediation are effective in preventing adverse effects to groundwater;
- concentrations of contaminants of concern continue to not represent a risk to human health or ecological receptors;
- concentrations of contaminants of concern continue to not represent unacceptable risks to sensitive receptors following remediation;
- Ongoing management of groundwater via natural attenuation remains an appropriate long term strategy, such that contingency measures, including groundwater remediation are not required; and
- no further groundwater monitoring is necessary.

This point will be reached when the groundwater assessment criteria are met.

3.4.3 Step 3 – Identify Inputs to the Decisions

The inputs required to make the above decisions are as follows:

- appropriate groundwater gauging data including water levels and LNAPL (if identified);
- appropriate groundwater analytical data (including obtaining data from appropriate monitoring wells and appropriate analysis);
- concentration trend analysis (Mann-Kendall) for relevant COCs, where an appropriate dataset is available;
- analytical results assessed against the assessment criteria;
- establishment of a monitoring and assessment schedule; and

- information, comments or advice provided by the relevant stakeholders, including Viva Energy, the Site Auditor, and the Planning Secretary.

3.4.4 Step 4 – Define the Study Boundaries

The study boundary is the Stage 2 Area, which forms a portion of the Clyde Western Area. The extent of the Stage 2 Area is shown on Figure 1, Appendix A.

Previous investigations and groundwater monitoring events have indicated soil and groundwater impacts are limited to the surficial water bearing unit and remedial excavations will be limited to the upper 2m. As such, groundwater monitoring will be limited to the shallow water bearing unit.

This GWMP applies to monitoring works conducted during remediation works, and biannual ongoing sampling events completed post-remediation a review of the monitoring schedule and potential for discontinuing monitoring will be undertaken at least annually.

The ability for completion of ongoing monitoring is expected to be limited by the sale and redevelopment of the Stage 2 Area. Should these limitations inhibit completion of future ongoing monitoring, the requirement will be assessed by the Site Auditor.

3.4.5 Step 5 – Develop a Decision Rule (or Analytical Approach)

The initial analytical approach proposed is semi-annual (6 monthly) groundwater monitoring events of a selection of groundwater monitoring wells within the study area. Trend and natural attenuation analysis is initially proposed to be conducted annually.

Following completion of two rounds of groundwater data collection, the analytical program should be reviewed. A scaling back of the frequency and number of monitoring locations required is envisaged progressively, contingent upon the monitoring results.

Monitoring of sufficient wells to provide representation of the areas surrounding areas where source removal has been undertaken must be maintained until such time as the groundwater assessment criteria are met or via consultation with the Site Auditor.

Relevant COPCs in groundwater are limited to BTEX, naphthalene and TRH C_6-C_{40}.

Groundwater quality during and following remediation will be evaluated primarily via comparison of groundwater analytical data with the relevant assessment criteria to assess potential for ongoing risk to receptors. In addition to dissolved phase concentrations, the occurrence of visible or measurable LNAPL in wells where not previously identified would trigger the implementation of contingency actions outlined in Section 3.7.

Demonstration of continued natural attenuation and stability of dissolved phase groundwater impacts is occurring over time will include evaluation of primary and secondary lines of evidence presented within *CRC Care Technical Report 15: A technical guide for demonstrating monitored natural attenuation of petroleum hydrocarbons in groundwater* (Beck & Mann, 2010). It is noted that tertiary lines of evidence (microcosm studies) are currently not considered necessary given primary and secondary lines of evidence have already demonstrated natural attenuation processes to have occurred at the Western Area.

Statistical Trend Analysis (Mann Kendall) will be utilised to evaluate spatial and temporal trends of COPC concentrations over time. Generally, stable to decreasing trends of COPCs will be a primary indicator that natural attenuation processes are occurring. Where statistically significant trends are unable to be established, results will be considered in the context of risk to receptors and/or mass flux.

In addition to establishing trends for dissolved phase COPCs, collection of natural attenuation indicators (dissolved oxygen, oxidation reduction potential, nitrate, sulfate, ferrous iron and methane) at selected up gradient, plume centre and plume edge locations will enable a secondary line of evidence of the occurrence of natural attenuation.

It is likely that in some wells statistically significant trends will prove impossible to establish, even when other assessment criteria are met. If this occurs, a critical evaluation of the dataset for particular monitoring wells will be undertaken using a 'lines of evidence' approach. Potential reasons for inability to establish statistically significant trends include the below:

- TRH concentrations include breakdown compounds that develop as natural attenuation proceeds. As a result, concentrations in some fractions (particularly the lower carbon chain lengths) can increase. The effect is a long period of low but fluctuating TRH concentrations without a clear trend. It is noted that TRH >C10 fractions in groundwater have been demonstrated to be heavily influenced by the presence of polar metabolites during recent monitoring events, which have been interpreted to be a product of natural biodegradation processes. As such, trend analysis will utilise results following silica gel cleanup as an indicator of petroleum hydrocarbon concentrations in the >C10- C40 range;
- Some wells will have limited datasets (particularly TRH silica gel analysis). Monitoring data was unable to be collected within former operational areas which were inaccessible for several years during demolition;
- Some wells may experience a change in conditions as a result of the source remediation work, such that post-remediation concentrations are significantly different from pre-remediation concentrations. In most instances this will be a reduction, however increases may occur. In these cases the long term dataset may be unsuitable to represent the current trend. Where considered appropriate, use of a post remediation period as a time frame for trend analysis will be considered;
- COC concentrations at some wells will be close to the laboratory Limit of Reporting (LOR), and a statistically significant trend is unlikely for results fluctuating around a LOR. This should be taken into account when assessing trends.

In order to provide a case for reduction or cessation of monitoring, concentrations within individual wells (or based on flux assessment) must be compliant with risk-based assessment criteria provided in Section 3.3 at the boundary with the Duck River and not exceed SSTLs within on-site areas throughout a period of post remediation monitoring. If rebound is recorded during post-remediation monitoring rounds, it may be necessary to extend the duration of post-remediation monitoring.

3.4.6 Step 6 – Specify Limits on Decision Errors

A decision error would be an incorrect determination on whether groundwater assessment criteria have been met, or an incorrect assessment of statistical trends.

The acceptable limits on decision errors applied during the review of the results will be based on the Data Quality Indicators (DQIs) of precision, accuracy, representativeness, comparability and completeness (PARCC) in accordance with the *ASC NEPM Schedule B (3) - Guidelines on Laboratory Analysis.*

The potential for significant decision errors will be minimised by:

- completing a robust QA/QC assessment of the assessment data and application of the probability that 95% of data will satisfy the DQIs, therefore a limit on the decision error would be 5% that a conclusive statement may be incorrect;
- assessing whether appropriate sampling and analytical density (both laterally and vertically throughout the fill and soil profiles) has been achieved for the purposes of meeting the Project objectives; and
- ensuring that the criteria set was appropriate for continuing use consistent with current and proposed usage under the Site's zoning (IN3 – Heavy Industrial) and the receiving environment of the Duck River;

- Mann Kendall trend analysis will be conducted on data using a significance level of 0.05, (or 95% confidence) which is considered suitable for sensitive land use.

3.4.7 Step 7 – Optimise the Plan

Review of the data set and concentration trends, and consideration of the appropriateness of the monitoring schedule will be undertaken annually. Revisions to the monitoring schedule (if required) should be made on the basis of the interpretation of the results. Outliers should be identified and contingency measures implemented if needed.

3.5 Sampling, Analysis and Quality Plan

3.5.1 Sampling Locations and Rationale

Table 1 and 2 of Appendix B presents the rationale for monitoring of specific existing groundwater monitoring wells.

Existing groundwater monitoring wells have been selected for gauging and sampling based on the following objectives:

- **Monitoring during remediation** – to demonstrate remediation works do not have short-term adverse effects on localised groundwater quality or the Duck River and implement contingency actions (if required). The monitoring program during the remediation phase is presented as Table B1, Appendix B; and
- **Monitoring post-remediation –** To demonstrate ongoing stability of groundwater conditions and that residual groundwater impacts do not present a risk to the ecological values of receptors, specifically the Duck River. The monitoring program to be implemented post-remediation is presented as Table B2, Appendix B.

Monitoring wells selected in Tables 1 and 2 of Appendix B form part of the existing monitoring well network. Should these monitoring wells be damaged, or unable to be located on site, an assessment of the adequacy of the remaining monitoring well network to meet the objectives of this GWMP will be undertaken. The re-installation of monitoring wells will only be considered if the existing network becomes unsuitable for its intended purpose.

Selected monitoring locations to be monitored during the remediation phase and the proposed analytical suite are listed in Table B1, Appendix B along with the rationale for their selection. The locations of these monitoring wells are shown on *Figure 1, Appendix A.* It is noted that wells designated for monitoring during remediation will only be applicable to where active remediation is being undertaken. For instance, only wells within the Stage 1 monitoring network will be monitored throughout the duration of Stage 1 remediation works.

Table 3-2 Groundwater Monitoring Requirements – During Remediation

Monitoring Area	Rationale	Frequency	Data Collected
Excavation Areas (nearby wells)	■ Sampling for adverse changes in dissolved phase COPC concentrations from remediation activities ■ Although considered unlikely to occur, an indication of potential ASS issues created during remediation may be assessed via collection of field parameters.	■ Baseline sampling prior to commencement of remediation works ■ Within 3 months following completion of remediation works	■ laboratory analysis for target COPCs (excavation specific), ■ collection of field parameters (including pH)
Excavation Areas (nearby wells)	■ Gauging to monitor potential alteration to groundwater levels/ flow regime;	■ Gauging weekly during excavation and/or dewatering	■ Gauging Data (water levels,

Monitoring Area	Rationale	Frequency	Data Collected
	■ Monitor potential for LNAPL mobilisation		LNAPL presence/ thickness);
Down-gradient boundary	■ Demonstrate groundwater at the boundary is not adversely impacted by remediation works or causing environmental harm to the Duck River; ■ Monitor potential for LNAPL mobilisation from remediation works	■ monthly during active remediation conducted up-gradient;	■ Gauging data (water levels, LNAPL presence/ thickness); ■ grab sample for collection of field parameters (including pH)

It is noted that wells designated for monitoring during remediation will only be applicable to where active remediation is being undertaken. For instance, only wells nominated within AEC-3A will be monitored throughout the duration of excavation works in this area.

Selected monitoring locations to be monitored post-remediation and the proposed analytical suite are listed in Table B2, Appendix B, along with the rationale for selection. The locations of these monitoring wells are shown on *Figure 2, Appendix A.*

Table 3-3 Groundwater Monitoring Requirements - Post remediation

Monitoring Area	Rationale	Frequency	Data collected
Excavation Areas (nearby wells)	■ Gauging to monitor potential for alteration to groundwater levels/ flow regime or LNAPL mobilisation	■ Completion of a single post-remediation sampling event (within 3 months of completion of remediation work)	■ laboratory analysis for TRH, BTEXN and MNA parameters ■ collection of field parameters ■ Gauging Data (water levels, LNAPL presence/ thickness).
Downgradient boundary	■ Demonstrate groundwater at the boundary is not impacted by remediation works or causing environmental harm to the Duck River; ■ Monitor potential for LNAPL mobilisation from remediation works	■ Biannually (every 6 months) following completion of post remediation sampling event ■ Requirement for ongoing sampling is to be reviewed at least annually (ie every two GMEs) based on trend analysis and reported concentrations	■ laboratory analysis for TRH, BTEXN and MNA parameters ■ collection of field parameters; ■ Gauging Data (water levels, LNAPL presence/ thickness); ■ collection of field parameters (including pH)
Downgradient boundary (AEC-4)	■ Demonstrate groundwater at the site boundary does not present an unacceptable risk to offsite receptors (Duck River) via mobilisation of contaminants from by in-situ managed buried waste material; ■ Monitor potential for LNAPL mobilisation and groundwater flow alteration following installation of surface capping.	■ Biannually (every 6 months) following completion of post remediation sampling event ■ Requirement for ongoing sampling is to be reviewed annually (ie every two GMEs) based on trend analysis and reported concentrations	■ Laboratory analysis for Contaminants of concern specific to AEC-4: ○ TRH C6-C40, BTEXN and MNA parameters ○ PAHs ○ Hexavalent Chromium ○ PFAS ■ Collection of field parameters

Monitoring Area	Rationale	Frequency	Data collected
			■ Gauging Data (water levels, LNAPL presence/ thickness)

3.5.2 Groundwater Sampling Method

Consistent with recent sampling methodologies employed since 2014, sampling via the use of no-purge 'Hydrasleeve' groundwater samplers is proposed.

To facilitate collection of representative groundwater samples, Hydrasleeve samplers will be installed a minimum of 24 hours prior to sample collection to allow for equilibration of the water column.

Water quality parameters, including pH, conductivity, dissolved oxygen (DO), temperature and redox potential (redox) will be measured during the groundwater sampling activities immediately following collection of groundwater samples from no purge samplers.

Where routine sampling of a well is required, samplers will be deployed for the next groundwater monitoring event following collection of samples.

3.5.3 Quality Assurance/Quality Control Plan

Appropriate quality assurance measures such as use of equipment that is calibrated and appropriately decontaminated between each sample location will be implemented. Samples will be placed in appropriate sample containers that are clearly labelled and stored in insulated boxes on ice.

Field quality control (QC) samples shall be collected including field duplicates, trip blanks, trip spikes and equipment rinsates. The number of field QC samples proposed is indicated in *Tables 1 and 2, Appendix B*.

Laboratory QA/QC procedures will be undertaken in accordance with *Schedule B(3) - Guidelines on Laboratory Analysis of Potentially Contaminated Soils* of the ASC NEPM (NEPC 2013) and will comprise matrix spikes, method blanks and surrogate recoveries. The results of the quality control testing will be presented in the laboratory reports. Duplicate testing will also be undertaken by the laboratories to compare the results obtained in analysing samples.

A comprehensive QA/QC assessment will be included within the annual summary report. However, the data quality will be evaluated after each event such that non-compliances are identified and resolved in a timely manner.

3.6 Data Evaluation and Reporting

Field and laboratory data collected as part of the groundwater monitoring program will be reviewed and evaluated continuously throughout the delivery of the Project to monitor compliance during and following completion of remediation works. Groundwater Monitoring reporting requirements are as follows:

Report	Timing	Description
Remediation Phase – Annual Groundwater compliance report	Annually throughout completion of remediation works	Factual presentation of groundwater data collected during remediation for demonstration of compliance. Report will summarise the results of monthly reporting and be incorporated into the Annual Report for the Development Consent (Section 6.2 of the REMP)

Report	Timing	Description
Remediation Phase – Monthly Factual Reporting	Monthly following completion of monitoring events during each stage of the remediation	Factual presentation of groundwater data collected during remediation for demonstration of compliance to the regulator throughout the duration of remediation works.
Ongoing Monitoring – Event 1 Factual Report	Following completion of first GME	Factual GME Report presenting laboratory results and field data
Ongoing Monitoring Event 2 and Annual Summary	Annual. The ongoing monitoring event 2 and annual summary report will be reported within 3 months of the completion of monitoring and provided to NSW EPA and Local Council (Parramatta City Council) in accordance with the requirements of the relevant LTEMPs	Interpretive GME report including: ■ Interpretation of dataset collected over the preceding year in relation to the historical dataset ■ Concentration and trend analysis and assessment of the progress of natural attenuation ■ Review of GWMP and provide amendment as necessary, including any proposed changes to monitoring (as appropriate) ■ Completion of interpretive QA/QC assessment for the preceding year's dataset

Based on the extensive existing dataset, which is demonstrating the occurrence of pre-existing natural attenuation processes, it is anticipated that ongoing groundwater monitoring of boundary monitoring wells will be required to be conducted for a minimum 1-2 years after the completion of remediation works to establish a sufficient post-remediation dataset for statistical purposes. Any reduction in the monitoring program will be reviewed in consultation with the Site Auditor in the context of the DQOs outlined in Section 3.4.

3.6.1 Non-Compliance Reporting

A non-compliance is defined within the REMP as "an occurrence, set of circumstances or development that is a breach of the requirements of the REMP, Development Consent, EPL or associated management plans, including exceedance of monitoring limits…".

Non-compliances (i.e. exceedances of monitoring limits which present risks to receptors) may be identified via the groundwater monitoring program and should be reported to the NSW DPIE, along with corrective actions in accordance with the procedure provided within Section 6.4 of the REMP.

3.7 Contingency Plan

If mobilisation of LNAPL or a spike in contaminant concentrations indicated via groundwater monitoring wells, the following actions should be taken:

- check whether concentrations are within the historical range, conducting re-analysis or additional sampling to confirm concentrations;
- Sample LNAPL to determine if composition of COPCs constitutes a risk to human health;
- evaluate surrounding wells to determine if there are pockets of groundwater in which attenuation does not appear to be occurring, or whether the situation appears isolated to one well. Monitor additional locations if needed to determine this;

- Revisit risk assessment in the context of mass flux to assess potential contaminant contributions to receptors;

If a risk to receptors is identified through the above actions or poses an immediate risk to the environment, consideration of short-term active LNAPL remediation solutions, such as mobile Multi-Phase Vacuum Extraction and/or in-situ chemical oxidation (ISCO) would be made in consultation with the Site Auditor.

3.8 Monitoring Well Decommissioning

When monitoring wells have been identified as being no longer required, decommissioning of these wells is recommended. Recommendations for the decommissioning of specific monitoring wells will be included in the Q4 reports.

Monitoring well decommissioning should be completed in accordance with the decommissioning requirements set out within the *Minimum Construction Requirements for Water Bores in Australia* (NUDLC, 2012).

3.9 GWMP Evaluation, Review and Completion

The monitoring program outlined within *Table 1 and 2 of Appendix B* should be reviewed at least annually (following completion of each Annual GME Summary report).

The requirements of the GWMP will be met for ongoing monitoring, enabling monitoring to cease when concentrations of contaminants of concern shown to have met the groundwater assessment criteria and are demonstrating statistically decreasing or stable trends following remediation.

A case for the reduction or cessation of monitoring will be provided to the Site Auditor for consideration and endorsement in consideration of the DQOs outlined in Section 3.4.

Complete cessation of monitoring may be presented in the same way, or may be prepared as a separate report for consideration by the Site Auditor.

3.10 Amendments

If the reviews described above recommend amendments, then this GWMP must be amended and re-issued. Any amendments must be reviewed by Viva Energy and the Site Auditor and documented within the Amendment Register at the front of this GWMP.

Amendments to the GMP and this GWMP must be documented in accordance with the requirements specified in Section 6.5 of the REMP and will be undertaken in consultation with the Site Auditor

4. REFERENCES

AECOM 2019a. Clyde Western Area Remediation Project, Environmental Impact Statement.

AECOM 2019b. Clyde Western Area Remediation Project, Conceptual RAP.

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ANZAST (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality

Beck, P & Mann, B 2010, *A technical guide for demonstrating monitored natural attenuation of petroleum hydrocarbons in groundwater,* CRC CARE Technical Report no.15. CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia.

Department of Land & Water Conservation (1998) *The NSW Groundwater Quality Protection Policy*

ERM 2018. *PFAS Conceptual Site Model and Flux Assessment* (0466133_Clyde PFAS PSI_FINAL) Clyde Terminal, Durham Street, Rosehill, NSW. December 2018.

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ERM 2020b. Clyde Western Area Remediation Project – *Human Health and Ecological Risk Assessment.* Final V3. February 2020.

ERM 2020c. Quarter 4 (2019) Groundwater Monitoring Event, Clyde and Parramatta Terminal. Final. February 2020.

ERM 2021a. Clyde Western Area Remediation Project – *Groundwater Monitoring Program.* Final Rev04. February 2021.

ERM 2021b. Clyde Western Area Remediation Project – *Stage 2 Detailed Remediation Action Plan.* Final Draft. May 2021.

ERM 2021c. Clyde Western Area Remediation Project – *Quarter 4 2020 Groundwater Monitoring Event.* Final. March 2021.

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NSW EPA (2020) *Consultants Reporting on Contaminated Land. Contaminated Land Guidelines*

National Health and Medical Research Council (2011). Australian Drinking Water Guidelines ADWG [updated August 2018].

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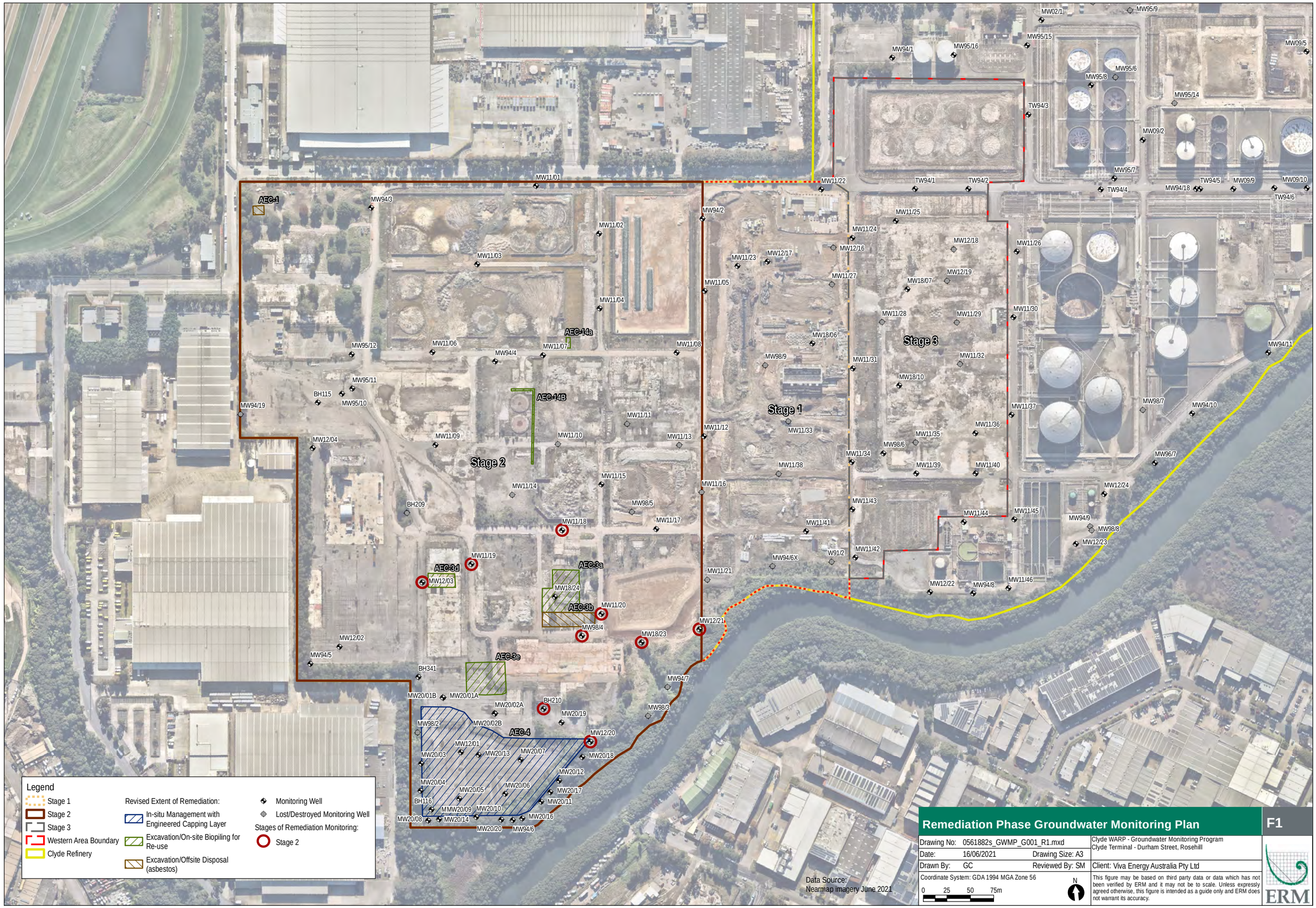
National Environment Protection Council (2013). National Environment Protection (Assessment of site Contamination) Amendment Measure (No.1). This is hereafter referred to as ‘the NEPM, 2013’.

National Health and Medical Research Council/National Resource Management Ministerial Council, Commonwealth of Australia, Canberra (2011). Australian drinking water guidelines paper 6 national water quality management strategy.

NSW Environment Protection Authority (2017). Guidelines for the NSW Site Auditor Scheme (3rd edition).

APPENDIX A FIGURES



Remediation Phase Groundwater Monitoring Plan

F1

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Date:	16/06/2021	Drawing Size: A3	
Drawn By:	GC	Reviewed By: SM	Client: Viva Energy Australia Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 25 50 75m

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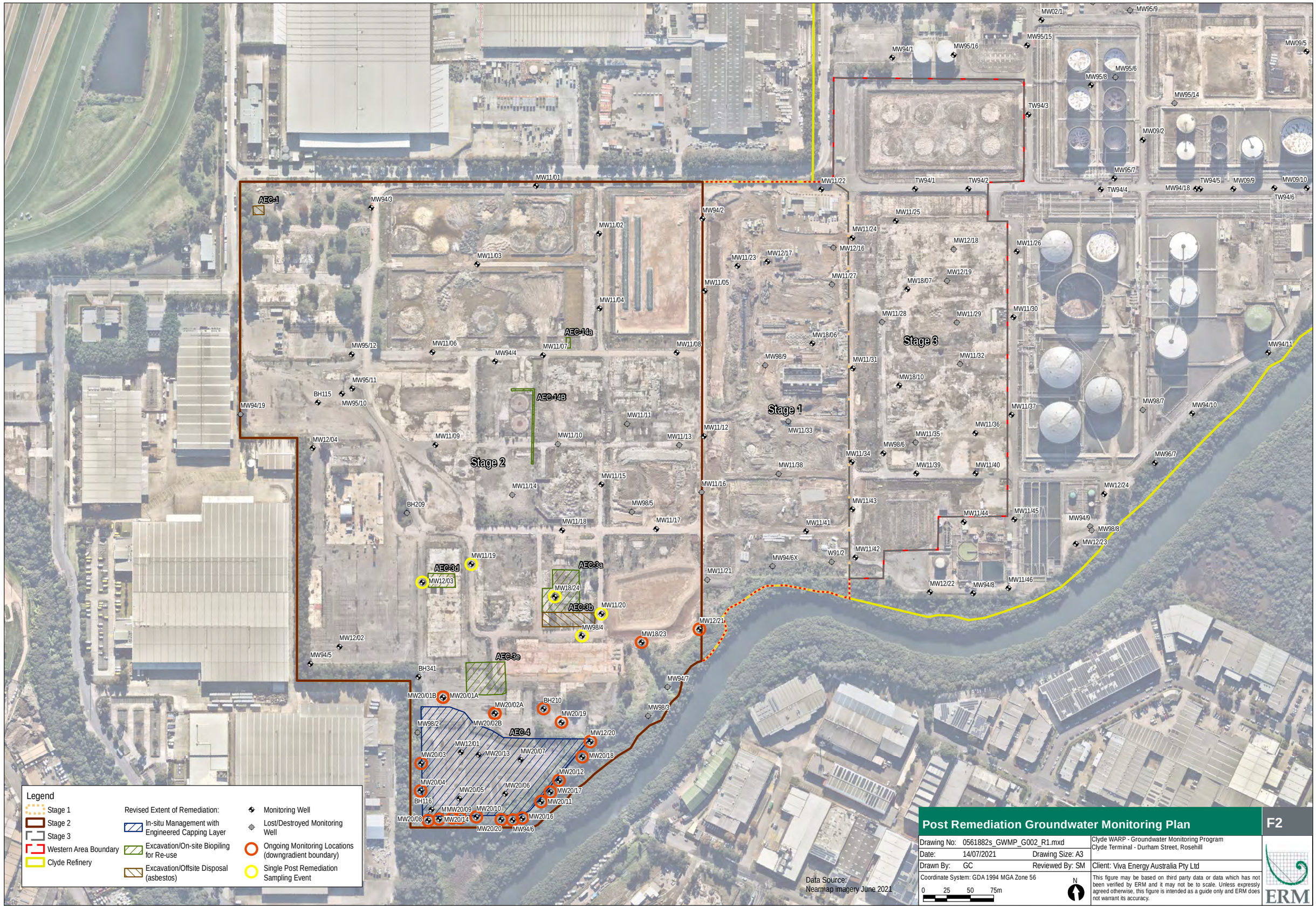

Post Remediation Groundwater Monitoring Plan

F2

Drawing No:	0561882s_GWMP_G002_R1.mxd		Clyde WARP - Groundwater Monitoring Program Clyde Terminal - Durham Street, Rosehill
Date:	14/07/2021	Drawing Size: A3	
Drawn By:	GC	Reviewed By: SM	Client: Viva Energy Australia Pty Ltd
Coordinate System: GDA 1994 MGA Zone 56			This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

APPENDIX B GROUNDWATER MONITORING PROGRAM SUMMARY TABLES

				Baseline Monitoring (prior to remediation commencement) **Completion Monitoring** (<3 months following completion of remediation excavation)				**During Remediation**		
Sample ID	**Remediation Stage**	**Purpose/ Rationale**	**Remediation Excavation Area**	**Gauging**	**Sampling**	**Analysis [2]**	**Field Parameters[1]**	**Frequency**	**Gauging**	**Field Parameters [1]**
BH210	Stage 2	Excavation Area Monitoring	AEC-3a	Y	Y	TRH C6-C40, BTEXN	Y	Weekly during excavation and dewatering	Y	Y
MW98/4	Stage 2	Excavation Area Monitoring	AEC-3a	Y	Y	TRH C6-C40, BTEXN	Y	Weekly during excavation and dewatering	Y	Y
MW11/18	Stage 2	Excavation Area Monitoring	AEC-3a	Y	Y	TRH C6-C40, BTEXN	Y	Weekly during excavation and dewatering	Y	Y
MW11/19	Stage 2	Excavation Area Monitoring	AEC-3d	Y	Y	TRH C6-C40, BTEXN	Y	Weekly during excavation and dewatering	Y	Y
MW11/20	Stage 2	Excavation Area Monitoring	AEC-3a	Y	Y	TRH C6-C40, BTEXN	Y	Weekly during excavation and dewatering	Y	Y
MW12/03	Stage 2	Excavation Area Monitoring	AEC-3d	Y	Y	TRH C6-C40, BTEXN	Y	Weekly during excavation and dewatering	Y	Y
MW12/20	Stage 2	Boundary Monitoring	-	Y	Y	TRH C6-C40, BTEXN	Y	Monthly during active remediation conducted up-gradient	Y	Y
MW18/23	Stage 2	Boundary Monitoring	-	Y	Y	TRH C6-C40, BTEXN	Y	Monthly during active remediation conducted up-gradient	Y	Y
MW12/21	Stage 2	Boundary Monitoring	-	Y	Y	TRH C6-C40, BTEXN	Y	Monthly during active remediation conducted up-gradient	Y	Y

QA/QC Samples

Sample Type	**Required Frequency**
Intra-laboratory duplicates	1 per 10 primary samples
Inter-laboratory duplicates	1 per 20 primary samples
Trip Blanks	1 per laboratory batch
Trip Spikes	1 per laboratory batch
Rinsate Blanks	1 per day of sampling

Notes:

1) Field Parameters include pH, conductivity, dissolved oxygen (DO), temperature and redox potential (redox)

2) All TRH analysis to include Silica Gel Cleanup results in addition to regular analysis

				Ongoing monitoring (biannual)						
Sample ID	**Remediation Stage**	**Purpose/ Rationale**	**Remediation Excavation Area**	**Gauging**	**Sampling**	**Field Parameters[1]**	**TRH C6-C40 (SGC[2]), BTEXN**	**MNA Parameters[3]**	**PAH / Speciated Cr (ultra trace[4])**	**PFAS (28)**
MW11/21	Stage 2	Boundary Monitoring	-	1	1	1	1	1	-	-
MW12/21	Stage 2	Boundary Monitoring	-	1	1	1	1	1	-	-
MW18/23	Stage 2	Boundary Monitoring	-	1	1	1	1	1	-	-
MW20/01A	Stage 2	Upgradient Monitoring	AEC-4	1	1	1	1	1	1	1
MW20/01B	Stage 2	Upgradient Monitoring	AEC-4	1	1	1	1	1	1	1
MW20/02A	Stage 2	Upgradient Monitoring	AEC-4	1	1	1	1	1	1	1
MW20/02B	Stage 2	Upgradient Monitoring	AEC-4	1	1	1	1	1	1	1
MW20/03	Stage 2	Source Area (north)	AEC-4	1	1	1	1	1	1	1
MW20/04	Stage 2	Source Area (south)	AEC-4	1	1	1	1	1	1	1
MW20/08	Stage 2	Downgradient Boundary Monitoring	AEC-4	1	1	1	1	1	1	1
MW20/09	Stage 2	Downgradient Boundary Monitoring	AEC-4	1	1	1	1	1	1	1
MW20/10	Stage 2	Downgradient Boundary Monitoring	AEC-4	1	1	1	1	1	1	1
MW20/11	Stage 2	Downgradient Boundary Monitoring	AEC-4	1	1	1	1	1	1	1
MW20/12	Stage 2	Downgradient Boundary Monitoring	AEC-4	1	1	1	1	1	1	1
MW20/14	Stage 2	Downgradient Boundary Monitoring	AEC-4	1	1	1	1	1	1	1
MW20/15	Stage 2	Downgradient Boundary Monitoring	AEC-4	1	1	1	1	1	1	1
MW20/16	Stage 2	Downgradient Boundary Monitoring	AEC-4	1	1	1	1	1	1	1
MW20/17	Stage 2	Downgradient Boundary Monitoring	AEC-4	1	1	1	1	1	1	1
MW20/18	Stage 2	Downgradient Boundary Monitoring	AEC-4	1	1	1	1	1	1	1
MW20/19	Stage 2	Upgradient Monitoring	AEC-4	1	1	1	1	1	1	1
BH210	Stage 2	Upgradient Monitoring	AEC-4	1	1	1	1	1	1	1
MW12/20	Stage 2	Downgradient Boundary Monitoring	AEC-4	1	1	1	1	1	1	1
MW94/6	Stage 2	Downgradient Boundary Monitoring	AEC-4	1	1	1	1	1	1	1
TOTAL				**23**	**23**	**23**	**23**	**23**	**20**	**20**

QA/QC Samples

Sample Type	**Required Frequency**
Intra-laboratory duplicates	1 per 10 primary samples
Inter-laboratory duplicates	1 per 20 primary samples
Trip Blanks	1 per laboratory batch
Trip Spikes	1 per laboratory batch
Rinsate Blanks	1 per day of sampling

Notes:
1) Field Parameters include pH, conductivity, dissolved oxygen (DO), temperature and redox potential (redox)
2) All TRH analysis to include Silica Gel Cleanup results in addition to regular analysis
3) Monitored Natural Attenuation (MNA) parameters include nitrate, ferrous iron, methane and sulphate
4) Ultra Trace PAH required below ANZG (2018) Marine Trigger Values. Laboratory Limit of Reporting <4.4 ug/L required for hexavalent chromium)

APPENDIX C GROUNDWATER SITE SPECIFIC LEVELS

COPC	Groundwater		
	VI (mg/L)		
	Commercial (1.8mbgl)	IMW	Construction
Benzene	5.0	NL	NL
Naphthalene	13	NL	NL
Benzo(a)pyrene TEQ	-	-	-
Total Chromium[a]	-	-	-
Chromium VI	-	-	-
TRH C6-C10 (less BTEX)	6.2	NL	NL
TRH C6-C10	-	-	-
TRH C10-C16 (less N)	NL	NL	NL
TRH C10-C16	-	-	-
TRH C16-C34	-	-	-
TRH C34-C40	-	-	-
TPH (EC5-6) aliphatic	-	-	-
TPH (>EC6-8) aliphatic	NL	NL	NL
TPH (>EC8-10) aliphatic	4	NL	NL
TPH (>EC10-12) aliphatic	NL	NL	NL
TPH (>EC12-16) aliphatic	NL	NL	NL
TPH (>EC16-21) aliphatic	-	-	-
TPH (>EC21-34) aliphatic	-	-	-
TPH (>34) aliphatic	-	-	-
TPH (>EC8-10) aromatic	NL	NL	NL
TPH (>EC10-12) aromatic	NL	NL	NL
TPH (>EC12-16) aromatic	NL	NL	NL
TPH (>EC16-21) aromatic	-	-	-
TPH (>EC21-34) aromatic	-	-	-
TPH (>34) aromatic	-	-	-
Trimethylbenzene, 1,2,4-			
Trimethylbenzene, 1,3,5-			
Cyclohexane			
Heptane, N-			
Hexane, N-			
Isooctane			
Propene			
Notes: NL = Non-Limiting			

ChemName	MatrixType	ActionLevelSource	ActionLevel	Units	Comments
1,1-dichloroethene	water	NHMRC (2008) Recreational Water - Health	0.3	mg/L	
1,2-dichlorobenzene	water	NHMRC (2008) Recreational Water - Health	15	mg/L	
1,2-dichloroethane	water	NHMRC (2008) Recreational Water - Health	0.03	mg/L	
1,2-dichloroethene	water	NHMRC (2008) Recreational Water - Health	0.6	mg/L	
1,3-Dichloropropene	water	NHMRC (2008) Recreational Water - Health	1	mg/L	
1,4-dichlorobenzene	water	NHMRC (2008) Recreational Water - Health	0.4	mg/L	
2,2-DPA	water	NHMRC (2008) Recreational Water - Health	5	mg/L	
2,4,5-T	water	NHMRC (2008) Recreational Water - Health	1	mg/L	
2,4,6-trichlorophenol	water	NHMRC (2008) Recreational Water - Health	0.2	mg/L	
2,4-D [(2,4-Dichlorophenoxy) acetic acid]	water	NHMRC (2008) Recreational Water - Health	0.3	mg/L	
2,4-dichlorophenol	water	NHMRC (2008) Recreational Water - Health	2	mg/L	
2-chlorophenol	water	NHMRC (2008) Recreational Water - Health	3	mg/L	
Acephate	water	NHMRC (2008) Recreational Water - Health	0.08	mg/L	
Acrylamide	water	NHMRC (2008) Recreational Water - Health	0.002	mg/L	
Aldicarb	water	NHMRC (2008) Recreational Water - Health	0.04	mg/L	
Aldrin & Dieldrin	water	NHMRC (2008) Recreational Water - Health	0.003	mg/L	
Ametryn	water	NHMRC (2008) Recreational Water - Health	0.7	mg/L	
Amitraz	water	NHMRC (2008) Recreational Water - Health	0.09	mg/L	
Amitrole	water	NHMRC (2008) Recreational Water - Health	0.09	mg/L	
Antimony	water	NHMRC (2008) Recreational Water - Health	0.03	mg/L	
Arsenic	water	NHMRC (2008) Recreational Water - Health	0.1	mg/L	
Asulam	water	NHMRC (2008) Recreational Water - Health	0.7	mg/L	
Atrazine	water	NHMRC (2008) Recreational Water - Health	0.2	mg/L	
Azinphos-methyl	water	NHMRC (2008) Recreational Water - Health	0.3	mg/L	
Barium	water	NHMRC (2008) Recreational Water - Health	20	mg/L	
Benomyl	water	NHMRC (2008) Recreational Water - Health	0.9	mg/L	
Bentazone	water	NHMRC (2008) Recreational Water - Health	4	mg/L	
Benzene	water	NHMRC (2008) Recreational Water - Health	0.01	mg/L	
Benzo-(a)-pyrene	water	NHMRC (2008) Recreational Water - Health	0.0001	mg/L	
Beryllium	water	NHMRC (2008) Recreational Water - Health	0.6	mg/L	
Bioresmethrin	water	NHMRC (2008) Recreational Water - Health	1	mg/L	
Boron	water	NHMRC (2008) Recreational Water - Health	40	mg/L	
Bromacil	water	NHMRC (2008) Recreational Water - Health	4	mg/L	
Bromate	water	NHMRC (2008) Recreational Water - Health	0.2	mg/L	
Bromophos-ethyl	water	NHMRC (2008) Recreational Water - Health	0.1	mg/L	
Bromoxynil	water	NHMRC (2008) Recreational Water - Health	0.1	mg/L	
Cadmium	water	NHMRC (2008) Recreational Water - Health	0.02	mg/L	
Captan	water	NHMRC (2008) Recreational Water - Health	4	mg/L	
Carbaryl	water	NHMRC (2008) Recreational Water - Health	0.3	mg/L	
Carbendazim	water	NHMRC (2008) Recreational Water - Health	0.9	mg/L	
Carbofuran	water	NHMRC (2008) Recreational Water - Health	0.1	mg/L	
Carbon tetrachloride	water	NHMRC (2008) Recreational Water - Health	0.03	mg/L	
Carbophenothion	water	NHMRC (2008) Recreational Water - Health	0.005	mg/L	
Carboxin	water	NHMRC (2008) Recreational Water - Health	3	mg/L	
Carfentrazone-ethyl	water	NHMRC (2008) Recreational Water - Health	1	mg/L	
Chlordane	water	NHMRC (2008) Recreational Water - Health	0.02	mg/L	
Chlorfenvinphos	water	NHMRC (2008) Recreational Water - Health	0.02	mg/L	
chloroacetic acid	water	NHMRC (2008) Recreational Water - Health	1.5	mg/L	
Chlorobenzene	water	NHMRC (2008) Recreational Water - Health	3	mg/L	
Chlorothalonil	water	NHMRC (2008) Recreational Water - Health	0.5	mg/L	
Chloroxuron	water	NHMRC (2008) Recreational Water - Health	0.1	mg/L	
Chlorpyrifos	water	NHMRC (2008) Recreational Water - Health	0.1	mg/L	
Chlorsulfuron	water	NHMRC (2008) Recreational Water - Health	2	mg/L	
Chromium (as Cr(VI))	water	NHMRC (2008) Recreational Water - Health	0.5	mg/L	
Clopyralid	water	NHMRC (2008) Recreational Water - Health	20	mg/L	
Copper	water	NHMRC (2008) Recreational Water - Health	20	mg/L	
Cyanide	water	NHMRC (2008) Recreational Water - Health	0.8	mg/L	
Cyanogen chloride (as cyanide)	water	NHMRC (2008) Recreational Water - Health	0.8	mg/L	
Cyfluthrin,Beta-cyfluthrin	water	NHMRC (2008) Recreational Water - Health	0.5	mg/L	
Cypermethrin isomers	water	NHMRC (2008) Recreational Water - Health	2	mg/L	
Cyprodinil	water	NHMRC (2008) Recreational Water - Health	0.9	mg/L	
DDT	water	NHMRC (2008) Recreational Water - Health	0.09	mg/L	
Deltamethrin	water	NHMRC (2008) Recreational Water - Health	0.4	mg/L	
di(2-ethylhexyl) phthalate	water	NHMRC (2008) Recreational Water - Health	0.1	mg/L	
Diazinon	water	NHMRC (2008) Recreational Water - Health	0.04	mg/L	
Dicamba	water	NHMRC (2008) Recreational Water - Health	1	mg/L	
Dichlobenil	water	NHMRC (2008) Recreational Water - Health	0.1	mg/L	
dichloroacetic acid	water	NHMRC (2008) Recreational Water - Health	1	mg/L	
Dichloromethane (methylene chloride)	water	NHMRC (2008) Recreational Water - Health	0.04	mg/L	
Dichloroprop / Dichlorprop-P	water	NHMRC (2008) Recreational Water - Health	1	mg/L	
Dichlorvos	water	NHMRC (2008) Recreational Water - Health	0.05	mg/L	
Difenzoquat	water	NHMRC (2008) Recreational Water - Health	1	mg/L	
Diflubenzuron	water	NHMRC (2008) Recreational Water - Health	0.7	mg/L	
Dimethoate	water	NHMRC (2008) Recreational Water - Health	0.07	mg/L	
Diphenamid	water	NHMRC (2008) Recreational Water - Health	3	mg/L	
Diuron	water	NHMRC (2008) Recreational Water - Health	0.2	mg/L	
EDB	water	NHMRC (2008) Recreational Water - Health	0.01	mg/L	
Endosulfan	water	NHMRC (2008) Recreational Water - Health	0.2	mg/L	
Endothal	water	NHMRC (2008) Recreational Water - Health	1	mg/L	
Epichlorohydrin	water	NHMRC (2008) Recreational Water - Health	0.005	mg/L	
EPTC	water	NHMRC (2008) Recreational Water - Health	3	mg/L	
Esfenvalerate	water	NHMRC (2008) Recreational Water - Health	0.3	mg/L	
Ethion	water	NHMRC (2008) Recreational Water - Health	0.04	mg/L	
Ethoprophos	water	NHMRC (2008) Recreational Water - Health	0.01	mg/L	
Ethylbenzene	water	NHMRC (2008) Recreational Water - Health	3	mg/L	
Ethylenediamine tetraacetic acid (EDTA)	water	NHMRC (2008) Recreational Water - Health	2.5	mg/L	
Etridiazole	water	NHMRC (2008) Recreational Water - Health	1	mg/L	
Fenamiphos	water	NHMRC (2008) Recreational Water - Health	0.005	mg/L	
Fenarimol	water	NHMRC (2008) Recreational Water - Health	0.4	mg/L	
Fenitrothion	water	NHMRC (2008) Recreational Water - Health	0.07	mg/L	
Fenoprop	water	NHMRC (2008) Recreational Water - Health	0.1	mg/L	
Fensulfothion	water	NHMRC (2008) Recreational Water - Health	0.1	mg/L	
Fenthion	water	NHMRC (2008) Recreational Water - Health	0.07	mg/L	
Fenvalerate	water	NHMRC (2008) Recreational Water - Health	0.6	mg/L	

ChemName	MatrixType	ActionLevelSource	ActionLevel	Units	Comments
Fipronil	water	NHMRC (2008) Recreational Water - Health	0.007	mg/L	
Flamprop-methyl	water	NHMRC (2008) Recreational Water - Health	0.04	mg/L	
Fluometuron	water	NHMRC (2008) Recreational Water - Health	0.7	mg/L	
Fluoride	water	NHMRC (2008) Recreational Water - Health	15	mg/L	
Fluproponate	water	NHMRC (2008) Recreational Water - Health	0.09	mg/L	
Formaldehyde	water	NHMRC (2008) Recreational Water - Health	5	mg/L	
Formothion	water	NHMRC (2008) Recreational Water - Health	0.5	mg/L	
Fosamine	water	NHMRC (2008) Recreational Water - Health	0.3	mg/L	
Glyphosate	water	NHMRC (2008) Recreational Water - Health	10	mg/L	
Haloxyfop	water	NHMRC (2008) Recreational Water - Health	0.01	mg/L	
Heptachlor	water	NHMRC (2008) Recreational Water - Health	0.003	mg/L	
Hexachlorobutadiene	water	NHMRC (2008) Recreational Water - Health	0.007	mg/L	
Hexaflurate	water	NHMRC (2008) Recreational Water - Health	0.3	mg/L	
Hexazinone	water	NHMRC (2008) Recreational Water - Health	4	mg/L	
Imazapyr	water	NHMRC (2008) Recreational Water - Health	90	mg/L	
Iodide	water	NHMRC (2008) Recreational Water - Health	5	mg/L	
Iprodione	water	NHMRC (2008) Recreational Water - Health	1	mg/L	
Lead	water	NHMRC (2008) Recreational Water - Health	0.1	mg/L	
Lindane	water	NHMRC (2008) Recreational Water - Health	0.1	mg/L	
Maldison (Malathion)	water	NHMRC (2008) Recreational Water - Health	0.7	mg/L	
Mancozeb	water	NHMRC (2008) Recreational Water - Health	0.09	mg/L	
Manganese	water	NHMRC (2008) Recreational Water - Health	5	mg/L	
MCPA	water	NHMRC (2008) Recreational Water - Health	0.4	mg/L	
Mercury	water	NHMRC (2008) Recreational Water - Health	0.01	mg/L	
Metaldehyde	water	NHMRC (2008) Recreational Water - Health	0.2	mg/L	
Metham	water	NHMRC (2008) Recreational Water - Health	0.01	mg/L	
Methidathion	water	NHMRC (2008) Recreational Water - Health	0.06	mg/L	
Methiocarb	water	NHMRC (2008) Recreational Water - Health	0.07	mg/L	
Methomyl	water	NHMRC (2008) Recreational Water - Health	0.2	mg/L	
Methyl bromide	water	NHMRC (2008) Recreational Water - Health	0.01	mg/L	
Metiram	water	NHMRC (2008) Recreational Water - Health	0.09	mg/L	
Metolachlor/s– Metolachlor	water	NHMRC (2008) Recreational Water - Health	3	mg/L	
Metribuzin	water	NHMRC (2008) Recreational Water - Health	0.7	mg/L	
Metsulfuron-methyl	water	NHMRC (2008) Recreational Water - Health	0.4	mg/L	
Mevinphos	water	NHMRC (2008) Recreational Water - Health	0.05	mg/L	
Microcystins	water	NHMRC (2008) Recreational Water - Health	13	µg/L	
Molinate	water	NHMRC (2008) Recreational Water - Health	0.04	mg/L	
Molybdenum	water	NHMRC (2008) Recreational Water - Health	0.5	mg/L	
Monochloramine	water	NHMRC (2008) Recreational Water - Health	30	mg/L	
Monocrotophos	water	NHMRC (2008) Recreational Water - Health	0.02	mg/L	
Napropamide	water	NHMRC (2008) Recreational Water - Health	4	mg/L	
Nicarbazin	water	NHMRC (2008) Recreational Water - Health	10	mg/L	
Nickel	water	NHMRC (2008) Recreational Water - Health	0.2	mg/L	
Nitrate (as nitrate)	water	NHMRC (2008) Recreational Water - Health	500	mg/L	
Nitrilotriacetic acid	water	NHMRC (2008) Recreational Water - Health	2	mg/L	
Nitrite (as nitrite)	water	NHMRC (2008) Recreational Water - Health	30	mg/L	
N-Nitrosodimethylamine (NDMA)	water	NHMRC (2008) Recreational Water - Health	0.001	mg/L	
Norflurazon	water	NHMRC (2008) Recreational Water - Health	0.5	mg/L	
Omethoate	water	NHMRC (2008) Recreational Water - Health	0.01	mg/L	
Oryzalin	water	NHMRC (2008) Recreational Water - Health	4	mg/L	
Oxamyl	water	NHMRC (2008) Recreational Water - Health	0.07	mg/L	
Paraquat	water	NHMRC (2008) Recreational Water - Health	0.2	mg/L	
Parathion	water	NHMRC (2008) Recreational Water - Health	0.2	mg/L	
Parathion-methyl	water	NHMRC (2008) Recreational Water - Health	0.007	mg/L	
Pebulate	water	NHMRC (2008) Recreational Water - Health	0.3	mg/L	
Pendimethalin	water	NHMRC (2008) Recreational Water - Health	4	mg/L	
Pentachlorophenol	water	NHMRC (2008) Recreational Water - Health	0.1	mg/L	
Permethrin	water	NHMRC (2008) Recreational Water - Health	2	mg/L	
Picloram	water	NHMRC (2008) Recreational Water - Health	3	mg/L	
Piperonyl butoxide	water	NHMRC (2008) Recreational Water - Health	6	mg/L	
Pirimicarb	water	NHMRC (2008) Recreational Water - Health	0.07	mg/L	
Pirimiphos methyl	water	NHMRC (2008) Recreational Water - Health	0.9	mg/L	
Pirimiphos-ethyl	water	NHMRC (2008) Recreational Water - Health	0.005	mg/L	
Polihexanide	water	NHMRC (2008) Recreational Water - Health	7	mg/L	
Profenofos	water	NHMRC (2008) Recreational Water - Health	0.003	mg/L	
Propachlor	water	NHMRC (2008) Recreational Water - Health	0.7	mg/L	
Propanil	water	NHMRC (2008) Recreational Water - Health	7	mg/L	
Propargite	water	NHMRC (2008) Recreational Water - Health	0.07	mg/L	
Propazine	water	NHMRC (2008) Recreational Water - Health	0.5	mg/L	
Propiconazole	water	NHMRC (2008) Recreational Water - Health	1	mg/L	
Propyzamide	water	NHMRC (2008) Recreational Water - Health	0.7	mg/L	
Pyrasulfotole	water	NHMRC (2008) Recreational Water - Health	0.4	mg/L	
Pyrazophos	water	NHMRC (2008) Recreational Water - Health	0.2	mg/L	
Pyroxsulam	water	NHMRC (2008) Recreational Water - Health	40	mg/L	
Quintozene	water	NHMRC (2008) Recreational Water - Health	0.3	mg/L	
Selenium	water	NHMRC (2008) Recreational Water - Health	0.1	mg/L	
Silver	water	NHMRC (2008) Recreational Water - Health	1	mg/L	
Simazine	water	NHMRC (2008) Recreational Water - Health	0.2	mg/L	
Spirotetramat	water	NHMRC (2008) Recreational Water - Health	2	mg/L	
Styrene (vinylbenzene)	water	NHMRC (2008) Recreational Water - Health	0.3	mg/L	
Sulprofos	water	NHMRC (2008) Recreational Water - Health	0.1	mg/L	
Temephos	water	NHMRC (2008) Recreational Water - Health	4	mg/L	
Terbacil	water	NHMRC (2008) Recreational Water - Health	2	mg/L	
Terbufos	water	NHMRC (2008) Recreational Water - Health	0.009	mg/L	
Terbuthylazine	water	NHMRC (2008) Recreational Water - Health	0.1	mg/L	
Terbutryn	water	NHMRC (2008) Recreational Water - Health	4	mg/L	
Tetrachloroethene	water	NHMRC (2008) Recreational Water - Health	0.5	mg/L	
Tetrachlorvinphos	water	NHMRC (2008) Recreational Water - Health	1	mg/L	
Thiobencarb	water	NHMRC (2008) Recreational Water - Health	0.4	mg/L	
Thiometon	water	NHMRC (2008) Recreational Water - Health	0.04	mg/L	
Thiophanate	water	NHMRC (2008) Recreational Water - Health	0.05	mg/L	
Thiram	water	NHMRC (2008) Recreational Water - Health	0.07	mg/L	
Toltrazuril	water	NHMRC (2008) Recreational Water - Health	0.04	mg/L	
Toluene	water	NHMRC (2008) Recreational Water - Health	8	mg/L	

ChemName	MatrixType	ActionLevelSource	ActionLevel	Units	Comments
Triadimefon	water	NHMRC (2008) Recreational Water - Health	0.9	mg/L	
tributyltin oxide	water	NHMRC (2008) Recreational Water - Health	0.01	mg/L	
Trichlorfon	water	NHMRC (2008) Recreational Water - Health	0.07	mg/L	
trichloroacetic acid	water	NHMRC (2008) Recreational Water - Health	1	mg/L	
Trichlorobenzenes (total)	water	NHMRC (2008) Recreational Water - Health	0.3	mg/L	
Triclopyr	water	NHMRC (2008) Recreational Water - Health	0.2	mg/L	
Trifluralin	water	NHMRC (2008) Recreational Water - Health	0.9	mg/L	
Trihalomethanes (THMs) (Total)	water	NHMRC (2008) Recreational Water - Health	2.5	mg/L	
Uranium	water	NHMRC (2008) Recreational Water - Health	0.17	mg/L	
Vernolate	water	NHMRC (2008) Recreational Water - Health	0.4	mg/L	
Vinyl chloride	water	NHMRC (2008) Recreational Water - Health	0.003	mg/L	
Xylene	water	NHMRC (2008) Recreational Water - Health	6	mg/L	
Chloral hydrate (Trichloroacetaldehyde)	water	NHMRC (2008) Recreational Water - Health	1	mg/L	
Chlorite	water	NHMRC (2008) Recreational Water - Health	8	mg/L	
Dicofol	water	NHMRC (2008) Recreational Water - Health	0.04	mg/L	
Disulfoton	water	NHMRC (2008) Recreational Water - Health	0.04	mg/L	
Chlorine	water	NHMRC (2008) Recreational Water - Health	50	mg/L	
Diclofop-methyl	water	NHMRC (2008) Recreational Water - Health	0.05	mg/L	
Diquat	water	NHMRC (2008) Recreational Water - Health	0.07	mg/L	
Chromium	water	NEPM (1999) GIL - Marine Water	4.4	µg/L	
Mercury	water	NEPM (1999) GIL - Marine Water	0.1	µg/L	
Cadmium	water	NEPM (1999) GIL - Marine Water	0.7	µg/L	
Copper	water	NEPM (1999) GIL - Marine Water	1.3	µg/L	
Nickel	water	NEPM (1999) GIL - Marine Water	7	µg/L	
Zinc	water	NEPM (1999) GIL - Marine Water	15	µg/L	
2,4-Dichlorophenol	water	NEPM (1999) GIL - Marine Water	160	µg/L	
1,1,2-Trichloroethane	water	NEPM (1999) GIL - Marine Water	1900	µg/L	
1,2,4-Trichlorobenzene	water	NEPM (1999) GIL - Marine Water	20	µg/L	
2,4,6-Trichlorophenol	water	NEPM (1999) GIL - Marine Water	20	µg/L	
Lead	water	NEPM (1999) GIL - Marine Water	4.4	µg/L	
Phenol	water	NEPM (1999) GIL - Marine Water	400	µg/L	
2-Chlorophenol	water	NEPM (1999) GIL - Marine Water	490	µg/L	
Naphthalene	water	NEPM (1999) GIL - Marine Water	50	µg/L	
Benzene	water	NEPM (1999) GIL - Marine Water	500	µg/L	
1,1,2-Trichloroethane	water	NEPM (1999) GIL - Marine Water	6500	µg/L	
Zinc	water	NEPM (1999) GIL - Marine Water	8	µg/L	
Arsenic	water	NEPM (1999) GIL - Marine Water	2.3	µg/L	
Anthracene	water	NEPM (1999) GIL - Marine Water	0.01	µg/L	
Fluoranthene	water	NEPM (1999) GIL - Marine Water	1.4	µg/L	
Toluene	water	NEPM (1999) GIL - Marine Water	180	µg/L	
1,2-Dichloroethane	water	NEPM (1999) GIL - Marine Water	1900	µg/L	
Phenanthrene	water	NEPM (1999) GIL - Marine Water	2	µg/L	
Carbon tetrachloride	water	NEPM (1999) GIL - Marine Water	240	µg/L	
1,1-Dichloroethane	water	NEPM (1999) GIL - Marine Water	250	µg/L	
1,1,1-Trichloroethane	water	NEPM (1999) GIL - Marine Water	270	µg/L	
meta- & para-Xylene	water	NEPM (1999) GIL - Marine Water	275	µg/L	
Trichloroethene	water	NEPM (1999) GIL - Marine Water	330	µg/L	
ortho-Xylene	water	NEPM (1999) GIL - Marine Water	350	µg/L	
Chloroform	water	NEPM (1999) GIL - Marine Water	370	µg/L	
1,1,2,2-Tetrachloroethane	water	NEPM (1999) GIL - Marine Water	400	µg/L	
Dichloromethane	water	NEPM (1999) GIL - Marine Water	4000	µg/L	
Tetrachloroethene	water	NEPM (1999) GIL - Marine Water	70	µg/L	
1,1-Dichloroethene	water	NEPM (1999) GIL - Marine Water	700	µg/L	
Pentachloroethane	water	NEPM (1999) GIL - Marine Water	80	µg/L	
Benzene	water	NEPM (1999) GIL - Marine Water	950	µg/L	
Selenium	water	NEPM (1999) GIL - Marine Water	3	µg/L	
Ethylbenzene	water	NEPM (1999) GIL - Marine Water	5	µg/L	
Benzo(a)pyrene	water	NEPM (1999) GIL - Marine Water	0.2	µg/L	
Benzo(a)pyrene TEQ	water	NEPM (1999) GIL - Marine Water	0.2	µg/L	
Benzene	water	CRC Care (2011) Intrusive Maint. Worker - San	NL	µg/L	
Ethylbenzene	water	CRC Care (2011) Intrusive Maint. Worker - San	NL	µg/L	
Naphthalene	water	CRC Care (2011) Intrusive Maint. Worker - San	NL	µg/L	
Toluene	water	CRC Care (2011) Intrusive Maint. Worker - San	NL	µg/L	
TRH >C10-C16 excluding naphthalene (F2)	water	CRC Care (2011) Intrusive Maint. Worker - San	NL	µg/L	
TRH C6 - C10 excluding BTEX (F1)	water	CRC Care (2011) Intrusive Maint. Worker - San	NL	µg/L	
Xylene Total	water	CRC Care (2011) Intrusive Maint. Worker - San	NL	µg/L	
Ammonia	water	ANZG (2018) TV - Marine water (95%)	910	µg/L	Moderate Reliability
Cadmium	water	ANZG (2018) TV - Marine water (95%)	5.5	µg/L	High Reliability
Chlorpyrifos	water	ANZG (2018) TV - Marine water (95%)	0.009	µg/L	Low Reliability
Chromium (CrVI)	water	ANZG (2018) TV - Marine water (95%)	4.4	µg/L	Very high Reliability
Cobalt	water	ANZG (2018) TV - Marine water (95%)	1	µg/L	High Reliability
Endosulfan	water	ANZG (2018) TV - Marine water (95%)	0.01	µg/L	Moderate Reliability
Endrin	water	ANZG (2018) TV - Marine water (95%)	0.008	µg/L	Moderate Reliability
Lead	water	ANZG (2018) TV - Marine water (95%)	4.4	µg/L	Low Reliability
Mercury (inorganic)	water	ANZG (2018) TV - Marine water (95%)	0.4	µg/L	Very high Reliability
Naphthalene	water	ANZG (2018) TV - Marine water (95%)	70	µg/L	Moderate Reliability
Nickel	water	ANZG (2018) TV - Marine water (95%)	70	µg/L	High Reliability
Phenol	water	ANZG (2018) TV - Marine water (95%)	400	µg/L	Low Reliability
Silver	water	ANZG (2018) TV - Marine water (95%)	1.4	µg/L	Moderate Reliability
Zinc	water	ANZG (2018) TV - Marine water (95%)	15	µg/L	Very high Reliability
1,1,1-Trichloroethane	water	ANZG (2018) TV - Marine water (95%)	270	µg/L	Unknown level of species protection; Unknown Reliability
1,1,2,2-Tetrachloroethylene	water	ANZG (2018) TV - Marine water (95%)	70	µg/L	Unknown level of species protection; Unknown Reliability
1,1,2-Trichloroethylene	water	ANZG (2018) TV - Marine water (95%)	330	µg/L	Unknown level of species protection; Unknown Reliability
1,2,3,4-Tetrachlorobenzene	water	ANZG (2018) TV - Marine water (95%)	2	µg/L	Unknown level of species protection; Unknown Reliability
1,2,3,5-Tetrachlorobenzene	water	ANZG (2018) TV - Marine water (95%)	3	µg/L	Unknown level of species protection; Unknown Reliability
1,2,3-Trichlorobenzene	water	ANZG (2018) TV - Marine water (95%)	3	µg/L	Unknown level of species protection; Unknown Reliability
1,2,4,5-Tetrachlorobenzene	water	ANZG (2018) TV - Marine water (95%)	5	µg/L	Unknown level of species protection; Unknown Reliability
1,2-Dichlorobenzene	water	ANZG (2018) TV - Marine water (95%)	160	µg/L	Unknown level of species protection; Unknown Reliability
1,2-Dichloroethane	water	ANZG (2018) TV - Marine water (95%)	1900	µg/L	Unknown level of species protection; Unknown Reliability
1,2-Dinitrobenzene	water	ANZG (2018) TV - Marine water (95%)	0.6	µg/L	Unknown level of species protection; Unknown Reliability
1,3,5-Trichlorobenzene	water	ANZG (2018) TV - Marine water (95%)	8	µg/L	Unknown level of species protection; Unknown Reliability
1,3-Dichloropropane	water	ANZG (2018) TV - Marine water (95%)	1100	µg/L	Unknown level of species protection; Unknown Reliability
1,3-Dichloropropene	water	ANZG (2018) TV - Marine water (95%)	0.8	µg/L	Unknown level of species protection; Unknown Reliability
1,3-Dinitrobenzene	water	ANZG (2018) TV - Marine water (95%)	13	µg/L	Unknown level of species protection; Unknown Reliability

ChemName	MatrixType	ActionLevelSource	ActionLevel	Units	Comments
1,4-Dichlorobenzene	water	ANZG (2018) TV - Marine water (95%)	60	µg/L	Unknown level of species protection; Unknown Reliability
1-Chloro-2-nitrobenzene	water	ANZG (2018) TV - Marine water (95%)	15	µg/L	Unknown level of species protection; Unknown Reliability
1-Chloro-3-nitrobenzene	water	ANZG (2018) TV - Marine water (95%)	12	µg/L	Unknown level of species protection; Unknown Reliability
1-Chloro-4-nitrobenzene	water	ANZG (2018) TV - Marine water (95%)	1	µg/L	Unknown level of species protection; Unknown Reliability
1-Chloronaphthalene	water	ANZG (2018) TV - Marine water (95%)	0.7	µg/L	Unknown level of species protection; Unknown Reliability
2,3,4,5-Tetrachlorophenol	water	ANZG (2018) TV - Marine water (95%)	2	µg/L	Unknown level of species protection; Unknown Reliability
2,3,4,6-Tetrachlorophenol	water	ANZG (2018) TV - Marine water (95%)	10	µg/L	Unknown level of species protection; Unknown Reliability
2,3,4-Trichlorophenol	water	ANZG (2018) TV - Marine water (95%)	4	µg/L	Unknown level of species protection; Unknown Reliability
2,3,5,6-Tetrachlorophenol	water	ANZG (2018) TV - Marine water (95%)	1.4	µg/L	Unknown level of species protection; Unknown Reliability
2,3,5-Trichlorophenol	water	ANZG (2018) TV - Marine water (95%)	2	µg/L	Unknown level of species protection; Unknown Reliability
2,3,6-Trichlorophenol	water	ANZG (2018) TV - Marine water (95%)	2	µg/L	Unknown level of species protection; Unknown Reliability
2,4,5-Trichlorophenol	water	ANZG (2018) TV - Marine water (95%)	4	µg/L	Unknown level of species protection; Unknown Reliability
2,4-Dichloroaniline	water	ANZG (2018) TV - Marine water (95%)	7	µg/L	Unknown level of species protection; Unknown Reliability
2,4-Dichlorophenol	water	ANZG (2018) TV - Marine water (95%)	120	µg/L	Unknown level of species protection; Unknown Reliability
2,4-Dimethylphenol	water	ANZG (2018) TV - Marine water (95%)	2	µg/L	Unknown level of species protection; Unknown Reliability
2,4-Dinitrophenol	water	ANZG (2018) TV - Marine water (95%)	45	µg/L	Unknown level of species protection; Unknown Reliability
2,4-Dinitrotoluene	water	ANZG (2018) TV - Marine water (95%)	16	µg/L	Unknown level of species protection; Unknown Reliability
2,5-Dichlorophenol	water	ANZG (2018) TV - Marine water (95%)	3	µg/L	Unknown level of species protection; Unknown Reliability
2,6-Dichlorophenol	water	ANZG (2018) TV - Marine water (95%)	34	µg/L	Unknown level of species protection; Unknown Reliability
2-Chlorophenol	water	ANZG (2018) TV - Marine water (95%)	340	µg/L	Unknown level of species protection; Unknown Reliability
2-Nitrophenol	water	ANZG (2018) TV - Marine water (95%)	2	µg/L	Unknown level of species protection; Unknown Reliability
2-Nitrotoluene	water	ANZG (2018) TV - Marine water (95%)	110	µg/L	Unknown level of species protection; Unknown Reliability
4-Nitrophenol	water	ANZG (2018) TV - Marine water (95%)	58	µg/L	Unknown level of species protection; Unknown Reliability
4-Nitrotoluene	water	ANZG (2018) TV - Marine water (95%)	120	µg/L	Unknown level of species protection; Unknown Reliability
Acetonitrile	water	ANZG (2018) TV - Marine water (95%)	160	µg/L	Unknown level of species protection; Unknown Reliability
Acrylonitrile	water	ANZG (2018) TV - Marine water (95%)	8	µg/L	Unknown level of species protection; Unknown Reliability
Aldrin	water	ANZG (2018) TV - Marine water (95%)	0.003	µg/L	Unknown level of species protection; Unknown Reliability
Amitrole	water	ANZG (2018) TV - Marine water (95%)	22	µg/L	Unknown level of species protection; Unknown Reliability
Aniline	water	ANZG (2018) TV - Marine water (95%)	8	µg/L	Unknown level of species protection; Unknown Reliability
Anthracene	water	ANZG (2018) TV - Marine water (95%)	0.1	µg/L	Unknown level of species protection; Unknown Reliability
Antimony	water	ANZG (2018) TV - Marine water (95%)	270	µg/L	Unknown level of species protection; Unknown Reliability
Aroclor 1242	water	ANZG (2018) TV - Marine water (95%)	0.3	µg/L	Unknown level of species protection; Unknown Reliability
Aroclor 1254	water	ANZG (2018) TV - Marine water (95%)	0.01	µg/L	Unknown level of species protection; Unknown Reliability
Atrazine	water	ANZG (2018) TV - Marine water (95%)	13	µg/L	Unknown level of species protection; Unknown Reliability
Azinphos methyl	water	ANZG (2018) TV - Marine water (95%)	0.01	µg/L	Unknown level of species protection; Unknown Reliability
Benzo(a)pyrene	water	ANZG (2018) TV - Marine water (95%)	0.1	µg/L	Unknown level of species protection; Unknown Reliability
Bromacil	water	ANZG (2018) TV - Marine water (95%)	180	µg/L	Unknown level of species protection; Unknown Reliability
Carbofuran	water	ANZG (2018) TV - Marine water (95%)	0.06	µg/L	Unknown level of species protection; Unknown Reliability
Carbon disulfide	water	ANZG (2018) TV - Marine water (95%)	20	µg/L	Unknown level of species protection; Unknown Reliability
Carbon tetrachloride	water	ANZG (2018) TV - Marine water (95%)	240	µg/L	Unknown level of species protection; Unknown Reliability
Chlordane	water	ANZG (2018) TV - Marine water (95%)	0.001	µg/L	Unknown level of species protection; Unknown Reliability
Chloroethylene	water	ANZG (2018) TV - Marine water (95%)	100	µg/L	Unknown level of species protection; Unknown Reliability
Chloroform	water	ANZG (2018) TV - Marine water (95%)	370	µg/L	Unknown level of species protection; Unknown Reliability
Cumene (isopropylbenzene)	water	ANZG (2018) TV - Marine water (95%)	30	µg/L	Unknown level of species protection; Unknown Reliability
DDE	water	ANZG (2018) TV - Marine water (95%)	0.0005	µg/L	Unknown level of species protection; Unknown Reliability
DDT	water	ANZG (2018) TV - Marine water (95%)	0.0004	µg/L	Unknown level of species protection; Unknown Reliability
Deltamethrin	water	ANZG (2018) TV - Marine water (95%)	0.0001	µg/L	Unknown level of species protection; Unknown Reliability
Demeton-S	water	ANZG (2018) TV - Marine water (95%)	0.3	µg/L	Unknown level of species protection; Unknown Reliability
Demeton-S-methyl	water	ANZG (2018) TV - Marine water (95%)	4	µg/L	Unknown level of species protection; Unknown Reliability
Di(2-ethylhexyl)phthalate	water	ANZG (2018) TV - Marine water (95%)	1	µg/L	Unknown level of species protection; Unknown Reliability
Diazinon	water	ANZG (2018) TV - Marine water (95%)	0.01	µg/L	Unknown level of species protection; Unknown Reliability
Dichloromethane	water	ANZG (2018) TV - Marine water (95%)	4000	µg/L	Unknown level of species protection; Unknown Reliability
Dicofol	water	ANZG (2018) TV - Marine water (95%)	0.1	µg/L	Unknown level of species protection; Unknown Reliability
Dieldrin	water	ANZG (2018) TV - Marine water (95%)	0.01	µg/L	Unknown level of species protection; Unknown Reliability
Dimethoate	water	ANZG (2018) TV - Marine water (95%)	0.15	µg/L	Unknown level of species protection; Unknown Reliability
Dimethylformamide	water	ANZG (2018) TV - Marine water (95%)	1000	µg/L	Unknown level of species protection; Unknown Reliability
Diphenylnitrosamine	water	ANZG (2018) TV - Marine water (95%)	6	µg/L	Unknown level of species protection; Unknown Reliability
Diquat	water	ANZG (2018) TV - Marine water (95%)	1.4	µg/L	Unknown level of species protection; Unknown Reliability
Diuron	water	ANZG (2018) TV - Marine water (95%)	1.8	µg/L	Unknown level of species protection; Unknown Reliability
Esfenvalerate	water	ANZG (2018) TV - Marine water (95%)	0.001	µg/L	Unknown level of species protection; Unknown Reliability
Ethanol	water	ANZG (2018) TV - Marine water (95%)	1400	µg/L	Unknown level of species protection; Unknown Reliability
Ethylbenzene	water	ANZG (2018) TV - Marine water (95%)	5	µg/L	Unknown level of species protection; Unknown Reliability
Ethylene glycol	water	ANZG (2018) TV - Marine water (95%)	50000	µg/L	Unknown level of species protection; Unknown Reliability
Fenitrothion	water	ANZG (2018) TV - Marine water (95%)	0.001	µg/L	Unknown level of species protection; Unknown Reliability
Fluoranthene	water	ANZG (2018) TV - Marine water (95%)	1	µg/L	Unknown level of species protection; Unknown Reliability
Heptachlor	water	ANZG (2018) TV - Marine water (95%)	0.0004	µg/L	Unknown level of species protection; Unknown Reliability
Hexachlorobenzene	water	ANZG (2018) TV - Marine water (95%)	0.05	µg/L	Unknown level of species protection; Unknown Reliability
Hexachlorocyclopentadiene	water	ANZG (2018) TV - Marine water (95%)	0.05	µg/L	Unknown level of species protection; Unknown Reliability
Hexachloroethane	water	ANZG (2018) TV - Marine water (95%)	290	µg/L	Unknown level of species protection; Unknown Reliability
Isophorone	water	ANZG (2018) TV - Marine water (95%)	130	µg/L	Unknown level of species protection; Unknown Reliability
Lindane	water	ANZG (2018) TV - Marine water (95%)	0.007	µg/L	Unknown level of species protection; Unknown Reliability
Malathion	water	ANZG (2018) TV - Marine water (95%)	0.05	µg/L	Unknown level of species protection; Unknown Reliability
Manganese	water	ANZG (2018) TV - Marine water (95%)	80	µg/L	Unknown level of species protection; Unknown Reliability
MCPA	water	ANZG (2018) TV - Marine water (95%)	1.4	µg/L	Unknown level of species protection; Unknown Reliability
Methomyl	water	ANZG (2018) TV - Marine water (95%)	3.5	µg/L	Unknown level of species protection; Unknown Reliability
Methoxychlor	water	ANZG (2018) TV - Marine water (95%)	0.004	µg/L	Unknown level of species protection; Unknown Reliability
Mirex	water	ANZG (2018) TV - Marine water (95%)	0.04	µg/L	Unknown level of species protection; Unknown Reliability
Molinate	water	ANZG (2018) TV - Marine water (95%)	3.4	µg/L	Unknown level of species protection; Unknown Reliability
Monochlorobenzene	water	ANZG (2018) TV - Marine water (95%)	55	µg/L	Unknown level of species protection; Unknown Reliability
m-Xylene	water	ANZG (2018) TV - Marine water (95%)	75	µg/L	Unknown level of species protection; Unknown Reliability
Nitrobenzene	water	ANZG (2018) TV - Marine water (95%)	550	µg/L	Unknown level of species protection; Unknown Reliability
o-Xylene	water	ANZG (2018) TV - Marine water (95%)	350	µg/L	Unknown level of species protection; Unknown Reliability
Paraquat	water	ANZG (2018) TV - Marine water (95%)	0.5	µg/L	Unknown level of species protection; Unknown Reliability
Parathion	water	ANZG (2018) TV - Marine water (95%)	0.004	µg/L	Unknown level of species protection; Unknown Reliability
Pentachlorobenzene	water	ANZG (2018) TV - Marine water (95%)	1.5	µg/L	Unknown level of species protection; Unknown Reliability
Pentachloroethane	water	ANZG (2018) TV - Marine water (95%)	80	µg/L	Unknown level of species protection; Unknown Reliability
Phenanthrene	water	ANZG (2018) TV - Marine water (95%)	0.6	µg/L	Unknown level of species protection; Unknown Reliability
Profenofos	water	ANZG (2018) TV - Marine water (95%)	0.002	µg/L	Unknown level of species protection; Unknown Reliability
p-Xylene	water	ANZG (2018) TV - Marine water (95%)	200	µg/L	Unknown level of species protection; Unknown Reliability
Tebuthiuron	water	ANZG (2018) TV - Marine water (95%)	2.2	µg/L	Unknown level of species protection; Unknown Reliability
Thallium	water	ANZG (2018) TV - Marine water (95%)	17	µg/L	Unknown level of species protection; Unknown Reliability
Thiobencarb	water	ANZG (2018) TV - Marine water (95%)	2.8	µg/L	Unknown level of species protection; Unknown Reliability
Thiram	water	ANZG (2018) TV - Marine water (95%)	0.01	µg/L	Unknown level of species protection; Unknown Reliability
Toluene	water	ANZG (2018) TV - Marine water (95%)	180	µg/L	Unknown level of species protection; Unknown Reliability

ChemName	MatrixType	ActionLevelSource	ActionLevel	Units	Comments
Toxaphene	water	ANZG (2018) TV - Marine water (95%)	0.0006	µg/L	Unknown level of species protection; Unknown Reliability
Xylene (m & p)	water	ANZG (2018) TV - Marine water (95%)	275	µg/L	Unknown level of species protection; Unknown Reliability
1,1,2-Trichloroethane	water	ANZG (2018) TV - Marine water (95%)	1900	µg/L	Very Low Reliability
1,2,4-Trichlorobenzene	water	ANZG (2018) TV - Marine water (95%)	80	µg/L	Moderate Reliability
3,4-Dichloroaniline	water	ANZG (2018) TV - Marine water (95%)	150	µg/L	Low Reliability
Benzene	water	ANZG (2018) TV - Marine water (95%)	700	µg/L	Moderate Reliability
Chromium (CrIII)	water	ANZG (2018) TV - Marine water (95%)	27.4	µg/L	Low Reliability
Copper	water	ANZG (2018) TV - Marine water (95%)	1.3	µg/L	Very high Reliability
Cyanide	water	ANZG (2018) TV - Marine water (95%)	4	µg/L	Very Low Reliability
Pentachlorophenol	water	ANZG (2018) TV - Marine water (95%)	22	µg/L	
Poly(acrylonitrile-co-butadiene-co-styrene)	water	ANZG (2018) TV - Marine water (95%)	250	µg/L	Low Reliability
Temephos	water	ANZG (2018) TV - Marine water (95%)	0.05	µg/L	Moderate Reliability
Tributyltin (as µg Sn/L)	water	ANZG (2018) TV - Marine water (95%)	0.006	µg/L	High Reliability
Vanadium	water	ANZG (2018) TV - Marine water (95%)	100	µg/L	High Reliability
1,1-Dichloroethylene	water	ANZG (2018) TV - Marine water (95%)	700	µg/L	Unknown level of species protection; Unknown Reliability
1,2-Dichloropropane	water	ANZG (2018) TV - Marine water (95%)	900	µg/L	Unknown level of species protection; Unknown Reliability
1,2-Diphenylhydrazine	water	ANZG (2018) TV - Marine water (95%)	2	µg/L	Unknown level of species protection; Unknown Reliability
1,3,5-Trinitrobenzene	water	ANZG (2018) TV - Marine water (95%)	4	µg/L	Unknown level of species protection; Unknown Reliability
1,3-Dichlorobenzene	water	ANZG (2018) TV - Marine water (95%)	260	µg/L	Unknown level of species protection; Unknown Reliability
1,4-Dinitrobenzene	water	ANZG (2018) TV - Marine water (95%)	0.6	µg/L	Unknown level of species protection; Unknown Reliability
2,3-Dichlorophenol	water	ANZG (2018) TV - Marine water (95%)	31	µg/L	Unknown level of species protection; Unknown Reliability
2,4,5-T	water	ANZG (2018) TV - Marine water (95%)	36	µg/L	Unknown level of species protection; Unknown Reliability
2,4,6-Trichlorophenol	water	ANZG (2018) TV - Marine water (95%)	3	µg/L	Unknown level of species protection; Unknown Reliability
2,4,6-Trinitrotoluene	water	ANZG (2018) TV - Marine water (95%)	140	µg/L	Unknown level of species protection; Unknown Reliability
3-Chloropropene	water	ANZG (2018) TV - Marine water (95%)	3	µg/L	Unknown level of species protection; Unknown Reliability
3-Nitrotoluene	water	ANZG (2018) TV - Marine water (95%)	75	µg/L	Unknown level of species protection; Unknown Reliability
4-Chlorophenol	water	ANZG (2018) TV - Marine water (95%)	220	µg/L	Unknown level of species protection; Unknown Reliability

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Clyde Western Area Remediation Project – Stage 2 Remediation Environmental Management Plan

Waste Management Plan

<table>
<tr><td colspan="6">Waste Management</td></tr>
<tr><td rowspan="2">Document Control</td><td>Revision</td><td>Date</td><td>Description</td><td>Author</td><td>Approved</td></tr>
<tr><td>4.0</td><td>21/07/2021</td><td>Final for consultation</td><td>AECOM</td><td>WM</td></tr>
<tr><td>Background</td><td colspan="5">The Conditions of Consent for SSD 9302 require a Waste Management Plan (WMP) to be produced as a subplan to the Remediation Environmental Management Plan (REMP) for the Clyde Western Area Remediation Project (the Project). This document provides the WMP subplan for Stage 2 of the Project. This WMP applies to the remediation phase for Stage 2, including preparation works, remediation works and demobilisation.</td></tr>
<tr><td>Objectives</td><td colspan="5">• Identify potential sources of solid and liquid waste generated and minimise and manage potential waste throughout the Stage 2 remediation phase
• Ensure compliance with relevant legislative and other requirements including the Development Consent (DC) (SSD 9302) conditions, mitigation and management measures (MMM) in Appendix 2 of the DC; and the Environment Protection Licence (EPL) 570.</td></tr>
<tr><td>Performance Criteria</td><td colspan="5">• Waste generated from remediation works will be managed appropriately and where possible recycled or reused.
• The amount of waste generated by the remediation works that requires off-site disposal will be minimised.
• A Waste Tracking System will be established, implemented and audited during the remediation phase.
• Compliant waste classification and segregation during the remediation phase.</td></tr>
<tr><td>Key Performance Indicators</td><td colspan="5">• No non-compliances related to waste during remediation phase
• Signage and labelling of waste storage containers and areas observed – evidenced in audits and inspections
• No non-compliances with Waste Tracking System.</td></tr>
<tr><td rowspan="4">Legislative Requirements</td><td colspan="5">Development Consent (SSD 9302) Conditions [Dated 7 May 2020]</td></tr>
<tr><td colspan="2">LIMITS OF CONSENT
Waste</td><td colspan="3">A6. The Applicant must not receive more than 5,000 cubic metres (m^3) of contaminated material from off-site for remediation on-site, unless otherwise agreed with the Planning Secretary.</td></tr>
<tr><td colspan="2">WASTE
Statutory Requirements</td><td colspan="3">B28. The Applicant must assess and classify all liquid and non-liquid wastes to be taken off the Western Area in accordance with the latest version of EPA's Waste Classification Guidelines Part 1: Classifying Waste (EPA, 2014) and dispose of the wastes to a facility that may lawfully accept the wastes
B29. The Applicant must ensure any waste material imported to the Western Area for remediation, is in accordance with the requirements of a Resource Recovery Order and Exemption issued under the Protection of the Environment Operations (Waste) Regulation 2014.
B30. The Applicant must identify, separate and dispose of asbestos from the Western Area in accordance with the requirements of SafeWork NSW, the Work Health and Safety Regulation 2017 and relevant guidelines.</td></tr>
<tr><td colspan="2">WASTE
Waste Management Plan</td><td colspan="3">B31. Prior to the commencement of remediation works, the Applicant must prepare a Waste Management Plan for the development to the satisfaction of the Planning Secretary. The Plan must form part of the REMP in accordance with condition C2 and must:
a) detail the quantities of each waste type generated during remediation and the proposed reuse, recycling and disposal locations
b) describe the handling, processing, treatment, storage and disposal of all waste streams, consistent with the POEO Act, Protection of the Environment Operations (Waste) Regulation 2014 and the EPA's Waste Classification Guidelines</td></tr>
</table>

Waste Management		
		c) detail tracking procedures for all excavated and backfill material, providing sufficient documentation to allow the Site Auditor to independently verify compliance with this requirement. B32. The Applicant must: a) not commence remediation works until the Waste Management Plan is approved by the Planning Secretary b) implement the most recent version of the Waste Management Plan approved by the Planning Secretary.
	Environment Protection Licence EPL 570 [25 February 2021]	
	L5 WASTE	L5.1: The licensee must not cause, permit or allow any waste generated outside the premises to be received at the premises for storage, treatment, processing, reprocessing or disposal or any waste generated at the premises to be disposed of at the premises, except as expressly permitted by the licence. L5.2: This condition only applies to the storage, treatment, processing, reprocessing or disposal of waste at the premises if it requires an environment protection licence. L5.3: Except as provided by any other condition of this licence, only the Hazardous and/or Liquid and/or Restricted Solid waste listed below may be generated and/or stored at the premises. a) A100 Waste resulting from surface treatment of metals and plastics b) B100 Acidic solutions or acids in solid form c) C100 Basic solutions or bases in solid form d) D120 Mercury; mercury compounds e) D140 Chromium compounds (hexavalent and trivalent) f) D210 Nickel compounds g) D220 Lead; lead compounds h) D270 Vanadium compounds i) D330 Inorganic sulfides j) D360 Phosphorus compounds excluding mineral phosphates k) F100 Waste from the production, formulation and use of inks, dyes, pigments, paints, lacquers and varnish l) G110 Organic solvents excluding halogenated solvents m) J100 Waste mineral oils unfit for their original intended use n) J120 Waste oil/water, hydrocarbons/water mixtures or emulsions o) J160 Waste tarry residues arising from refining, distillation, and any pyrolytic treatment p) M100 Waste substances and articles containing or contaminated with polychlorinated biphenyls (PCB's), polychlorinated napthalenes (PCN's), polyterphenyls (PCT's) and/or polybrominated biphenyls (PBB's) q) M150 Phenols, phenol compounds including chlorophenols

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		r) M250 Surface active agents (surfactants), containing principally organic constituents and which may contain metals and inorganic materials s) M260 Highly odorous organic chemicals (including mercaptans and acrylates) t) N100 Containers and drums which are contaminated with residues of substances referred to in this list u) N120 Soils contaminated with a waste v) N140 Fire debris and fire wash waters w) N160 Encapsulated, chemically-fixed, solidified or polymerised wastes x) N190 Filter cake y) N230 Ceramic-based fibres with physicochemical characteristics similar to those of asbestos z) R100 Clinical and related wastes aa) T190 (or N205) Residues from industrial waste treatment/disposal operations bb) Z100 Organic compounds (i.e. aliphatic nitrogen compounds) cc) Z110 Inorganic compounds. L5.7: Except as provided by any other condition of this licence, only the Hazardous and/or Liquid and/or Restricted Solid wastes listed below may be treated, processed, reprocessed or disposed of at the premises. a) A100 Waste resulting from the surface treatment of metals and plastics b) C100 Basic solutions or bases in solid form c) J120 Waste oil/water, hydrocarbons/water mixtures or emulsions d) M260 Highly odorous organic chemicals (including mercaptans and acrylates) e) N120 Soils contaminated with a controlled waste f) N160 Encapsulated, chemically-fixed, solidified or polymerised wastes g) T190 Residues from industrial waste treatment/disposal operations. L5.10: After onsite treatment to reduce hydrocarbon contamination of soil or sediment to less than 1% on a weight basis, such treated waste may be disposed of onsite in the area marked "Treatment Material Onsite Disposal Site (TPH < 1%) as shown on drawing labelled 'Environmental Protection Licence No.570 Licenced Discharge Points' - CLR_0126667_0004 Rev1 (EPA ref. DOC21/70815-1), or offsite to a facility that can lawfully accept that waste. L5.11: The licensee must comply with the conditions as specified in this licence or where no specific conditions are outlined in this licence, the licensee must comply with the Protection of the Environment Operations (Waste) Regulation 2014. L5.12 The licensee must ensure that only Virgin Excavated Natural Material, Excavated Natural Material or other material approved in writing by the EPA is brought onto the Western Area of the premises.

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	4 Operating Conditions O1 Activities must be carried out in a competent manner	O1.1 Licensed activities must be carried out in a competent manner. This includes: a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.
	O4 PROCESSES AND MANAGEMENT	O4.1: The licensee must ensure that any liquid and/or non-liquid waste at its premise that is generated, stored, processed, reprocessed or disposed, or any combination of those activities, is assessed and classified in accordance with the EPA Waste Classification Guidelines as in force from time to time. O4.2: Oily sludge and/or soil contaminated with hydrocarbon may be treated in the landfarm area or the sludge dewatering facility as defined by the shaded area labelled "Landfarm" and "Sludge dewatering facility" on drawing 'Environmental Protection Licence No.570 Licenced Discharge Points' - CLR_0126667_0004 Rev 1 (EPA ref. DOC21/70815-1). O4.3: Treated soil contamination with hydrocarbons and/or oily sludge may be disposed of in the disposal area as defined by the shaded area labelled "Treated Material Onsite Disposal Site (TPH < 1%) on drawing 'Environmental Protection Licence No.570 Licenced Discharge Points' - CLR_0126667_0004 Rev 1 (EPA ref. DOC21/70815-1), or disposed of offsite to a facility that can lawfully accept that waste.. O4.4: The licensee must store all chemicals, fuels and oils used for the development in appropriately bunded areas in accordance with the requirements of all relevant Australian Standards, and/or EPA's *Storing and Handling of Liquids: Environmental Protection – Participants Manual* (Department of Environment and Climate Change, 2007).
	O5 WASTE MANAGEMENT	O5.1: The licensee must ensure that waste identified for recycling is stored separately from other waste. O5.2: All above ground tanks containing material that is likely to cause environmental harm must be bunded or have an alternative spill containment system in place. O5.3 The licensee must ensure that suitable measures (e.g. high/low alarms, control valves with interlock control, one-way valves) are installed on all tanks, ponds or clarifiers and associated pipes and hoses to prevent the spillage of waste.
	5 Monitoring and Recording Conditions M1 Monitoring records	M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition. M1.2 All records required to be kept by this licence must be: a) in a legible form, or in a form that can readily be reduced to a legible form b) kept for at least 4 years after the monitoring or event to which they relate took place c) produced in a legible form to any authorised officer of the EPA who asks to see them. M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence: a) the date(s) on which the sample was taken b) the time(s) at which the sample was collected c) the point at which the sample was taken

Waste Management		
		d) the name of the person who collected the sample.
Activities	The remediation phase activities which are likely to generate waste and the classification of that waste include: • Preparation works: – General solid waste (putrescible and non-putrescible) – Liquid. • Removal of redundant infrastructure and waste: – Restricted and/or hazardous solid waste – General solid waste (putrescible and non-putrescible) – Special waste – Liquid waste. • Remediation, including landforming: – Hazardous or restricted waste (non-putrescible) – Liquid waste – General solid waste (putrescible and non-putrescible). • Completion works and demobilisation: – General solid waste (putrescible and non-putrescible).	
Predicted Impacts discussed in the EIS and RtS	If not managed responsibly, waste generated by the remediation works has the potential to cause the following impacts: • Land and water (surface water and groundwater) pollution to sensitive environments in the vicinity of the Western Area resulting in human health and environmental impacts; • Land and water (surface water and groundwater) pollution to sensitive environments during transportation resulting in human health and environmental impacts; and • Inefficient use of resources.	
Detailed Remedial Action Plan for Stage 2	Viva Energy are proposing to stage the remediation of the Western Area as follows: • Stage 1 – Former Process West • Stage 2 – Former Utilities and Movements • Stage 3 – Former Process East. A Detailed Remedial Action Plan (RAP) has been prepared for Stage 2. This section outlines the approach to the remediation for the Stage 2 Area (Former Utilities and Movements) as it applies to waste management considerations. **Remediation Methodology for Stage 2** • The proposed remediation methodologies as stated in the Stage 2 RAP are as follows: - Excavation and off-site disposal of soils (asbestos removal); - Excavation for on-site bioremediation (biopiling); and	

Waste Management	
	- Excavation and on-site management (engineered capping). • These remedial technologies were selected for use in combination to address the source areas in the soil and to manage potential human health risks. A validation approach for assessment of excavations and beneficial re-use of material has been presented in the Stage 2 Detailed RAP. • Given the current assessment that hydrocarbon concentrations in groundwater are stable to decreasing, it is expected that the remediation works proposed will enhance the current natural attenuation processes to reduce residual groundwater impacts over time. • A detailed remediation works overview is provided in Section 9 of the Stage 2 Detailed RAP. **Excavation and off-site disposal of soils (asbestos removal)** • Asbestos identified in soils within AEC-1 and AEC-3B will be excavated and disposed off-site in line with the approach presented in the Stage 2 Detailed RAP. Various controls are to be implemented to manage potential risks. These controls would be detailed in the asbestos management plan required under Mitigation and Management Measure SWMP3 (refer to the Soil and Water Management Plan); • Excavation works in these areas would involve: - Careful excavation of impacted materials using appropriate equipment (e.g. excavators /backhoes), from the AEC-1 and AEC-3B areas. Works will be conducted in accordance with the approved management plans with particular emphasis on dust mitigation; - A validation consultant shall observe the excavation and excavated materials for indicators of unexpected finds including visual (staining, discolouration) and olfactory (odours). If indicators of potential contamination that are inconsistent with identified Asbestos Containing Materials (ACM) impacts are observed, the Unexpected Finds Protocol (UFP) detailed within Appendix C of the Stage 2 Detailed RAP will be implemented; - Where practicable, to reduce the area of disturbed material, the number of areas subject to excavation works at any one time will be minimised and materials will be excavated and placed in temporary covered stockpiles (to eliminate dust/airborne particles) or placed directly into a truck for transport to an approved / suitably licensed off-site disposal location.; • As offsite disposal of excavated ACM containing soils is required, these soils will be placed within a temporary stockpile in the vicinity of the excavation area for additional assessment and waste classification purposes or classified in-situ based on existing data. Where classification of materials is required to be undertaken prior to disposal, samples will be collected either in-situ or from stockpiled materials to determine the requirements for off-site disposal. Sampling densities and stockpile validation processes are documented in the Stage 2 Detailed RAP in accordance with the NSW EPA Waste Classification Guidelines (NSW EPA, 2014); and • Where waste materials are not temporarily stockpiled on hardstand, following removal of stockpiled impacted materials, the footprint of the stockpile location may require validation to verify no cross contamination. The results of collected waste classification and stockpile footprint validation samples are to be collated and provided for inclusion into the final site validation report. **Excavation for on-site bioremediation (biopiling)** • Biopiles are constructed via placement of soil in 1 m layers with solid and perforated pipe being laid prior to the next layer being placed. The solid pipe will extend into the stockpile where it is attached to the perforated pipe and is adjoined to a piping manifold. The piping is connected to a Soil Vapour Extraction (SVE) system which extracts air (and soil vapour) from the stockpile (via a powered blower unit) into an air/water separator with 'drop out' tank for removal of moisture. The 'drop out' tank will be pumped (as required) to a holding tank prior to disposal off-site. • The SVE system will be attached to vessels of granular activated carbon filter media, to treat contaminated air and remove odours prior to emission via an exhaust stack. A 'lead' and 'lag' vessel will be installed in a continuous circuit such that if breakthrough of contaminants occur through the lead vessel, it is captured via the lag vessel prior to emission.

Waste Management	
	• Biopiles will be covered with an impermeable cover to contain potential air emissions and odours from the stockpile, to prevent creation of leachate via rainfall, and to retain soil moisture and temperature to encourage biodegradation. • Following completion of biopiling the treated material will be validated and re-used within the Western Area during future stages of remediation or disposed off-site to a suitably licensed receiving facility if unable to be treated to the re-use criteria outlined in the Stage 2 Detailed RAP. **Excavation and on-site management (engineered capping)** • The engineered cap will be constructed via excavations of soil up to 0.5 metres deep along the AEC-4 footprint to remove the existing asphalt hardstand. The existing asphalt hardstand that would be removed is currently in variable condition with unsealed sides and visible cracking throughout. Once excavated, this will be disposed off-site disposal or recycled. • After the existing hardstand has been removed, re-work and re-grading of the soil, as well as waste classification sampling of soil material, will be completed in order to achieve the desired landform. • After the desired landform has been achieved, a capping layer will be placed in the AEC-4 footprint. This capping layer will manage direct contact with impacted soils. The AEC-4 area will be covered with appropriate backfill material before the placement of a hardstand covering. The final relative levels of the cap will be confirmed within the Detailed Cap Design produced by the remediation contractor.
Management Approach	**Waste Management Overview** The waste management hierarchy has been used to help identify mitigation and management measures for waste generated and managed during the Project. The waste management hierarchy is a framework for prioritising waste management practices to achieve the best environmental outcome. The preferred order of adoption is as follows: 1. Avoid by identifying appropriate materials and procuring. 2. Reduce waste by optimising remediation and operation methods. 3. Reuse waste by identifying sources that can utilise the waste. 4. Recycle waste by identifying facilities that are able to recycle waste. 5. Recovery of waste materials. 6. Disposal of waste at an appropriate facility. The underlying objective of effective waste management is to minimise the impacts on the environmental and social values and to implement sustainability principles. To deliver effective waste management across the Project, a number of strategies will be adopted in accordance with the waste hierarchy. The Project aims to avoid waste by reducing the amount of waste generated and avoiding unnecessary consumption. The Project reduces the amount of waste generated by remediating the soils from the Western Area which may otherwise have been disposed of at landfill. **Resource Reuse/Recycling/Recovery** • It is intended that waste generated from the Project will be managed appropriately and where possible, recycled and/or reused. The Project aims to minimise the volume of waste generated by the Project requiring off-site treatment and/or disposal. **Waste Disposal** • The disposal of waste materials will be considered where other options are not feasible. Viva Energy would employ licensed waste management companies to manage the identified waste streams arising from the Project that require disposal.

Waste Management	
	• If off-site disposal of excavated materials is required, this will be undertaken in accordance with the NSW EPA (2014) Waste Classification Guidelines: Part 1: Classifying Waste ('the waste classification criteria'). • Ex-situ sampling of stockpiled material will be undertaken where in-situ datasets are unavailable or insufficient for waste classification purposes. **Waste Monitoring and Auditing** • Infrastructure and waste materials removed during the Project will be tracked in line with material tracking measures outlined in this and subsequent WMPs and the Detailed RAPs. Documentation (such as receipts) for the transport and disposal of waste and recycling materials from the Western Area will be retained. • A Material Tracking Register will be maintained by the Validation Consultant on-site which will provide information regarding the source, characteristics, destination and quantities of material placed within containment locations, disposed off-site or imported to the Stage 2 Area for backfilling purposes. • The contractor's nominated site representative will collate all the required materials tracking information for material imported to site and material taken off-site as waste to the Validation Consultant for incorporation into subsequent validation reporting. **Licence and Approval Requirements** • The transport of wastes will be undertaken by appropriately licenced contractors and disposed to appropriately licenced facilities.

Waste Management Plan - Mitigation and Management Measures					
Reference	Source Reference	Aspect	Mitigation and Management Measure	Responsibility	Timing
WMP1	DC: A6, B28-B32 EPL 570: L5, O4, O5 MMM: W1-W5	Waste management	The Project will be delivered to meet the objectives, performance criteria and key performance indicators outlined in this plan. Compliance with the objectives, performance criteria, key performance indicators and the mitigation and management measures will be demonstrated.	Remediation Contractor	At all times
WMP2	DC: A6	Waste management	No more than 5,000 cubic metres (m^3) of contaminated material from off-site for remediation on-site will be received, unless otherwise agreed with the Planning Secretary.	Remediation Contractor	At all times
WMP3	EPL 570: L5.1 to L5.7 and L5.12	Waste management for waste from outside the Site	Only Virgin Excavated Natural Material, Excavated Natural Material or other material approved in writing by the EPA will be brought onto the Western Area. Waste generated outside the Site shall not be received at the Western Area for storage, treatment, processing, reprocessing, or disposal, except as expressly permitted by WMP2 and WMP4 or a licence under the POEO Act, if such a licence is required in relation to that waste.	Western Area Remediation Project Manager	At all times
WMP4	DC: B29	Importation of waste	Any waste material imported to the Western Area for remediation, will be imported in accordance with the requirements of a Resource Recovery Order and Exemption issued under the *Protection of the Environment Operations (Waste) Regulation 2014*.	Western Area Remediation Project Manager	At all times
WMP5	DC: B28 EPL 570: O4.1 MMM: W3	Waste management	All liquid and non-liquid wastes generated during remediation will be assessed, classified and managed in accordance with the EPA's *Waste Classification Guidelines Part 1: Classifying Waste, November 2014,* or its latest version and disposed of to a facility that may lawfully accept the waste.	Remediation Contractor	At all times
WMP6	EPL 570: L5.7	Waste management of Scheduled chemical waste and PCBs	All materials and waste containing Scheduled Chemical Waste and polychlorinated biphenyls will be managed in accordance with the applicable Chemical Control Order or in accordance with a licence under the Environmentally Hazardous Chemicals Act 1985.	Remediation Contractor	At all times
WMP7	DC: B30	Asbestos management	Asbestos will be identified, separated and disposed from the Western Area in accordance with the requirements of SafeWork NSW, the *Work Health and Safety Regulation 2017* and relevant guidelines.	Remediation Contractor	As required
WMP8	MMM: W1	Waste segregation	Waste generated within the Western Area will be segregated at source and suitably stored in designated waste management areas within the Project Area. These waste management areas will be detailed within the Detailed RAPs (refer to Figure B.4-1).	Remediation Contractor	At all times

Waste Management Plan - Mitigation and Management Measures					
Reference	Source Reference	Aspect	Mitigation and Management Measure	Responsibility	Timing
WMP9	MMM: W2 EPL 570: O5.1	Waste stockpiling	Stockpiled wastes will be: • Appropriately segregated to avoid mixing and contamination; • Appropriately labelled; • Appropriately stored to minimise risk of erosion; • Less than 5 m in height; and • Located more than 40 m away from sensitive receivers or ecological areas.	Remediation Contractor	At all times
WMP10	MMM: W4	Contaminated soil	All contaminated soil (as defined by Waste Classification Guidelines) received into the Western Area will comply with the SAQP criteria defined as part of the Detailed RAPs)	Remediation Contractor	At all times
WMP11	EPL 570: O4.2	Contaminated soil	Oily sludge and/or soil contaminated with hydrocarbon will be treated in the landfarm area or the sludge dewatering facility as defined by the shaded area labelled "Landfarm" and "Sludge dewatering facility" on drawing number CLR_0126667_0004 Revision H, 24/7/2019 titled "Clyde Terminal E.P.L. Licensed Discharge Points".	Remediation Contractor	As required
WMP12	EPL 570: O4.3	Contaminated soil	Treated soil contaminated with hydrocarbons and/or oily sludge will be disposed of in the disposal area as defined by the shaded area labelled "Treated Material Onsite Disposal Site (TPH < 1%) on drawing number CLR_0126667_0004 Revision H, 24/7/2019 titled "Clyde Terminal E.P.L. No. 570 Licensed Discharge Points or disposed of offsite to a facility that can lawfully accept that waste.	Remediation Contractor	As required
WMP13	MMM: HR2	Hazardous substances	The transport, storage and handling of hazardous substances, including wastes, will be undertaken in accordance with: • Work Health and Safety Act 2011 (NSW); • Protection of the Environment Operations (Waste) Regulation 2005 (NSW); • Dangerous Goods (Road and Rail Transport) Act 2008 (NSW); • Dangerous Goods Regulation (Road and Rail Transport) Regulation 2014 (NSW); • Australian Code for the Transport of Dangerous Goods by Road and Rail (National Transport Commission, 2018); • relevant Australian Standards; • the thresholds outlined in Applying SEPP 33 guidelines; and • the relevant Material Safety Data Sheets.	Remediation Contractor	At all times

Waste Management Plan - Mitigation and Management Measures					
Reference	Source Reference	Aspect	Mitigation and Management Measure	Responsibility	Timing
WMP14	DC: B31 MMM: W1	Waste Management Method Statement	The Remediation Contractor will prepare a Waste Management Method Statement (WMMS) for each stage of the Project that supports this WMP and demonstrates how measures WMP1 to WMP15 above will be achieved. The WMMS will: • identify requirements consistent with the waste and resource hierarchy and cleaner production initiatives; • include relevant measures from the revised National Waste Policy: Less Waste, More Resources (EPHC, 2009); • ensure resource efficiency is delivered through the design, remediation and operational practices, including identify options for reuse of excavated soil, concrete and drainage pipes were appropriate; The WMMS will also: • detail the quantities of each waste type generated during each stage of the Project and the proposed reuse, recycling and disposal locations of each waste type; • provide consistent clear direction on waste and resource handling, storage, stockpiling, use and reuse management measures; • describe the handling, storage and disposal of all waste streams, consistent with the POEO Act, Protection of the Environment Operations (Waste) Regulation 2014 and the EPA's Waste Classification Guidelines; • set out processes for disposal, including on-site transfer, management and the necessary associated approvals; and • detail tracking procedures for: o all excavated and backfill material, providing sufficient documentation to allow the Site Auditor to independently verify compliance with this requirement. o all other waste and recyclables generated from the Project and removed from the Project Area. • outline an unexpected finds protocol to manage the potential for unexpected finds during the remediation of the soils (i.e., asbestos or other hazardous materials, excluding hydrocarbon contamination).	Remediation Contractor	Two weeks prior to commencement of preparation works

Waste Management - Monitoring Requirements			
Aspect	Description	Responsibility	Frequency
Remediation works waste	Waste tracking system will be implemented in accordance with NSW EPA requirements. Documentation (such as receipts) for the transport and disposal of waste and recycling materials from the Western Area. Material tracking records will include types, volumes and management measures for waste and resource arising from/used for the Project.	Remediation Contractor and Viva Energy	At all times
Remediation works waste	Waste tracking system will be audited to confirm system is being implemented in accordance with NSW EPA requirements	Project Environment Lead	6-monthly
Asbestos register	Maintain an asbestos register for all asbestos waste generated during remediation activities	Remediation Contractor	At all times
Imported fill	Imported fill material will be stockpiled and tracked separately to the on-site materials and tested/validated to confirm the fill meets the criteria to be reused on the Project Area	Remediation Contractor	As required
General	Ad hoc visual observations to ensure compliance with waste management requirements	Remediation Contractor	At all times
General	Quarterly audits against the requirements of this WMP and any active WMMS	Remediation Contractor and Viva Energy	Quarterly

Waste Management – Reporting Requirements			
Aspect	Description	Responsibility	Frequency
Material tracking	A Material Tracking Register will be maintained by the validation consultant on-Site which will provide information regarding the source, characteristics, destination and quantities of material placed within containment locations, disposed off-Site or imported to the Stage 2 Area for backfilling purposes. The contractor's nominated site representative will collate all the required materials tracking information for material imported to site and material taken off-site as waste to the Validation Consultant for incorporation into subsequent validation reporting.	Remediation Contractor and Validation Consultant	As required
KPI and compliance reporting	Reporting of key performance indicator(s) and compliance quarterly, including a summary of any visual observations and audits undertaken in the period.	Remediation Contractor	Quarterly
Complaints	Register of complaints will be maintained and updated.	Viva Energy	As required

Waste Management - Corrective Action			
Aspect	Description	Responsibility	Frequency
Non-compliance with DC or MMM	An investigation and as required, corrective action and update to the WMP, will be undertaken in line with Section 4.6 and 6.4 of the REMP, should any of the following occur: • Non-compliance raised; • Complaints from the local community; • Waste transported offsite without waste tracking; • Waste transported to an inappropriate facility; • Inappropriate handling, storage, transport of hazardous substances.	Project Environment Lead	Ongoing, as required

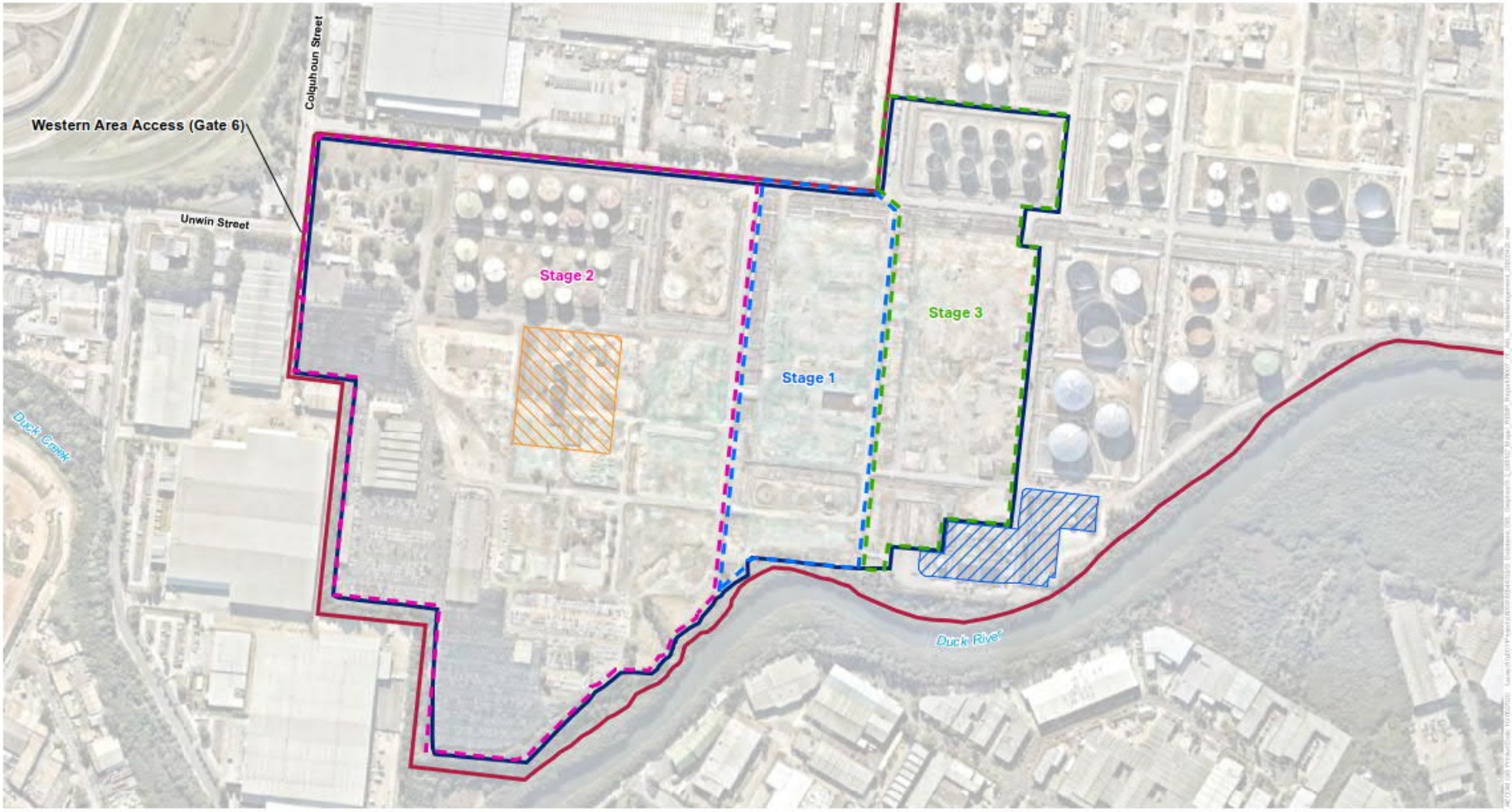

FIGURE B.4-1: WASTE MANAGEMENT AREA

KEY

- Site boundary
- Western Area boundary
- Stage 1 Area boundary
- Stage 2 Area boundary
- Stage 3 Area boundary
- Wastewater Treatment Plant (WWTP)
- Waste proccessing area

Note: Project Area boundary along the southern border is indicative only and will be refined during detailed design to exclude the tree management zone.

AECOM

0 50 100 200 m

Figure B.4-1. Project-wide Waste Management Area

Traffic Management Plan

<table>
<tr><td colspan="6">Traffic Management</td></tr>
<tr><td rowspan="2">Document Control</td><td>Revision</td><td>Date</td><td>Description</td><td>Author</td><td>Approved</td></tr>
<tr><td>4.0</td><td>21/07/2021</td><td>Final for consultation</td><td>AECOM</td><td>WM</td></tr>
<tr><td>Background</td><td colspan="5">The Conditions of Consent for SSD 9302 require a Traffic Management Plan (TMP) to be produced as a subplan to the Remediation Environmental Management Plan (REMP) for the Clyde Western Area Remediation Project (the Project). This document provides the TMP subplan for Stage 2 of the Project. This TMP applies to the remediation phase for Stage 2, including preparation works, remediation works and demobilisation.</td></tr>
<tr><td>Objectives</td><td colspan="5">• Minimise and manage traffic impacts to potentially affected receivers throughout the Stage 2 remediation phase of the Project
• Ensure compliance with relevant legislative and other requirements including the Development Consent (DC) (SSD 9302) conditions and mitigation measures in in Appendix 2 of the DC conditions.</td></tr>
<tr><td>Performance Criteria</td><td colspan="5">• Minimise the impact of the remediation phase traffic on the local and regional road network.
• Minimise conflicts with other road users.</td></tr>
<tr><td>Key Performance Indicators</td><td colspan="5">• No traffic related issues raised by the community and stakeholders during the remediation phase.
• No project-related trucks parked or queuing on the local roads surrounding the Western Area.
• No damage to public infrastructure including roads during the execution of the remediation.</td></tr>
<tr><td rowspan="4">Legislative Requirements</td><td colspan="5">Development Consent (SSD 9302) Conditions of Consent [Dated 7 May 2020]</td></tr>
<tr><td>PROTECTION OF PUBLIC INFRASTRUCTURE</td><td colspan="4">A12. Before the commencement of preparation works, the Applicant must:
(a) consult with the relevant owner and provider of services that are likely to be affected by the development to make suitable arrangements for access to, diversion, protection and support of the affected infrastructure;
(b) prepare a dilapidation report identifying the condition of all public infrastructure in the vicinity of the development (including roads, gutters and footpaths); and
(c) submit a copy of the dilapidation report to the Planning Secretary and Council.</td></tr>
<tr><td></td><td colspan="4">A13. Unless the Applicant and the applicable authority agree otherwise, the Applicant must:
(a) repair, or pay the full costs associated with repairing, any public infrastructure that is damaged by carrying out the development; and
(b) relocate, or pay the full costs associated with relocating, any public infrastructure that needs to be relocated as a result of the development</td></tr>
<tr><td>TRAFFIC
Traffic Management Plan</td><td colspan="4">B33. Prior to the commencement of the remediation, the Applicant must prepare a Traffic Management Plan for the development. The plan must form part of the REMP required by condition C2 and must:
(a) be prepared by a suitably qualified and experienced expert;
(b) be prepared in consultation with Council, TfNSW and RMS;
(c) detail the measures to be implemented to support road safety and network efficiency;
(d) detail heavy vehicle routes, access, parking, traffic control measures and hours of operation;
(e) include a schedule for avoiding peak traffic periods, including measures to minimise the cumulative traffic impacts of the development and Parramatta Light Rail and the Clyde Barging Project (if occurring at the same time as the development);
(f) include a Driver Code of Conduct to:
i. minimise impacts on the local and regional road network;</td></tr>
</table>

Traffic Management		
		ii. minimise conflicts with other road users; iii. ensure truck drivers use specified routes (g) include a program to monitor the effectiveness of these measures; and; (h) if necessary, detail procedures for notifying residents and the community, of any potential disruptions to routes.
	TRAFFIC Operating Conditions	B34. The Applicant must ensure: (a) development-related vehicles do not queue on the public road network; (b) provide sufficient parking facilities on the Western Area for heavy vehicles and site personnel, to ensure that traffic associated with the development does not utilise public and residential streets or public parking facilities; (c) all loading and unloading of materials is carried out on the Western Area; (d) all trucks entering or leaving the Western Area with loads have their loads covered and do not track dirt onto the public road network.
		B35. The Applicant must obtain relevant permits for the use of over-dimensional vehicles on the road network, in accordance with the *Heavy Vehicles National Law (NSW)* and Council's Oversize Vehicles Access Permit.
	Environment Protection Licence EPL 570 [25 February 2021]	
	4 OPERATING CONDITIONS O1 Activities must be carried out in a competent manner	O1.1 Licensed activities must be carried out in a competent manner. This includes: a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.
Activities	The majority of the project activities will be undertaken between the hours of 7:00 am and 6:00pm Monday to Friday and 8:00 am to 5:00 pm Saturdays. Project-related works that are inaudible to nearby sensitive receivers or required for other reasons stipulated within the DC may occur outside of these hours. Project activities will generate a maximum of 100 one-way heavy vehicle movements and 160 one-way private vehicle movements per day. This includes a maximum of 20 one-way heavy vehicle movements and 80 one-way private vehicle movements during the AM and PM peak hours. The project activities will be undertaken within the Western Area of the Site. The site access, parking location and routes for private, heavy and oversized vehicles are shown in **Figure B.5-1**. All project-related traffic will enter and exit the Western Area via Gate 6.	
Predicted Impacts discussed in the EIS and RtS	The Traffic Impact Assessment concluded that the Project would result in increases to light vehicle and heavy vehicle numbers during the remediation phase of the Project. This includes both heavy vehicles used for Project activities and light vehicles for the transport of the workforce to the Western Area. However, this increase in vehicles would not significantly impact the surrounding road network, and as such, the level of service for the impacted intersections is not predicted to change. There would be no need for additional parking allocations outside of the Site boundary, as existing car parking arrangements within the Western Area would be adequate to service the needs of the Project. In the unlikely event that the number of private vehicles exceeds the Western Area parking capacity, there would be sufficient room in the car park opposite the state office building at Gate 5 for these additional vehicles. It is expected that any such events would be highly unlikely, infrequent and of short duration.	

Traffic Management	
	The existing road network adequately caters for heavy vehicle access to the Western Area, with Class 2 GML 25/26 m B-doubles already permitted, under the Heavy Vehicle National Law (HVNL), to travel directly to the Western Area via two separate route options from the nearby arterial road network. Most of the expected plant, equipment and materials that would be either delivered or removed from the Western Area would be undertaken using vehicles permitted within the requirements of Class 2 under the NHVL. There is the possibility that a large piece of plant or equipment may need to be delivered (and subsequently removed) by a vehicle exceeding the existing permitted limit (e.g. a large excavator being carried by a prime-mover towing an oversize platform trailer). Due to the vehicle height restriction of 4.6 m where Wentworth Street travels under the M4 Western Motorway, over height vehicles exceeding 4.6 m would need to access the Project Area via Grand Avenue and obtain appropriate permits.
Detailed Remedial Action Plan for Stage 2	Viva Energy are proposing to stage the remediation of the Western Area as follows: • Stage 1 – Former Process West • Stage 2 – Former Utilities and Movements • Stage 3 – Former Process East. A Detailed Remedial Action Plan (RAP) has been prepared for Stage 2. This section outlines the approach to the remediation for the Stage 2 Area (Former Utilities and Movements) as it applies to traffic considerations. **Remediation Methodology for Stage 2** • The proposed remediation methodologies as stated in the Stage 2 RAP are as follows: - Excavation and off-site disposal of soils (asbestos removal); - Excavation for on-site bioremediation (biopiling); and - Excavation and on-site management (engineered capping). • These remedial technologies were selected for use in combination to address the source areas in the soil and to manage potential human health risks. A validation approach for assessment of excavations and beneficial re-use of material has been presented in the Stage 2 Detailed RAP. • Given the current assessment that hydrocarbon concentrations in groundwater are stable to decreasing, it is expected that the remediation works proposed will enhance the current natural attenuation processes to reduce residual groundwater impacts over time. • A detailed remediation works overview is provided in Section 9 of the Stage 2 Detailed RAP. **Excavation and off-site disposal of soils (asbestos removal)** • Asbestos identified in soils within AEC-1 and AEC-3B will be excavated and disposed off-site in line with the approach presented in the Stage 2 Detailed RAP. Various controls are to be implemented to manage potential risks. These controls would be detailed in the asbestos management plan required under Mitigation and Management Measure SWMP3 (refer to the Soil and Water Management Plan); • Excavation works in these areas would involve: - Careful excavation of impacted materials using appropriate equipment (e.g. excavators /backhoes), from the AEC-1 and AEC-3B areas. Works will be conducted in accordance with the approved management plans with particular emphasis on dust mitigation; - A validation consultant shall observe the excavation and excavated materials for indicators of unexpected finds including visual (staining, discolouration) and olfactory (odours). If indicators of potential contamination that are inconsistent with identified Asbestos Containing Materials (ACM) impacts are observed, the Unexpected Finds Protocol (UFP) detailed within Appendix C of the Stage 2 Detailed RAP will be implemented; - Where practicable, to reduce the area of disturbed material, the number of areas subject to excavation works at any one time will be minimised and materials will be excavated and placed in temporary covered stockpiles (to eliminate dust/airborne particles) or placed directly into a truck for transport to an approved / suitably licensed off-site disposal location.; • As offsite disposal of excavated ACM containing soils is required, these soils will be placed within a temporary stockpile in the vicinity of the excavation area for additional assessment and waste classification purposes or classified in-situ based on existing data. Where classification of materials is required to be undertaken

Traffic Management	
	prior to disposal, samples will be collected either in-situ or from stockpiled materials to determine the requirements for off-site disposal. Sampling densities and stockpile validation processes are documented in the Stage 2 Detailed RAP in accordance with the NSW EPA Waste Classification Guidelines (NSW EPA, 2014); and • Where waste materials are not temporarily stockpiled on hardstand, following removal of stockpiled impacted materials, the footprint of the stockpile location may require validation to verify no cross contamination. The results of collected waste classification and stockpile footprint validation samples are to be collated and provided for inclusion into the final site validation report. **Excavation for on-site bioremediation (biopiling)** • Biopiles are constructed via placement of soil in 1 m layers with solid and perforated pipe being laid prior to the next layer being placed. The solid pipe will extend into the stockpile where it is attached to the perforated pipe and is adjoined to a piping manifold. The piping is connected to a Soil Vapour Extraction (SVE) system which extracts air (and soil vapour) from the stockpile (via a powered blower unit) into an air/water separator with 'drop out' tank for removal of moisture. The 'drop out' tank will be pumped (as required) to a holding tank prior to disposal off-site. • The SVE system will be attached to vessels of granular activated carbon filter media, to treat contaminated air and remove odours prior to emission via an exhaust stack. A 'lead' and 'lag' vessel will be installed in a continuous circuit such that if breakthrough of contaminants occur through the lead vessel, it is captured via the lag vessel prior to emission. • Biopiles will be covered with an impermeable cover to contain potential air emissions and odours from the stockpile, to prevent creation of leachate via rainfall, and to retain soil moisture and temperature to encourage biodegradation. • Following completion of biopiling the treated material will be validated and re-used within the Western Area during future stages of remediation or disposed off-site to a suitably licensed receiving facility if unable to be treated to the re-use criteria outlined in the Stage 2 Detailed RAP. **Excavation and on-site management (engineered capping)** • The engineered cap will be constructed via excavations of soil up to 0.5 metres deep along the AEC-4 footprint to remove the existing asphalt hardstand. The existing asphalt hardstand that would be removed is currently in variable condition with unsealed sides and visible cracking throughout. Once excavated, this will be disposed off-site disposal or recycled. • After the existing hardstand has been removed, re-work and re-grading of the soil, as well as waste classification sampling of soil material, will be completed in order to achieve the desired landform. • After the desired landform has been achieved, a capping layer will be placed in the AEC-4 footprint. This capping layer will manage direct contact with impacted soils. The AEC-4 area will be covered with appropriate backfill material before the placement of a hardstand covering. The final relative levels of the cap will be confirmed within the Detailed Cap Design produced by the remediation contractor.
Management Approach	**Traffic Management Overview** The approach to managing traffic generated by the Project and mitigate the impacts identified above includes: • encourage the workforce to utilise more sustainable transport modes e.g. car-pooling in private vehicles; • providing a dedicated parking area within the Stage 2 area; • obtaining required permits for vehicles with loads likely to exceed GML limits or those comprising non-standard dimensions; • outlining appropriate routes for private and heavy vehicles (including oversize or over-height vehicles), to access the Western Area; and • abiding by NSW road rules, including speed limits and legislative requirements for the transport of hazardous substances. **Licence and Approval Requirements** Vehicles with loads exceeding the General Mass Limits (GML) (as defined by the National Heavy Vehicle Regulator (NHVR)) or comprising non-standard dimensions that require to access the Western Area will obtain a permit, in accordance with the Heavy Vehicle National Law (NSW) and Council's Oversize Vehicle Access.

Traffic Management					
Traffic Management Plan - Mitigation and Management Measures					
Reference	Source Reference	Aspect	Mitigation and Management Measure	Responsibility	Timing
TMP1	DC: A12, A13, B33-B35 MMM: TT1-TT5	Traffic management	The Project will be delivered to meet the objectives, performance criteria and key performance indicators outlined in this plan. Compliance with the objectives, performance criteria, key performance indicators and the mitigation and management measures will be demonstrated.	Remediation Contractor	At all times
TMP2	DC: A12 & B33(g)	Dilapidation Report	A dilapidation report of the public infrastructure in the vicinity of the site (including roads, kerbs, footpaths, nature trip, street trees and furniture on Devon Street, Durham Street, Unwin Road, Kay Street, Wentworth Street) will be prepared and submitted to the Planning Secretary and Parramatta City Council.	Remediation Contractor	Prior to commencement of preparation works
TMP3	DC: A13	Public infrastructure	Any public infrastructure that is damaged resulting from the remediation phase of the Project will be repaired, or the full costs associated with repairing paid to the affected party.	Remediation Contractor	In the event of damage
TMP4	DC: B33(e) MMM: TT1 & CU1	Cumulative impacts with the Parramatta Light Rail and the Clyde Barging Projects	Liaison with the appropriate teams at the Parramatta Light Rail and the Clyde Barging Projects (if occurring at the same time as the development) to gain an understanding of project timing and traffic movements in order to avoid potential cumulative traffic impacts where possible.	Remediation Contractor	Prior to commencement of preparation works and throughout the remediation phase
TMP5	DC: B33(d)	Project Area access and routes	Access to the Project Area will be during the hours of work as described in the REMP. Gate 6 is the access point for the Project Area and is located on the corner of Colquhoun Street and Unwin Street. There are two options to access Gate 6 (see Figure B5.1): • from Wentworth Street, via Kay Street and Unwin Street (both local roads); or • from Grand Avenue is via Colquhoun Street or Durham Street, and Devon Street (all local roads). Heavy vehicles will access the Project Area as per the measure outlined in TMP5.	Remediation Contractor	Ongoing
TMP6	DC: B33(c), B33(d) & B33(e) MMM: TT1 & TT5	Peak periods travel routes	All heavy vehicles and private vehicles related to the Project will access / egress the Western Area via Wentworth Street during the network peak hours (7:00 am – 9:00 am and 4:00 pm – 6:00 pm). All drivers will be instructed to avoid the intersection of James Ruse Drive, Grand Avenue and Hassall Street during these peak hours, however this route is available for use during the off-peak hours. Site access is shown in **Figure B.5-1**.	Remediation Contractor	During peak traffic periods (7:00 am – 9:00 am and 4:00 pm – 6:00 pm)

Traffic Management					
TMP7	DC: B33(c), B33(d) & B33(e) MMM: TT1 & TT5	Oversized vehicle route	Oversized vehicles exceeding 4.6 m in height will not travel under the M4 Western Motorway using Wentworth Street. They will access the Western Area through the intersection of James Ruse Drive, Grand Avenue and Hassall Street as shown in **Figure B.5-1**. Oversized vehicles will be scheduled to arrive / depart the Western Area outside of the peak hours.	Remediation Contractor	At all times
TMP8	DC: B33(d) MMM: TT1	Speed management	A Western Area speed limit of 20 kph will be implemented.	Remediation Contractor	At all times
TMP9	DC: B33(d) & B33(b) MMM: TT1 & TT3	Parking	Staff will use parking provided within the Western Area as shown on **Figure B.5-1**. Public and residential streets or public parking facilities will not be used for project-related staff parking during remediation phase. The parking location will include provisions for authorised visitors to the Western Area and for emergency vehicles. Heavy vehicles will park within the Project Area and not along local streets.	Remediation Contractor	At all times
TMP10	DC: B33(c) & B33(f)	Driver Code of Conduct	The Remediation Contractor will develop a Driver Code of Conduct to: • minimise the impacts of the remediation phase on the local and regional road network; • minimise conflicts with other road users; and • educate heavy vehicle drivers to use specified routes.	Remediation Contractor	Prior to commencement of preparation works
TMP11	DC: B33(c) & B34(a)	Queueing	Project-related vehicles will not queue onto the public road network before entering the Western Area.	Remediation Contractor	At all times
TMP12	DC: B34(c)	Loading and unloading of materials	All loading and unloading of materials will be carried out on the Western Area.	Remediation Contractor	At all times
TMP13	DC: B34(d)	Load cover	All trucks entering or leaving the Western Area with loads will have their loads covered.	Remediation Contractor	At all times
TMP14	DC: B33(c) & B35 MMM: TT1 & TT4	Traffic management	Vehicles with loads exceeding the GML (as defined by the NHVR) or comprising non-standard dimensions that require to access the Project Area will obtain a permit, in accordance with the Heavy Vehicle National Law (NSW) and Council's Oversize Vehicle Access Permit.	Remediation Contractor	Prior to use of any such vehicle
TMP15	MMM: TT2	Sustainable transport	Workers will be encouraged to utilise more sustainable transport modes such as car-pooling in private vehicles.	Remediation Contractor	During worker induction

Traffic Management					
TMP16	MMM: HR2	Transport of hazardous substances	The transport of hazardous substances will be undertaken in accordance with: • *Work Health and Safety Act 2011 (NSW);* • *Protection of the Environment Operations (Waste) Regulation 2005 (NSW);* • *Dangerous Goods (Road and Rail Transport) Act 2008 (NSW);* • *Dangerous Goods Regulation (Road and Rail Transport) Regulation 2014 (NSW);* • *Australian Code for the Transport of Dangerous Goods by Road and Rail (National Transport Commission, 2018);* • Relevant Australian Standards • The thresholds outlined in Applying SEPP 33 guidelines; and • The relevant Material Safety Data Sheets.	Remediation Contractor	At all times
TMP17	MMM: TT1 DC: B33(e)	Traffic Management Method Statement	The Remediation Contractor will prepare a Traffic Management Method Statement (TMMS) for Stage 2 of the Project that supports this TMP and demonstrates how measures TMP1 to TMP16 above will be achieved. The TMS will: • confirm the maximum number of heavy and private vehicles expected to be generated for the preparation works, remediations works and demobilisation for each stage; • confirm the time periods that vehicles are expected to be travelling to and from the Project Area; • detail the process for ensuring operators have the relevant permits from the National Heavy Vehicle Regulator, if required; • detail the temporary measures that would be implemented to mitigate road safety and network efficiency impacts during the Project, such as work zone speed limits and traffic control; • include a notification process for notifying: – residents and the community, of any potential disruptions to routes. – potentially affected businesses along Project haulage routes, in the event of a potential traffic disruption related to the use of vehicles larger than Class 2 Gross Mass Limit 25/26 m B-Doubles; • detail vehicle management measures to manage vehicle movements within the Western Area to reduce the likelihood of conflicts between workers and private and heavy vehicles, including a speed limit of 20 km/h for all on-site vehicles; and • include a schedule for avoiding peak traffic periods, including measures to minimise the cumulative traffic impacts of the development and Parramatta Light Rail and the Clyde Barging Project (if occurring at the same time as the development).	Remediation Contractor	Two weeks prior to commencement of preparation works

Traffic - Monitoring Requirements			
Aspect	Description	Responsibility	Frequency
General	Ad hoc visual observations to ensure compliance with traffic management requirements	Remediation Contractor	At all times
General	Quarterly inspections against the requirements of this TMP and any active TMMS	Remediation Contractor and Viva Energy	Quarterly

Traffic – Reporting Requirements			
Aspect	Description	Responsibility	Frequency
KPI and compliance reporting	Reporting of key performance indicator(s) and compliance quarterly, including a summary of any visual observations and audits undertaken in the period.	Remediation Contractor	Quarterly
Complaints	Register of complaints will be maintained and updated.	Viva Energy	As required

Traffic - Corrective Action			
Aspect	Description	Responsibility	Frequency
Non-compliance with DC or MMM	An investigation and as required, corrective action and update to the TMP, will be undertaken in line with Section 4.6 and 6.4 of the REMP, should any of the following occur: • Non-compliance raised; • Incident involving vehicle collision; • Complaints from the local community; • Use of access points or routes different to those outlined in this TMP; • Parking outside of the designated areas (as outlined in this TMP or any TMSs); • Damage to public infrastructure; • Uncovered loads; and • Inappropriate transport of hazardous substances.	Project Environment Lead	Ongoing, as required

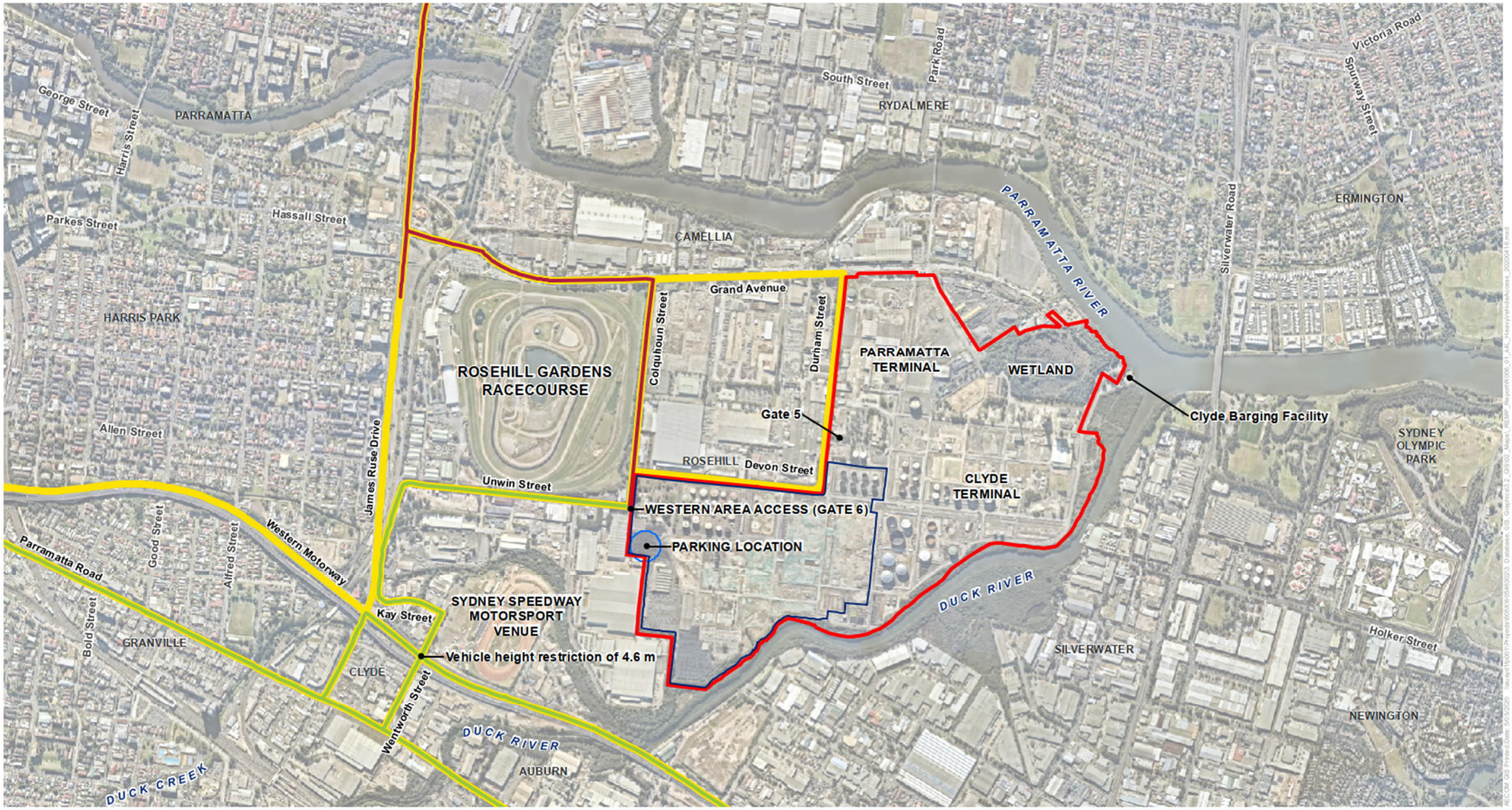

FIGURE B.5-1: HEAVY VEHICLE ACCESS ROUTE AND STAFF PARKING AREA

KEY

- Site boundary
- Project Area boundary
- Parking location
- Oversized vehicle access and off-peak access for all vehicles
- Peak and off-peak access for private and heavy vehicles
- Class 2 GML 25/26m B-Double route

AECOM

0 100 200 400 m

Figure B.5-1. Heavy Vehicle Access Route and Staff Parking Area

APPENDIX C LEGISLATION, STANDARDS, CODES AND REGULATIONS

This list is a guide only to documents applicable in the preparation and review of contractor management method statements or general Project relevant regulations and may not include all relevant documents. It is the responsibility of all persons preparing documents to be fully aware of the requirements associated with their work activities. For the latest version of each of the following documents go to the relevant websites for each e.g. Legislation *www.legislation.nsw.gov.au, Australian Standards;* www.saiglobal.com*, NSW Codes of Practice;* https://www.safework.nsw.gov.au/home*, National Codes of Practice; www.safeworkaustralia.gov.au.*

NSW Legislation

Key NSW legislation is provided in the following table.

Table C-1: Relevant NSW Legislation

Legislation, Licences, Permits or Consents	Applicability	Responsibility
Environmental Planning and Assessment Act 1979	• The Project must be undertaken in accordance with the conditions presented in the DC, which was granted under this Act.	Project Manager
Water Management Act 2000	• Active remediation of groundwater during the Project is not proposed; however as the Project will encounter groundwater in soils and rock under the Western Area, an aquifer interference approval for activities associated with groundwater management within excavations may be required.	Project Manager
Protection of the Environment Operations (POEO) Act 1997	• Relevant to all phases of the Project. • Environment Protection Licence 570 is currently associated with the terminal operations. • The Project will be carried out in line with the conditions stipulated in EPL 570. • Any spills or pollution incidents need to be reported under this Act. • EPL 570 will be varied to account for the remediation activities.	Project Manager
Protection of the Environment Operations (Waste) Regulation 2005	• All wastes received or removed in relation to the Project will be stored, transported and disposed of in accordance with the requirements of this Regulation and tracked via implementation of the Material Tracking Plan.	Project Environment Lead Remediation Contractor - Project Manager
Contaminated Land Management (CLM) Act 1997, under authority of NSW EPA	• The Site contains contaminated land and the provisions of this Act must be complied with during the works. • Ongoing operations at the Site and associated management actions required to reduce potential impacts to human health or the environment as a result of contamination will continue to be regulated by the requirements of both the POEO Act and the CLM Act.	Project Remediation Lead Remediation Contractor - Project Manager

Legislation, Licences, Permits or Consents	Applicability	Responsibility
Work Health and Safety Act 2011 & supporting regulation	• Relevant to all Project activities. • Ensure that all works are carried out in accordance with the Act • Ensure that all dangerous goods or combustible liquids are identified and properly stored to prevent spillage. • Maintain Dangerous Goods register and MSDS. • Record the results of a risk assessment relating to the storage and handling of dangerous goods. • Abide by these regulations for dealing with asbestos waste.	Project Manager Remediation Contractor - Project Manager Site HSSE Manager
Environmentally Hazardous Chemicals Act 1985	• Any PCB or scheduled chemical wastes generated as part of the Project above the limits provided in the CCOs will be managed according to the CCO.	Project Manager Remediation Contractor - Project Manager Site HSSE Manager
Heritage Act 1977	• Is activated upon discovery of a relic. • In the event that unexpected relics are discovered on-site, works should cease immediately and the process outlined in Table 5-1 followed.	Project Environment Lead Remediation Contractor - Project Manager Site HSSE Manager
National Parks and Wildlife Act 1974	• Is activated upon discovery of an aboriginal object. • In the event that unexpected Aboriginal object is discovered on-site, works should cease immediately and the process outlined in Table 5-1 followed.	Project Environment Lead Remediation Contractor - Project Manager Site HSSE Manager
Noxious Weeds Act 1993	• Relevant to all Site activities. • Noxious weeds must be identified and controlled according to defined control actions, dependent on potential to cause harm to our local environment (defined by Control Classes 1-5).	Project Environment Lead Remediation Contractor - Project Manager
Dangerous Goods (Road and Rail Transport) Act 2008 and associated regulation	• The transport, storage and handling of hazardous substances will be undertaken in accordance with this Act.	Remediation Contractor - Project Manager
Heavy Vehicle National Law	• Viva Energy must obtain relevant permits for the use of over-dimensional vehicles on the road network, in accordance with the Heavy Vehicle National Law (NSW) and Council's Oversize Vehicle Access Permit.	Project Manager Remediation Contractor - Project Manager Site HSSE Manager

Commonwealth Legislation

Key Commonwealth legislation that the Project team should be aware of includes:

- Environment Protection and Biodiversity Conservation Act 1999
- National Environment Protection (Assessment of Site Contamination) Measure 1999.

Other Requirements

- Development Consent SSD 5147
- Development Consent SSD 9302
- Environment Protection Licence 570
- Department of Environment and Climate Change, 2007, PA's Storing and Handling of Liquids: Environmental Protection – Participants Manual
- Department of Environment and Conservation (now OEH), 2007, Guidelines for the Assessment and Management of Groundwater Contamination
- Department of Planning's Hazardous and Offensive Development Application Guidelines – Applying SEPP 33
- DIN 4150-3: 1999 Structural Vibration – Part 3: Effects of vibration on structures
- Environment Protection and Heritage Council (EPHC), 2009, National Waste Policy: Less Waste, More Resources, November 2009
- Heads of Environment Protection Authority, 2018, PFAS National Environmental Management Plan
- National Code of Practice for the Storage and Handing of Dangerous Goods [NOHSC: 2017 (2001)]
- National Health and Medical Research Council, 2011, Australian Drinking Water Guidelines ADWG [updated August 2018].
- National Standard for the Storage and Handling of Workplace Dangerous Goods [NOHSC: 1015 (2001)]
- National Transport Commission, 2018, Australian Code for the Transport of Dangerous Goods by Road & Rail, Edition 7.6, July 2018
- New South Wales Acid Sulphate Soils Management Advisory Committee, 1998, Acid Sulphate Soils Assessment Guidelines, August 1998
- NSW DECC, 2009, Interim Construction Noise Guideline (ICNG)
- NSW Department of Environment and Conservation (DEC), 2006, Assessing Vibration: a technical guideline
- NSW Department of Environment and Conservation (DEC), 2007, Approved Methods for Sampling and Analysis of Air Pollutants in New South Wales
- NSW Department of Health, 2008, Exhumation of Human Remains
- NSW Environment Protection Authority (NSW EPA), 1995, Sampling Design Guidelines
- NSW Environment Protection Authority (NSW EPA), 2011, Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites, August 2011
- NSW Environment Protection Authority (NSW EPA), 2014, Best Practice Note: Landfarming, April 2014
- NSW Environment Protection Authority (NSW EPA), 2014, Waste Classification Guidelines, November 2014
- NSW Environment Protection Authority (NSW EPA), 2016, Approved Methods for the Modelling and Assessment of Air Pollutants in NSW, January 2017
- NSW Health, 2013, Exhumation of Human Remains Policy
- NSW Landcom, 2004, Managing Urban Stormwater - Soils and Construction (4th Edition, March 2004); and Managing Urban Stormwater, NSW EPA 1997 (the Blue Book)
- NSW Noise Policy for Industry (2017)
- NSW Police Force, 2015, NSW Police Force Handbook
- NSW Road Noise Policy (2011)
- Standards Australia Committee, 1999, AS 4482.2 1999, Guide to the Sampling and Investigation of Potentially Contaminated Soil, Part 2: Volatile Substances.

- Standards Australia Committee, 2005, AS 4482.1 2005, Guide to the Investigation and Sampling of sites with Potentially Contaminated Soil, Part 2: Non-volatile and Semi-volatile compounds
- Standards Australia Committee, 2009, AS4970-2009 Australian Standard. Protection of trees on development sites

APPENDIX D NSW Department of Planning, Industry and Environment - Written Incident Notification Process

1. A written incident notification addressing the requirements set out below must be emailed to the NSW DPIE at the following address: compliance@planning.nsw.gov.au within seven days after Viva Energy becomes aware of an incident. Notification is required to be given even if Viva Energy fails to give the notification required under condition C8 or, having given such notification, subsequently forms the view that an incident has not occurred.
2. Written notification of an incident must:
    a. identify the development and application number;
    b. provide details of the incident (date, time, location, a brief description of what occurred and why it is classified as an incident);
    c. identify how the incident was detected;
    d. identify when the applicant became aware of the incident;
    e. identify any actual or potential non-compliance with conditions of consent;
    f. describe what immediate steps were taken in relation to the incident;
    g. identify further action(s) that will be taken in relation to the incident; and
    h. identify a project contact for further communication regarding the incident.
3. Within 30 days of the date on which the incident occurred or as otherwise agreed to by the Planning Secretary, Viva Energy must provide the Planning Secretary and any relevant public authorities (as determined by the Planning Secretary) with a detailed report on the incident addressing all requirements below, and such further reports as may be requested.
4. The Incident Report must include:
    a. a summary of the incident;
    b. outcomes of an incident investigation, including identification of the cause of the incident;
    c. details of the corrective and preventative actions that have been, or will be, implemented to address the incident and prevent recurrence; and
    d. details of any communication with other stakeholders regarding the incident.

Appendix E Management of previously unrecorded Aboriginal objects

Should a suspected Aboriginal object be identified at any point throughout the life of the Project, the following standard procedure should be adopted:

1. all works must cease immediately in the area to prevent any further impacts to the object;
2. notify Environmental Representative;
3. engage a suitably qualified archaeologist to determine the nature, extent and significance of the find and provide appropriate management advice. Management action(s) will vary according to the type of evidence identified, its significance (both scientific and cultural) and the nature of potential impacts; and
4. prepare and submit an Aboriginal Heritage Information Management System site card for the site.

In the event that potential human skeletal remains are identified at any point during the life of the Project, the following standard procedure (New South Wales Police Force, 2015; NSW Health, 2008) should be followed:

1. all work in the vicinity of the remains should cease immediately;
2. the location should be cordoned off and the NSW Police notified; and
3. if the Police suspect the remains are Aboriginal, they will contact the Environment, Energy and Science (EES) Group of the DPIE and arrange for a forensic anthropologist or archaeological expert to examine the site.

Subsequent management actions will be dependent on the findings of the inspection undertaken under Point 3:

- if the remains are identified as modern and human, the area will become a crime scene under the jurisdiction of the NSW Police;
- if the remains are identified as pre-contact or historic Aboriginal, EES and all Registered Aboriginal Parties are to be formally notified in writing. Where impacts to exposed Aboriginal skeletal remains cannot be avoided an appropriate management mitigation strategy will be developed in consultation with EES and Registered Aboriginal Parties;
- if the remains are identified as historic non-Aboriginal, the site is to be secured and the NSW Heritage Division contacted; and
- if the remains are identified as non-human, work can recommence immediately.