

Appendix B5

Soil and Water Management Sub-plan Infrastructure Works (Package 4)

Parramatta Light Rail – Stage 1

November 2021

PLR1INF-CPBD-ALL-WA-PLN-000001 Rev 11

Construction Environment Management Plan

Appendix B5

Soil and Water Management Sub-plan

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Document Control

The Project Director is responsible for ensuring that this plan is reviewed and approved. The Project Director is responsible for updating this plan to reflect changes to the project, legal and other requirements, as required.

Amendments

Any revisions or amendments must be approved by the Project Director and/or client before being distributed / implemented.

Revision	Details
Rev A	Internal review.
Rev B	Incorporation of internal review comments.
Rev 0	First draft submitted to TfNSW and ER. Revision issued for external stakeholder consultation.
Rev 1	Second draft submitted to TfNSW and ER for consultation.
Rev 2	Incorporation of external stakeholder consultation comments. Issued to ER for endorsement.
Rev 3	Incorporation of ER comments and issued to ER for endorsement.
Rev 4	Incorporation of ER comments and issued to ER for endorsement.
Rev 5	Incorporation of ER endorsement and submission to the DPIE for approval.
Rev 6	Incorporation of DPIE comments and submission to the DPIE for approval.
Rev 7	Minor amendments following issue of Environmental Protection Licence 21347. Minor errors and omissions from Rev 6 raised by the ER relating to the Water Quality Monitoring Program.
Rev 8	Minor amendments for annual review.
Rev 9	Minor amendments for annual review.
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Glossary / Abbreviations

Abbreviations	Expanded text
ANZECC	Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)
ASS	Acid Sulfate Soil
BC Act	<i>Biodiversity Conservation Act 2016</i>
CEMP	Construction Environmental Management Sub-plan
CLMP	Construction Contaminated Land Management Sub-plan
CoA	Conditions of Approval
DO	Dissolved Oxygen
DPIE	NSW Department of Planning, Industry and Environment (functions of the former Department of Environment and Planning and Office of Environment and Heritage (OEH) are now administered by the Department of Planning, Industry and Environment).
Dol Water	NSW Department of Industry - Water
DPI	NSW Department of Primary Industries
ECM	Environmental Control Maps
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPA	NSW Environment Protection Authority
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
EPOs	Environmental Performance Outcomes
ESCP	Erosion and Sediment Control Plan
EWMS	Environmental Work Method Statement
GDE	Groundwater Dependant Ecosystem
JV, the	CPB Contractors and Downer EDI Works Joint Venture (Parramatta Connect)
N	Nitrogen

Abbreviations	Expanded text
OEH	Former Office of Environment and Heritage. Relevant functions of the OEH are now administered by the Department of Planning, Industry and Environment.
P	Phosphorus
PIRMP	Pollution Incident Response Management Plan
PLR	Parramatta Light Rail
PMF	Probable Maximum Flood
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
REMMM	Revised Environmental Mitigation and Management Measure
RUSLE	Revised Universal Soil Loss Equation
SPIR	Submissions and Preferred Infrastructure Report
SWMP	Soil and Water Management Sub-plan
TSC Act	<i>Threatened Species Conservation Act 1995</i> (now repealed)

1 Introduction

1.1 Context

This Soil and Water Management Sub-plan (SWMP or Sub-plan) forms part of the Construction Environmental Management Plan (CEMP) for the Parramatta Light Rail Stage 1, Package 4 Infrastructure Works (Infrastructure Works). This SWMP has been prepared to address the requirements of the Minister's Conditions of Approval (CoA) SSI-8285, the revised environmental mitigation and management measures (REMMMs) and Environmental Performance Outcomes (EPO's) listed in *Parramatta Light Rail Stage 1 Westmead to Carlingford via Parramatta CBD and Camellia Environmental Impact Statement* (the EIS), as amended by the *Parramatta Light Rail (Stage 1) Westmead to Carlingford via Parramatta CBD and Camellia Submissions Report (incorporating Preferred Infrastructure Report)* (February 2018) (the SPIR). In addition, this Sub-plan addresses all applicable legislation and contractual requirements, including the PLR Stage 1 Infrastructure Contract Project Deed (ISD-17-6721).

1.2 Background

1.2.1 Parramatta Light Rail – Stage 1 description

Parramatta Light Rail is one of the NSW Government's major infrastructure projects being delivered to serve a growing Sydney.

Parramatta Light Rail Stage 1 (Stage 1) will connect Westmead to Carlingford via Parramatta Central Business District (CBD) and Camellia. Stage 1 is expected to be operational in 2023.

Stage 1 will create new communities, connect great places and help both local residents and visitors move around and explore what the region has to offer. The route will link Parramatta's CBD and train station to a number of key locations, including the Westmead Precinct, the Parramatta North Growth Centre, the new Western Sydney Stadium, the Camellia Town Centre, the new Powerhouse Museum and Riverside Theatre arts and cultural precinct, the private and social housing redevelopment at Telopea, the Rosehill Gardens Racecourse and the three Western Sydney University campuses.

In summary, the key features of Stage 1 include:

- A new dual track light rail network of approximately twelve (12) kilometres in length, including approximately seven (7) kilometres within the existing road corridor and approximately five (5) kilometres within the existing Carlingford Line and Sandown Line, replacing current heavy rail services
- Sixteen (16) stops that are fully accessible and integrated into the urban environment including a terminus stop at each end of Westmead and Carlingford
- High frequency 'turn-up-and-go' services operating seven days a week from 5am to 1am. Weekday services will operate approximately every 7.5 minutes in the peak period between 7am and 7pm
- Modern and comfortable air-conditioned light rail vehicles, nominally 45 metres long and driver-operated, each carrying up to 300 passengers.
- Intermodal interchanges with existing public transport services at Westmead terminus, Parramatta CBD and the Carlingford terminus
- Creation of two light rail and pedestrian zones (no general vehicle access) within the Parramatta CBD along Church Street (generally between Market Street and Macquarie Street) and along Macquarie Street (generally between Horwood Place and Smith Street)

- A Stabling and Maintenance (SaM) Facility located in Camellia for light rail vehicles (LRV) to be stabled, cleaned and maintained
- New bridge structures along the alignment including over James Ruse Drive and Clay Cliff Creek, Parramatta River (near the Cumberland Hospital), Kissing Point Road and Vineyard Creek, Rydalmere
- Alterations to the existing road network including line marking, additional traffic lanes and turning lanes, new traffic signals, and changes to traffic flows
- Relocation and protection of existing utilities
- Public domain and urban design works along the corridor and at Stop precincts
- Closure of the heavy rail line between Carlingford and Clyde
- Active transport corridors and additional urban design features along sections of the alignment and within Stop precincts
- Integration with the Opal Electronic Ticketing System (ETS)
- Real time information in light rail vehicles and at Stops via visual displays and audio.

An overview of Parramatta Light Rail Stage 1 route is shown in **Figure 1-1**.

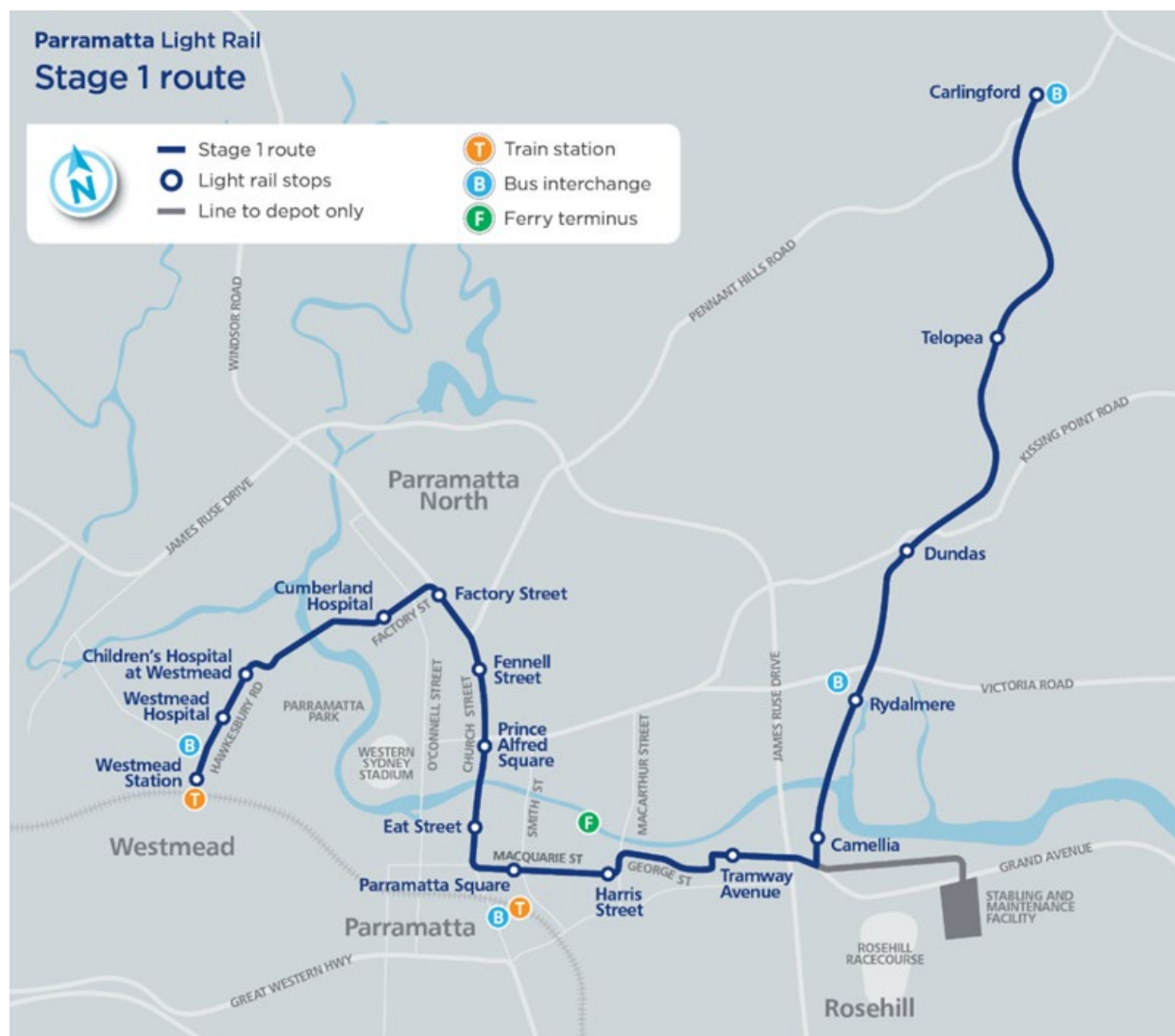


Figure 1-1: Parramatta Light Rail – Stage 1 Route

1.2.2 Statutory Context

The Parramatta Light Rail is subject to environmental impact assessment under the *Environmental Planning and Assessment Act 1979* (EP&A Act). It is classified as Critical State Significant Infrastructure (CSSI). The EIS assessed impacts for Parramatta Light Rail Stage 1 (Westmead to Carlingford). This covered the light rail and associated works including road enabling work.

Stage 1 received Infrastructure Approval from the Minister for Planning under Section 5.19 of the EP&A Act on 29 May 2018 (Critical State Significant Infrastructure Application SSI-8285), subject to the conditions provided in the Instrument of Approval, specifically Schedule B – Ministerial Conditions of Approval.

The Infrastructure Approval was subsequently modified under Section 5.25 of the EP&A Act on 21 December 2018 and 25 January 2019.

The planning approval, modifications and related environmental assessment documents are located at: http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8285.

1.2.3 Stage 1 Delivery Strategy

Delivery of Stage 1 is achieved through the following five packages of work:

- **Enabling Works (Package 1)** – Local road network improvements including O’Connell Street and George Street (off-alignment)
- **Westmead Precinct Works (Package 2)** – Hawkesbury Road widening and demolition at Cumberland Hospital (east and west Campus)
- **Early Works (Package 3)** – Remediation of the Stabling and Maintenance (SaM) Facility.
- **Infrastructure Works (Package 4) (the subject of this Sub-plan)** – Design and construction of civil works, public domain and light rail infrastructure up to road level/top of rail and to the top of the concrete slab at stops, including provision of utility services (excluding high-voltage power supply and cabling for rail systems), and decommissioning of the T6 Carlingford Line)
- **Supply, Operate and Maintain Works (Package 5)** – Design and construction of the light rail systems, high-voltage power supply and stops above slab level, the supply of light rail vehicles, and the design and construction of the SaM Facility, including all light rail operations, customer service and asset management.

Each package of work is to be delivered under separate contracts on behalf of the proponent Transport for NSW. While the packages will commence at different times under separate construction approvals, there will be periods during which the packages works will overlap. The interactions between the packages are shown in **Figure 1-2**.

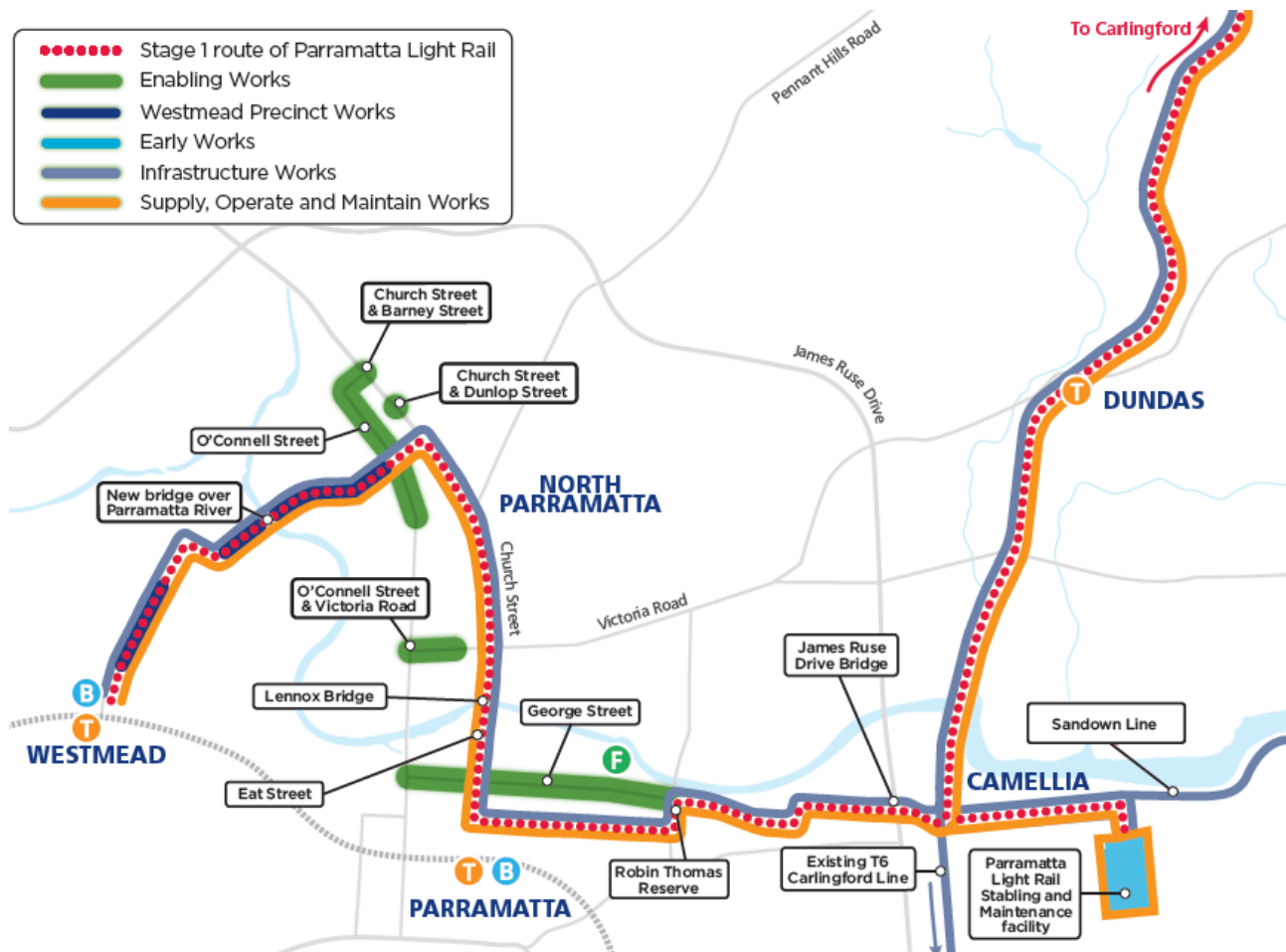


Figure 1-2: Parramatta Light Rail Stage 1 Delivery Strategy

1.3 Infrastructure Works

The CPB Contractors and Downer EDI Works Joint Venture (JV), Parramatta Connect, has been engaged to deliver Package 4 – Infrastructure Works (INF).

In summary the Infrastructure Works include:

- Utility Services adjustment and relocation works (for more than minor impact)
- Property demolition to make space for the light rail tracks and ancillary facilities
- Decommissioning of the existing Carlingford T6 heavy rail line and disused Sandown Line
- Earthworks and retaining structures
- Drainage works
- Intersection signalling works
- The light rail civil infrastructure and Stop slabs
- Urban and architectural design and finishes of the corridor and public domain
- Rail, track slabs, ballasted track and grass tracks
- Footpath and kerb realignment including intersection works and road upgrades to accommodate light rail and other traffic (both temporary and permanent)
- New light rail bridges carrying the light rail over the Parramatta River (at Cumberland Hospital), James Ruse Drive, Vineyard Creek and Kissing Point Road and bridge strengthening and modifications to existing bridges as required

- Acid sulphate soils (ASS)
- In-stream activities
- Chemical Storage and Spill Response.

This Soil and Water Management Sub-plan includes the Water Quality (Turbidity) Monitoring program required in CoA C9 - Construction Monitoring Programs.

This Sub-plan is applicable to all activities during construction of the Infrastructure Works, including all areas where physical works will occur or areas that may be otherwise impacted by the construction works, and under the control of the JV. All the JV staff and sub-contractors are required to operate fully under the requirements of this Sub-plan and related environmental management plans, over the full duration of the construction program.

1.6 Environmental management systems overview

The environmental management system overview is described in Section 1.5 of the CEMP and detailed in **Figure 1-4**. The environmental management system overview is described in Section 1.5 of the CEMP.

To achieve the intended environmental performance outcomes, CPB have established, implemented, maintained and continually improved an EMS in accordance with the requirements of ISO14001:2015. The CPB EMS will be adopted as the guiding environmental management framework for the Infrastructure Works.

The EMS consists of governance documentation, including this Sub-plan, Sub Plans, procedures and tools as set out below and illustrated in **Figure 1-4**.

- **The JV Environment and Sustainability Policy.** Outlines the commitments and intentions established by the JV to ensure environmental performance and sustainability objectives and targets are achieved (**Appendix A3**).
- **This CEMP.** This document details the processes and procedures to be implemented during the Infrastructure Works to comply with applicable CoA, REMMMs, EPOs, legislative obligations and contractual requirements. The relevant compliance obligations are detailed in **Appendix A1**, with a cross reference to where they are met in this Sub-plan.
- **Environmental Management Sub-plans.** These documents describe procedures and controls for specific environmental aspects requiring more rigorous management strategies.
- **Environmental Design Review Reports –** reports to accompany each design package that will demonstrate and consideration of environmental impacts including Trees.
- **Environmental Work Method Statements (EWMS)** - Task-specific risk assessment prepared for high-risk construction activities. EWMS are focussed on activities with significant environmental risks
- **Environmental Control Maps (ECMs)** - Reflecting the outcomes of risk assessments, ECMs depict environmental risks and controls on site-specific maps.
- **Erosion and Sediment Control Plans (ESCPs)** – Site specific plans prepared in accordance with Managing Urban Stormwater: Soils and Construction (Landcom, 2004) Volume 1 and Volume 2.
- **Geographic Information System (GIS).** The GIS incorporate key features of the alignment and relevant environmental constraints. Features include waterways, heritage, biodiversity contamination and sensitive receivers amongst other site relevant features. The GIS forms the basis of Environmental Control Maps (ECMs).
- **Procedures, strategies and protocols.** Detailed procedures for inclusion in work packs.

Key interactions for this Sub-plan with other management plans include:

- **Flood Management Sub-plan** - to address requirements relating to management of flooding risks during construction.
 - **Flood Management Design Report** - will detail the implications of the Infrastructure Works design on flood conditions, including modelling, design measures to manage impacts and sensitivity analysis. The modelling from the Flood Management Design Report will be utilised to identify areas within the 10% AEP flood level
- **Waste and Resource Management Sub-plan** - to address requirements relating to waste and resource including excavation, handling and reuse of spoil. Construction water conservation is addressed in the Construction Waste and Resource Management Sub-plan.
- **Construction Contaminated Land Management Sub-plan** - to address existing contamination requirements. Investigation of contaminated land may result in the development of remediation action plans (RAPs) and Environmental Management Plans that may include ongoing soil and groundwater monitoring for contamination.

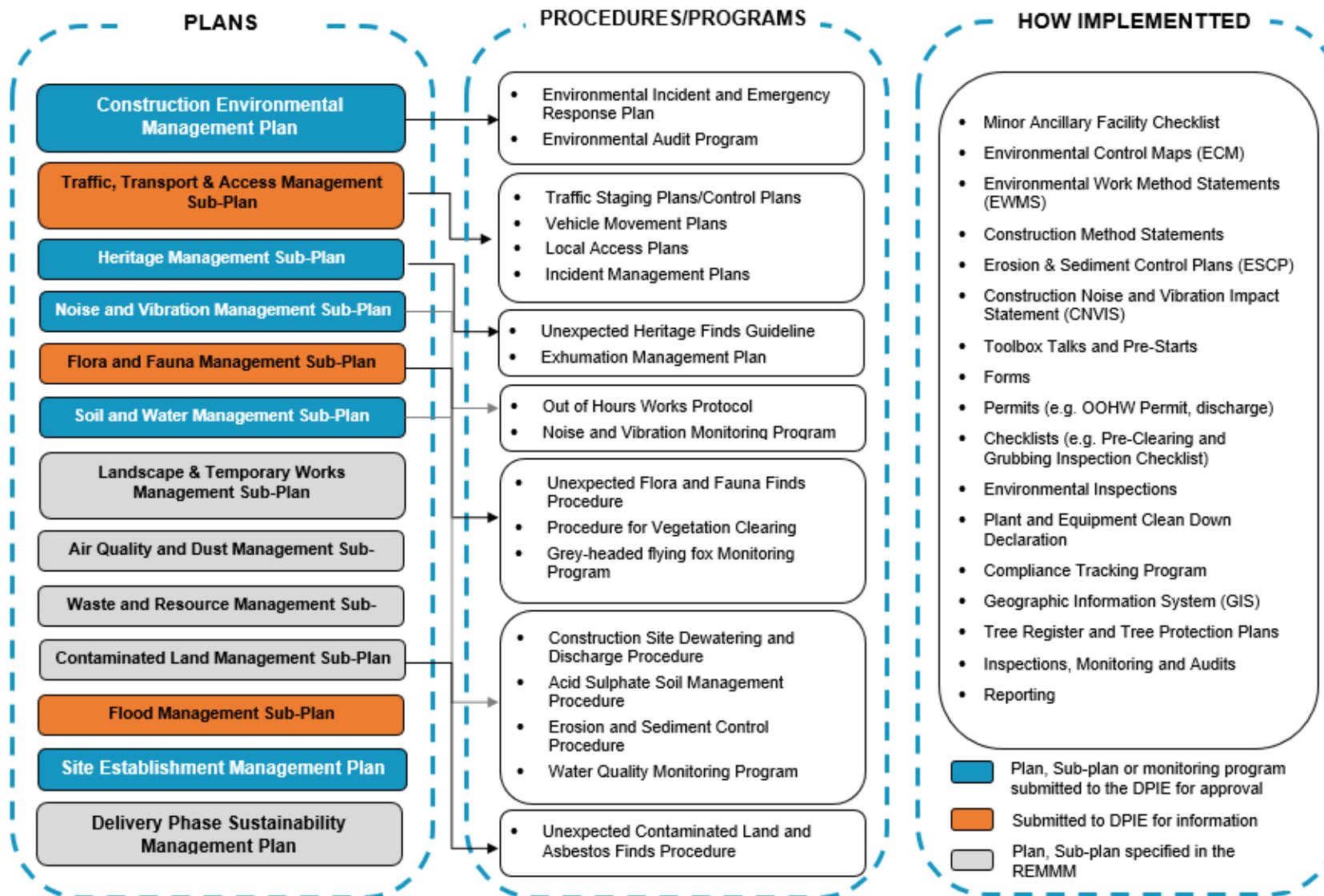


Figure 1-4: Environmental Management System

2 Purpose and objectives

2.1 Purpose

The purpose of this Sub-plan is to describe how the JV proposes to manage and protect soil and water quality and resources during construction of the Project.

2.2 Objectives

The key objective of the SWMP is to ensure all CoA, REMMMs and licence/permit requirements relevant to soil and water including water quality are described, scheduled and assigned responsibility as outlined in:

- Environmental impact assessment prepared for Parramatta Light Rail Stage 1
- Submissions and Preferred Infrastructure Report for Parramatta Light Rail Stage 1
- CoA granted to the project on 29 May 2019 and subsequent modifications
- PLR Stage 1 Infrastructure Contract Project Deed (Project Deed).

Additional objectives and strategies of the Sub-plan include:

- Erosion and sediment controls during construction will be implemented in accordance with Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and Managing Urban Stormwater: Soils and Construction Volume 2 (Department of Environment and Climate Change, 2008a)
- There will be no impacts on aquatic environments associated with the disturbance of ASS during construction
- Minimise the extent and duration of exposed surfaces (particularly those works that have the greatest potential to disturb soils that are contaminated or have a high erosion and runoff hazard) to manage and protect soil resource and prevent erosion
- Develop and implement adequate water quality control measures prior to the carrying out of significant earthwork or bridge construction activities
- Outline the Water Quality (Turbidity) Monitoring Program.

2.2.1 Water quality design criteria and objectives

The water quality objective, as defined in the EIS, is to minimise the potential impacts on downstream receiving waters. Reflecting the TfNSW Sustainable Design Guidelines v3.0 and the SEARs, quantitative objectives (or design criteria) are detailed in **Table 2-1**. The water quality monitoring program (Appendix D) will assess compliance with the design criteria.

Table 2-1 Water Quality Design Criteria

Document Source	Design Criteria
Transport for NSW Sustainable Design Guidelines v3.0	The following requirements apply where there is a continuous new effective impervious area greater than 1,000m²: • 85% retention of the average annual load of Total Suspended Solids (TSS) • 65% retention of the average annual load of Total Phosphorous • 45% retention of the annual load of Total Nitrogen.

2.3 Targets

The following targets have been established for the management of soil and water impacts during the project:

- Ensure full compliance with the relevant legislative requirements, CoA and environmental mitigation measures
- Erosion and sediment controls are planned and implemented in accordance with Managing Urban Stormwater: Soils and Construction. Landcom, (4th Edition) March 2004 (reprinted 2006) (the “Blue Book”). Volume 1 and Volume 2
- Meet environmental protection licence water quality discharge parameters for discharges
- Confirm areas of Acid Sulfate Soil prior to commencement of works. Manage works in areas of Acid Sulfate Soils to prevent generation of acid leachate entering receiving waters.
- Ensure chemical storage in accordance with the Australian Standards and National Code of Practice and any spillages are contained and collected for appropriate disposal
- Manage downstream water quality impacts attributable to the project (i.e. maintain water waterway health by avoiding the introduction of nutrients, sediment and chemicals outside of that permitted by the environmental protection licence and/or ANZECC guidelines)
- Maximise opportunities for water re-use from captured stormwater, wastewater and groundwater
- Ensure training on best practice soil and water management is provided to all construction personnel through site inductions.

3 Environmental requirements

3.1 Relevant legislation and guidelines

3.1.1 Legislation

All legislation relevant to this SWMP is included in Appendix A1 of the CEMP.

3.1.2 Guidelines and standards

The main guidelines, specifications and policy documents relevant to this plan include:

- Acid Sulfate Soil Manual (ASSMAC 1998)
- Acid Sulfate Soil and Rock – Victorian EPA Publication 655.1 – July 2009
- Australian Standard AS 1940B1993: The Storage and Handling of Flammable and Combustible Liquids
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ 2000)
- Department of Environment and Conservation (DEC): Bunding & Spill Management. Insert to the Environment Protection Manual for Authorised Officers - Technical section "Bu" November 1997
- IS Technical Manual Version 1.2, Infrastructure Sustainability Council of Australia (ISCA, 2016)
- Managing Urban Stormwater: Soils and Construction. Landcom, (4th Edition) March 2004 (reprinted 2006) (the "Blue Book"). Volume 1 and Volume 2
 - Volume 2A Installation of Services (DECCW 2008)
 - Volume 2C Unsealed Roads (DECCW 2008)
 - Volume 2D Main Roads Construction (DECCW 2008)
- Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings. NSW Fisheries, Fairfull, S. and Witheridge, G. (2003)
- Policy and Guidelines for Fish Habitat Conservation and Management (2013 update), DPI Fisheries
- Transport for NSW's Chemical Storage and Spill Response Guidelines, (9TP-SD-066/3.0, 2015)
- Transport for NSW's Concrete Washout Guideline (3TP-SD-112/2.0, 2015)
- Transport for NSW's Water Discharge and Reuse Guideline (7TP-SD-024/3.0)
- Transport for NSW's Guide to Environmental Control Map (3TP-SD-015/8.0)
- Environmental Best Management Practice Guideline for Concreting Contractors (DEC 2004).

3.2 Minister's Conditions of Approval

The CoA relevant to this Sub-plan are listed in Table 3-1. A cross reference is also included to indicate where the condition is addressed in this Sub-plan or other Project management documents.

Table 3-1 Conditions of Approval relevant to the SWMP

CoA No.	Condition Requirements	SWMP Reference	How Addressed
A1	The CSSI must be carried out in accordance with the terms of this approval and generally in accordance with the description of the CSSI in the Parramatta Light Rail (Stage 1) Westmead to Carlingford via Parramatta CBD and Camellia Environmental Impact Statement (dated August 2017) (the EIS) as amended by (a) the Parramatta Light Rail (Stage 1) Westmead to Carlingford via Parramatta CBD and Camellia Submissions Report (incorporating Preferred Infrastructure Report) (February 2018) (the SPIR); (b) SSI 8285 Administrative modification (November 2018) (MOD 1); and (c) SSI 8285 Correction to Administrative modification (January 2019) (MOD 2).	Section 3.2 Section 3.3	Section 3.2 and 3.3 outline how the conditions of the approval and the SPIR have been addressed in the development of this Sub-plan.

CoA No.	Condition Requirements	SWMP Reference	How Addressed
A5	Where the terms of this approval require a document or monitoring program to be prepared or a review to be undertaken in consultation with identified parties, evidence of the consultation undertaken must be submitted to the Secretary with the document or monitoring program or review. The evidence must include: (a) documentation of the engagement with the party(ies) identified in the relevant condition of approval before submitting the document for approval; (b) log of the points of engagement or attempted engagement with the identified party(ies) and a summary of the issues raised by the identified party(ies); (c) documentation of any follow-up with the identified party(ies), where feedback has not been provided, to confirm that the identified party(ies) has none or has failed to provide feedback after repeated requests; (d) outline of the issues raised by the identified party(ies) and how they have been addressed, including evidence that the party(ies) is satisfied the issues have been addressed; and (e) where there are outstanding issues raised by the identified party(ies) that have not been adopted, the reasons why they have not been/could not be adopted must be provided, including evidence of consultation with the relevant party(ies).	Section 4 Appendix E	Details of consultation requirements and relevant stakeholders are specified in Section 4. Consultation feedback will be incorporated into this Sub-plan and summarised in Appendix E.
C4	The CEMP Sub-plans must state how:	-	-
(a)	the environmental performance outcomes identified in the documents listed in Condition A1 will be achieved;	Section 3.4	Section 3.4 addresses how the EPOs relevant to soil and water management have been addressed in this Sub-plan.

CoA No.	Condition Requirements	SWMP Reference	How Addressed
(b)	the mitigation measures identified in the documents listed in Condition A1 will be implemented;	Section 3.3	The REMMMs are outlined in Section 3.3 will be complied with through the preparation and implementation of this Sub-plan. Confirmation of compliance with the terms of approval will be undertaken in accordance with Section 8.
(c)	the relevant terms of this approval will be complied with; and	Section 3.2	The terms of this approval are outlined in Section 3.2 and will be complied with through the preparation and implementation of this Sub-plan. Confirmation of compliance with the terms of approval will be undertaken in accordance with Section 8.

CoA No.	Condition Requirements	SWMP Reference	How Addressed
(d)	issues requiring management during construction, as identified through ongoing environmental risk analysis, will be managed.	Section 6 Section 7	Issues that require management during construction are outlined in Section 6 as well as their predicted impact. The process for quantitative risk assessment for the Project is outlined in the CEMP Section 1.5.1. CEMP Appendix A2 is the environmental risk register for the construction activities associated with the Project. The risk register is reviewed and updated as required and the Sub-plan amended where required during the annual review. The management of these risks has been outlined in Section 7. These will be implemented during pre-construction and construction phases of the Project.
C5	The CEMP Sub-plans must be developed in consultation with relevant government agencies (including Relevant Council(s)). Details of all information requested by an agency to be included in a CEMP Sub-plan as a result of consultation, including all copies of correspondence from those agencies, must be provided to the Secretary with the relevant CEMP Sub-plan.	Section 4 Appendix E	This Sub-plan will be provided to the relevant councils and agencies for consultation. The results of this consultation will be incorporated into the final plan and are summarised in Section 4 and Appendix E.

CoA No.	Condition Requirements	SWMP Reference	How Addressed
C6	Any of the CEMP Sub-plans may be submitted along with, or subsequent to, the submission of the CEMP but in any event, no later than one month before construction.	Section 4	This Sub-plan will be submitted with the CEMP no later than one month before construction. This is to ensure adequate time is allowed for the approval of the CEMP prior to construction. Details of this and other submission requirements have been incorporated into Section 4.
C9	The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies for each to compare actual performance of construction of the CSSI against performance predicted in the documents listed in Condition A1 or in the CEMP: Required Construction Monitoring Programs; Relevant government agencies to be consulted for each Construction Monitoring Program a) Water Quality (Turbidity) Monitoring; (DoI Water, EPA, Relevant Council(s)) b) Noise and Vibration Monitoring; (Relevant Council(s), EPA, NSW Health (as relevant)) c) Grey Headed flying fox monitoring (OEH)	Appendix D	The Water Quality Monitoring Program has been provided to DoI Water, EPA, City of Parramatta Council and Cumberland Council for consultation.

CoA No.	Condition Requirements	SWMP Reference	How Addressed
C10	Each Construction Monitoring Program must provide: a) details of baseline data available; b) details of baseline data to be obtained and when; c) details of all monitoring of the project to be undertaken; d) the parameters of the project to be monitored; e) the frequency of monitoring to be undertaken; f) the location of monitoring; g) the reporting of monitoring results against relevant criteria; h) procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory; and i) any consultation to be undertaken in relation to the monitoring programs	Appendix D	Water Quality (Turbidity) Monitoring Program preparation includes details as per C10
C12	The Construction Monitoring Programs must be developed in consultation with relevant government agencies and Relevant Council(s) as identified in Condition C9 of this approval and must include, information requested by an agency to be included in a Construction Monitoring Programs during such consultation. Details of all information requested by an agency, including copies of all correspondence from those agencies, must be provided with the relevant Construction Monitoring Program.	Section 4 Appendix E	The Water Quality Monitoring Program has been provided to DoI Water, EPA, City of Parramatta Council and Cumberland Council for consultation.

CoA No.	Condition Requirements	SWMP Reference	How Addressed
C13	The Construction Monitoring Programs must be endorsed by the ER and submitted to the Secretary for information at least one month before the commencement of construction.	Section 4 Appendix D – Water Quality Monitoring Program	The Water Quality Monitoring Program must be endorsed by the ER and submitted the Secretary at least one month before the commencement of construction.
C14	Construction must not commence until the Secretary has received all of the required Construction Monitoring Programs, and all relevant baseline data for the specific construction activity has been collected.	Appendix D – Water Quality Monitoring Program	The Water Quality Monitoring Program has included relevant baseline data from the EIS Technical Paper 6 – Water Quality Assessment. The Pre-construction sampling (baseline review) water quality (turbidity) monitoring has been completed to confirm the baseline water quality objectives prior to the commencement of construction and assess where the NSW Water Quality Objectives are being achieved in the existing environment. The results of this monitoring have been included in Section D-6 and Table D-3.
C15	The Construction Monitoring Programs, as submitted to the Secretary including any minor amendments approved by the ER must be implemented for the duration of construction and for any longer period set out in the monitoring program or specified by the Secretary, whichever is the greater.	Appendix D – Water Quality Monitoring Program	The Water Quality Monitoring Program outlines the duration for implementation of the monitoring program.

CoA No.	Condition Requirements	SWMP Reference	How Addressed
C16	The results of the Construction Monitoring Programs must be submitted to the Secretary, and relevant regulatory agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program.	Appendix D – Water Quality Monitoring Program	Water Quality Monitoring Program outlines the reports to be prepared during construction at a frequency determined through agency consultation.
C17	Where a relevant CEMP Sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP Sub-plan.	Appendix D – Water Quality Monitoring Program	Water Quality Monitoring Program has been included in Appendix D of this Sub-plan
E111	Before undertaking any works and during maintenance or construction activities, erosion and sediment controls must be implemented and maintained to prevent water pollution consistent with LandCom's Managing Urban Stormwater series (The Blue Book).	Section 7, control measure SW-09. Appendix A - Erosion and Sediment Control Procedure	Erosion and sediment control plans will be prepared and implemented for each worksite in accordance with Volume 2D of Managing Urban Stormwater: Soils and Construction (Landcom, 2004 prior to the commencement of construction and be updated and managed throughout as relevant to the activities during construction. Appendix A provides the Erosion and Sediment Control Procedures to guide development of Erosion and Sediment Control Plans (ESCPs) in accordance with The Blue Book that will be implemented prior to undertaking works.

CoA No.	Condition Requirements	SWMP Reference	How Addressed
E112	The CSSI must be designed, constructed and operated so as to maintain the NSW Water Quality Objectives where they are being achieved as at the date of this approval, and contribute towards achievement of the NSW Water Quality Objectives over time where they are not being achieved as at the date of this approval, unless an EPL in force in respect of the CSSI contains different requirements in relation to the NSW Water Quality Objectives, in which case those requirements must be complied with.	Section 5.4.1 Section 7 – Environmental Control Measures	The Water Quality Objectives are outlined in Section 5.4.1. The control measures outlined in Section 7 have been developed to address risks to the water quality objectives associated with the proposed construction activities including erosion and sediment control, construction water discharges, management of acid sulfate soils, management of chemicals and concreting works including concrete washout.

3.3 Revised Environmental Mitigation and Management Measures

Relevant REMMMs are listed in Table 3-2. This includes reference to required outcomes, the timing of when the commitment applies, relevant documents or sections of the environmental assessment influencing the outcome and implementation.

Table 3-2 Revised Environmental mitigation and management measures relevant to this SWMP

Ref #	Commitment	Timing	SWMP Reference	How Addressed
GEN-1	A construction environmental management plan (CEMP) would be prepared for the construction phase of the project. The CEMP would provide a centralised mechanism through which all potential environmental impacts would be managed. The CEMP would document mechanisms for demonstrating compliance with the commitments made in the Environmental Impact Statement), the submissions report, as well as any other relevant statutory approvals (e.g. conditions of approval, licences and permits). The CEMP would outline a framework for the management of environmental impacts during construction, including further details on the following: • Traffic, transport and access management. • Noise and vibration management. • Heritage management. • Air quality and dust management. • Soil and water management. • Flora and fauna management. • Waste and resource management. • Site compound and ancillary works management.	Pre-construction	Section 1.4	This plan has been prepared to address the Soil and Water Management Sub-plan. With reference to the scope of the Soil and Water Management Sub-plan outlined in HY-6, the following plans also been prepared as separated Sub-plans: • Flood Management Sub-plan • Waste and Resource Management Sub-plan • Construction Contaminated Land Management Sub-plan

Ref #	Commitment	Timing	SWMP Reference	How Addressed
	- Landscape and temporary works management. - Emergency and incident response management. The CEMP would be prepared by the responsible contractor(s) and approved by the Secretary of the NSW Department of Planning and Environment.			
BI-4	The following measures would be adopted in the flora and fauna management plan to mitigate impacts on aquatic habitats during construction:	Pre-construction / Construction	-	Although these conditions have been addressed in the Flora and Fauna Management Sub-plan, the requirements that relate to soil, water, erosion, sediment control and in stream works have also been addressed in this Sub-plan.
	Implementing the soil and water mitigation and management measures HY-7, SG-3, SG-4 and CM-3.	Pre-construction / Construction	Refer referencing in this table	This plan addresses HY-7, SG-3, SG-4. CM-3 is addressed in the Construction Contaminated Land Management Sub-plan
	Preparation of acid sulfate soils/contaminated soils management plan.	Pre-construction	Section 7, control measure SW-48 Appendix C	The Acid Sulfate Soil Management Procedure is presented in Appendix C of this Soil and Water Management Sub-plan. The Construction Contaminated Land Management Sub-plan has been prepared separately.

Ref #	Commitment	Timing	SWMP Reference	How Addressed
	Minimising the works footprint in and adjacent to watercourses, including establishment and marking of vegetation buffer zones in areas of vegetation removal in riparian zones.	Pre-construction	n/a	Addressed in the Flora and Fauna Management Sub-plan
	Crossing design would adhere to relevant policies and guidelines including the fish friendly passage guidelines (Fairfull and Witheridge, 2003) for waterway crossings and avoid/minimise disruption to fish movements and the Policy and guidelines for fish habitat conservation and management (Department of Primary Industries, 2013).	Pre-construction	n/a	Addressed in the Flora and Fauna Management Sub-plan
	Construction compounds would where feasible be located within previously disturbed areas, away from riparian vegetation (to the extent possible).	Pre-construction	n/a	Addressed in the Site Establishment Management Plan
	Use of platforms/temporary wharfs in preference to weirs for instream construction works.	Construction	Section 7, control measure SW-50	This requirement will be incorporated into planning of construction works and documented in Construction work packs.
	Use of floating booms around work zones.	Construction	Section 7, control measure SW-51	Floating booms will be installed around in stream works.
	Use of silt curtains around new piers during piling to restrict turbidity.	Construction	Section 7, control measure SW-52	Silt curtains will be installed around in stream works including piling of new piers.

Ref #	Commitment	Timing	SWMP Reference	How Addressed
	Bund integrity of equipment wash-downs would be maintained for all works on/near river banks.	Construction	Section 7, control measure SW-53	Nominated and established equipment wash-down areas will be established and inspected regularly.
	Prohibition dumping of excavated materials or untreated runoff water in the river.	Construction	Section 7, control measure SW-54	This condition will be reinforced through awareness training and ensuring alternative waste disposal options are identified prior to works.
	Remediation and revegetation of disturbed watercourse bed, banks and aquatic habitats as soon as possible following disturbance in accordance with the Guidelines for watercourse crossings on waterfront land (Department of Primary Industries, 2012) and the Policy and guidelines for fish habitat conservation and management (Department of Primary Industries, 2013).	Construction	Section 7, control measure SW-55	Final detailed design will be developed prior to removal of temporary works that have disturbed watercourse bed, banks and aquatic habitats. An EWMS will be prepared for this activity.
	The relevant mitigation and management measures would be shown on Environmental Control Maps in accordance with Transport for NSW's Guide to Environmental Control Map.	Construction	Section 7, control measure SW-56	The relevant controls outlined in BI-3 will be set out on Environmental Control Maps.
CC-2	Construction-related climate change risks (e.g. increased frequency and severity of extreme rainfall events placing increased pressure on construction water quality control measures) would be considered during the development of environmental management measures as part of the CEMP.	Pre-construction	Section 6.2 Section 7, control measure SW-09	The relevant controls outlined in SW-09 would be implemented through ESCP development.

Ref #	Commitment	Timing	SWMP Reference	How Addressed
HY-1	A water quality management program would be developed in consultation with the Department of Industry (Lands and Water) and the EPA, and established prior to construction to ensure compliance with identified water quality objectives and enable potential impacts on surface and groundwater to be identified, controlled and reported. This would include targeted baseline monitoring of receiving waters and shallow groundwater prior to construction to identify baseline water quality conditions.	Construction	Appendix D	The Water Quality Monitoring Program for the Infrastructure Works has been presented in this Sub-plan. The Water Quality Monitoring Program will be developed in consultation with Department of Industry (Lands and Water) and the EPA. Evidence of consultation with these agencies will be included in Section 4 and Appendix E in accordance with CoA A5.
HY-2	Contemporary good practice guidelines would be followed to ensure stormwater runoff from the project area receives adequate water quality treatment, where required. Water quality guidelines to be followed include the Water Sensitive Urban Design Guideline. Applying water sensitive urban design to NSW Transport projects (Transport for NSW, 2017), Managing Urban Stormwater, Environmental Targets Consultation Draft (DECCW, 2007) and Managing Urban Stormwater: Council Handbook (EPA, 1997). This would include consideration of water quality treatment devices into the drainage design, such as Gross Pollutant Traps (GPTs) and other Water Sensitive Urban Design (WSUD) treatment measures such as water quality basins, and biofiltration swales, where required to achieve the relevant targets. The location and specification for these would be determined through the detailed design and documented in the design report.	Design	Section 7.1	This is a technical requirement that will be addressed in the detailed design and the Environmental Design Review Reports.

Ref #	Commitment	Timing	SWMP Reference	How Addressed
HY-3	Opportunities to improve existing flood impacts along the project alignment would be considered during the detailed design of the project. Measures considered would include improved drainage, streetscape design and integration of WSUD measures. Adequate drainage and runoff management would be incorporated into the design of the stabling and maintenance facility.	Design	Section 7.1	This is a technical requirement that will be addressed in the detailed design and the Environmental Design Review Reports.
HY-4	A Flood Management Strategy would be prepared for the project, to include an update of the flood impact assessment undertaken for the EIS (refer Technical Paper 7) to inform the detailed design, re-assess the level of flood immunity of the project and to identify potential impacts of the project on flood behaviour prior to construction. The strategy would demonstrate how the project design achieves the desired Performance Criteria (refer to Table 17.5 of the EIS). The Flood Management Strategy would identify design responses and construction management measures that would be implemented in design or during construction. Construction management procedures would be detailed in the Construction Environmental Management Plan. The Flood Management Strategy would be prepared in consultation with the City of Parramatta Council.	Design	n/a	The Flood Management Design Report will be prepared during detailed design in accordance with CoA E113.

Ref #	Commitment	Timing	SWMP Reference	How Addressed
HY-5	The CEMP would include soil and water management measures to manage the risk of sedimentation, littering and chemical pollution of the Parramatta River, Clay Cliff Creek, Vineyard Creek and other nearby waterways within the study area during construction.	Construction	This Sub-plan Section 7.2 Appendix A	Sedimentation will be controlled through the development and implementation of Erosion and Sediment Control Measures in accordance with the Blue Book, as outlined in Appendix A. Control Measures to address chemical pollution have been included in Section 7.2 in accordance with the Transport for NSW's Chemical Storage and Spill Response Guidelines, (9TP-SD-066/3.0, 2015) and Concrete Washout Guideline (3TP-SD-112/2.0, 2015). Littering will be controlled through provision of suitable bins and awareness training.
HY-6	A soil and water management plan would be prepared as part of the CEMP. Specific measures would be identified in consultation with relevant government agencies and would be consistent with the principles and practices detailed in Landcom's (2004) Managing Urban Stormwater: Soils and Construction. The objectives and strategies of the soil and water management Sub-plan would include the following:	Pre-construction	Section 1.5	This Sub-plan has been prepared to address the CoA, REMMMs and EPOs relating to soil and water.

Ref #	Commitment	Timing	SWMP Reference	How Addressed
HY-6 (cont.)	Minimise the extent and duration of exposed surfaces (particularly those works that have the greatest potential to disturb soils that are contaminated or have a high erosion and runoff hazard).	Construction	Section 2.2	This objective has been adopted in this Sub-plan and the Construction Contaminated Land Management Sub-plan.
	Develop and implement adequate water quality control measures prior to the carrying out of significant earthwork or bridge construction activities.	Construction	Section 2.2	This objective has been adopted in this Sub-plan.
	Minimise and manage impacts on water quality and downstream receiving environments during instream activities.	Construction	Section 2.2	This objective has been adopted in this Sub-plan.
	Flood response measures for activities located on land affected by the 20 year ARI flood level (e.g. bridge support construction compounds), or works within waterways (such as bridge works).	Construction	n/a	This requirement has been addressed in the Flood Management Sub-plan.
	Where possible, reuse excavated materials as fill on other parts of the project in preference to disposing off-site in accordance with OEH's Waste Classification Guidelines (2016).	Construction	n/a	This requirement has been addressed in the Waste and Resource Management Sub-plan.
	Areas of potential contamination concern would be identified and works in these areas managed to minimise disturbance.	Construction	n/a	This requirement has been addressed in the Construction Contaminated Land Management Sub-plan.

Ref #	Commitment	Timing	SWMP Reference	How Addressed
HY-6 (cont.)	Excavate pre-classified contaminated materials and transfer such materials directly into haulage trucks for off-site disposal at a waste facility licensed to accept the contaminated material.	Construction	n/a	This requirement has been addressed in the Waste and Resource Management Sub-plan.
	Transport for NSW would also undertake consultation with DPI Fisheries with respect to the development for the CEMP, and Erosion and Sediment Control Plan for the project.	Pre-construction	Section 4 Appendix E	The Sub-plan will be issued to relevant stakeholders for consultation including DPI Fisheries.
	Develop procedures for the assessment, handling and stockpiling of potentially contaminated materials, in accordance with OEH's Waste Classification Guidelines (2016).	Pre-construction	n/a	This requirement has been addressed in the Construction Contaminated Land Management Sub-plan.
HY-7	During construction, any water collected from the worksites would be treated and discharged in accordance with current guidelines to avoid any potential contamination or local stormwater system impacts. These guidelines include: - The Blue Book - Managing Urban Stormwater: Soils and Construction (Landcom, 2004 and DEC 2008). - Transport for NSW Water Discharge and Reuse Guideline 7TP-SD-024.	Construction	Section 7, control measure SW-26 Appendix B	Appendix B provides a construction site dewatering and discharge procedure that was developed with reference to the nominated guidelines.

Ref #	Commitment	Timing	SWMP Reference	How Addressed
HY-7 (cont.)	All water (including groundwater) requiring disposal during construction would be tested and treated in accordance with the Transport for NSW Water Discharge and Reuse Guideline 7TP-SD-024 and the Waste Classification Guidelines (OEH, 2016) prior to disposal. If required, water treatment would occur to ensure guidelines are met prior to water disposal. Treatments may include sediment basins and pH neutralisation.	Construction	Section 7, control measure SW-27.	Appendix B provides a construction site dewatering and discharge procedure that was developed with reference to the nominated guidelines.
HY-8	Large areas of disturbance such as compound areas and stockpile sites would, where feasible and reasonable, be located away from any surface runoff flow paths and above the 10% AEP flood levels.	Construction	n/a	This requirement has been addressed in the Flood Management Sub-plan.
HY-9	The design of stormwater outlets would consider the need for scour protection measures. Typical scour protection might include concrete energy dissipating structures or dumped stone rip rap.	Pre-construction	Section 7.1	This is a technical requirement that will be addressed in the detailed design and the Environmental Design Review Reports.
HY-10	The construction planning will demonstrate that it has considered measures for construction of new or modification of existing bridges that minimise impacts on waterways (e.g. in a design report or constructability assessment). This would include consideration of:	Pre-construction	Section 7.1	An Environmental Design Review Report will be prepared for each stage of each design package by a suitably qualified environmental specialist. To complete the design review, the Environmental Specialist will review the design drawings and design package report, attend value engineering and safety in design workshops and liaise directly with the design engineers.

Ref #	Commitment	Timing	SWMP Reference	How Addressed
HY-10 (cont.)	Maximising use of pre-cast elements to minimise construction works within the floodplain.	Pre-construction	Section 7, control measure SW-04.	This will be addressed in the detailed design process.
	Minimising temporary formwork requirements and removal of formwork as soon as possible after completion of each work stage.	Construction	Section 7, control measure SW-05.	This will be addressed in the detailed design process.
	Minimising extent and duration of use of temporary structures required within the waterway.	Construction	Section 7, control measure SW-06.	This will be addressed in construction planning and documented in ECMs.
	Staging works to minimise the duration of construction activities within the waterway.	Construction	Section 7, control measure SW-07.	This will be addressed in construction planning and documented in ECMs.
GW-1	The design of embankments would incorporate adequate drainage to reduce compaction and/or sealing of the underlying aquifer.	Detailed Design	-	This REMMM has been addressed in the detailed design and will be reviewed in the relevant Environmental Design Review Reports.
GW-2	A condition assessment of existing buildings and infrastructure located in those areas that may potentially be affected by groundwater drawdown as a result of the project would be carried out prior to and following construction to monitor the risk of settlement from groundwater drawdown.	Pre- and Post-construction	Section 8.3 Section 8.5	The conditions assessments have been added to the Inspection and Monitoring and Reporting registers in Section 8 of this Sub-plan.
GW-3	Excavation techniques would be adopted to minimise impacts on aquifers.	Construction	Section 7, control measure SW-46	This will be addressed in construction planning and documented in ECMs.

Ref #	Commitment	Timing	SWMP Reference	How Addressed
GW-4	Hazardous material procedures (including procedures for managing spills and refuelling and maintaining construction vehicles/equipment) would be developed and implemented as part of the CEMP to minimise potential for groundwater quality impacts due to chemical spills.	Construction	Section 7, control measure SW-57 to SW-89	A range of control measures have been included based on the TfNSW's Chemical Storage and Spill Response Guidelines, (9TP-SD-066/3.0, 2015), TfNSW's Concrete Washout Guideline (3TP-SD-112/2.0, 2015) and relevant Australian Standards and Codes.
GW-5	No new wells would be drilled to extract water for construction use.	Construction	Section 7, control measures SW-45	No new wells will be drilled to extract water for construction use. Existing wells or alternate potable or non-potable construction water sources will be utilised.
SG-3	To manage potential impacts to geology and soils, the soil and water management plan prepared as part of the CEMP (refer HY-6 above) would include standard management measures to be implemented during construction, including (but not limited to): Erosion and sediment control plans would be prepared for each worksite in accordance with Volume 2D of Managing Urban Stormwater: Soils and Construction (Landcom, 2004). Due to the potential high erosion of soils along the alignment, the erosion and sediment control plans would be established prior to the commencement of construction and be updated and managed throughout as relevant to the activities during construction.	Pre-construction / Construction Construction	Section 7 Section 7, control measure SW-09 Appendix A	The following measures have been included in the environmental control measures in Section 7. The process for the preparation, implementation and review of ECSPs is outlined in Appendix A – Erosion and Sediment Control Procedure. These will be implemented and subject to regular inspections throughout construction.

Ref #	Commitment	Timing	SWMP Reference	How Addressed
SG-3 (cont.)	Stabilised surfaces would be reinstated as quickly as practicable after construction.	Construction	Section 7, control measure SW-12	This will be included in the preparation of ECSPs
	All stockpiled materials would be stored in bunded areas and kept away from waterways to avoid sediment entering the waterways.	Construction	Section 7, control measure SW-24	This requirement has been included in the Environmental Control Measures table.
	Sediment would be prevented from moving off-site and sediment laden water prevented from entering any watercourse, drainage line or drainage inlet.	Construction	Section 7, control measure SW-09 to SW-25	Controls to prevent the movement of sediment off site will be outlined in the ECSPs prepared in accordance with Appendix A – Erosion and Sediment Control Procedure.
	Clean water would be diverted around the work site in accordance with Managing Urban Stormwater: Soils and Construction (Landcom, 2004).	Construction	Section 7, control measure SW-10	The diversion of clean water around the works sites will be outlined in the ECSPs prepared in accordance with Appendix A – Erosion and Sediment Control Procedure.
	Erosion and sediment control measures would be regularly inspected (particularly following rainfall events) to ensure their ongoing functionality.	Construction	Section 7, control measure SW-23 Section 8.3	Erosion and sediment controls will be inspected weekly during changing site conditions and prior to and after major rainfall events (>20mm in 24hr).
	Erosion and sediment control measures would be left in place until the works are complete and areas are stabilised.	Construction	Section 7, control measure SW-22	Erosion and sediment controls will only be removed following the stabilisation of the upslope catchment.

Ref #	Commitment	Timing	SWMP Reference	How Addressed
SG-4	The presence of ASS along the project alignment would be confirmed through intrusive testing of soils in areas where ASS is likely to occur. Should ASS be identified during intrusive investigations at any section along the project, an ASS management plan would be required for construction of the project in these areas.	Pre-construction	Section 7, control measure SW-47 Appendix C	The Acid Sulfate Soil Management Procedure is presented in Appendix C of this Soil and Water Management Sub-plan.
	The ASS management plan should outline procedures for the safe handling, treatment and transport of potential/actual ASS excavated during construction or maintenance works and identify management measures, including: • Excavation procedures • Spoil storage and treatment • Dewatering and groundwater management • Bunding and measures to protect surrounding areas and waterways from the potential risk of acid contamination. The objective of the ASS management plan would be to comply with all statutory requirements and implement all environmental controls to minimise and manage impacts on the environment from the disturbance of potential or actual ASS.	Construction	Section 7, control measure SW-48 Appendix C	An EWMS and ECM would be prepared where ASS is identified to detail the implementation of the Acid Sulfate Soil Management Procedure.

Ref #	Commitment	Timing	SWMP Reference	How Addressed
AQ-1	An air quality and dust management plan would be developed and implemented as part of the CEMP. This plan would identify triggers and procedures for dealing with significant dust generating activities, with the aim of minimising impacts on surrounding sensitive receivers. Air quality and dust management measures that would be identified in the CEMP would include:	Pre-construction / Construction	Air Quality Management Sub-plan	Although the majority of REMMM AQ-1 is been addressed in the Air Quality Management Sub-plan, the relevant requirements that relate to soil and water, erosion and sediment control and in stream works have also been addressed in this Sub-plan.
	Apply wheel-wash or rumble grid facilities as appropriate to remove loose material and prevent the tracking of spoil debris onto local roads.	Construction	Section 7, control measure SW-20	The requirements for wheel-wash or rumble grid facilities have been included in the Environmental Control Measures table.
	Clean loose materials and debris from the tailgate of vehicles unloading materials to stockpiles prior to departure from site.	Construction	Section 7, control measure SW-21	The requirement to clean loose materials and debris from the tailgate of vehicles have been included in the Environmental Control Measures table.
	Stockpiles left for extended periods would be grassed or covered with appropriate material.	Construction	Section 7, control measure SW-25	The requirement to stabilise or cover stockpiles has been included in the Environmental Control Measures table.
HR-5	Environmental management measures relating to hazards and risk would be developed and implemented as part of the CEMP. These would include:	Pre-construction / Construction	n/a	Hazard and risk identification and management is addressed in section 1.5.1 of the CEMP.
	Potential environmental hazards and risks associated with construction activities would be identified prior to construction.	Pre-construction	n/a	Hazard and risk identification and management is addressed in section 1.5.1 of the CEMP.

Ref #	Commitment	Timing	SWMP Reference	How Addressed
HR-5 (cont.)	The storage of hazardous materials, and refuelling/maintenance of construction plant and equipment would be carried out in clearly marked and bunded areas within the construction site that are designed to contain spills and leaks in accordance with Australian Standards and DECCW guidelines.	Construction	Section 7, control measure SW-57	Chemical storage and refuelling areas will be identified in ECMs and monitored during routine inspections. Flammable liquid cabinets shall be included at each compound where liquid chemicals area being stored. Bunded pallets will be provided for storage of chemical during works and returned to flammable liquid cabinets at the end of shift.
	Hazardous materials would not be stored below the 10% AEP flood level flood level.	Construction	n/a	This requirement has been addressed in the Flood Management Sub-plan (Construction)
	Chemical spill kits would be readily available and accessible to construction workers. Kits would be kept at site compounds and on specific construction vehicles, and all hazardous materials spills and leaks would be reported to site managers and actions would be immediately taken to remedy spills and leaks.	Construction	Section 7, control measure SW-77	Chemical spill kits will be provided at compounds and on specific construction vehicles. These will be monitored during routine inspections.
	Employees would be trained in the correct use of spill kits.	Construction	Section 7, control measure SW-80 Section 8.2 - Training	The requirement for spill kit training has been included in the Environmental Control Measures table.

3.4 Environmental Performance Outcomes

Relevant Environmental Performance Outcomes (EPOs) are listed in Table 3-3 below. This includes reference to required outcomes, the timing of when the commitment applies relevant documents or sections of the environmental assessment influencing the outcome and implementation.

Table 3-3 Environmental Performance Outcomes relevant to this SWMP

ID Ref#	Environmental Performance Outcome	Timing	SWMP reference	How Addressed
EPO-SG-1	Erosion and sediment controls during construction would be implemented in accordance with Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and Managing Urban Stormwater: Soils and Construction Volume 2 (Department of Environment and Climate Change, 2008a)	Construction	Section 6, Environmental Control Measures SW-09 Appendix A – Erosion and Sediment Control Procedure	Erosion and sediment control plans will be prepared by competent personnel that with complete training in the preparation of Erosion and Sediment Control Plans in accordance with Managing Urban Stormwater: Soils and Construction Volume 1 and 2. Erosion and sediment control plans for moderate or high-risk areas, such as works adjacent to or within waterways, will be reviewed by a Soil Conservationist expert.
EPO-SG-2	There would be no impacts on aquatic environments associated with the disturbance of ASS during construction.	Construction	Section 6, Environmental Control Measures SW-47 to-48 Appendix C – Acid Sulfate Soil Management Procedure.	The presence of ASS along the alignment will be confirmed through intrusive testing of soils. Any ASS disturbed by the project will be managed in accordance with the Acid Sulfate Soil Management Procedure presented in Appendix C.

4 Consultation

In accordance with CoA C5, this SWMP is required to be developed in consultation with DoI Water, EPA, City of Parramatta Council and Cumberland Council.

This SWMP has been endorsed by the Environmental Representative (ER), including the Water Quality (Turbidity) Monitoring Program provided in **Appendix D**, prior to the commencement of construction as required by the CoA.

The Sub-plan including the Water Quality (Turbidity) Monitoring Program, as submitted to DPIE, including any minor amendments approved by the ER, will be implemented for the duration of construction.

This consultation is intended to assist in the development and finalisation of the Sub-plan. Table 4-1 summarises the relevant stakeholder reviews and responses. Detailed consultation log and response to comments are provided in **Appendix E**.

Table 4-1 Summary of Consultation and Approval

Agency	Requirement	Status	Response	Date
EPA	Minor changes to clarify reporting to EPA	Addressed	Closed	17/10/19
DPI Fisheries	No comments	-	-	27/06/19
Natural Resources Access Regulator (NRAR)	No comments	-	-	15/07/19
City of Parramatta Council	No comments	-	-	08/07/19
Cumberland Council	No comments	-	-	11/07/19

5 Existing Environment

The following sections summarise what is known about factors influencing soils and water within and adjacent to the Project corridor.

The key reference documents are:

- EIS Section 10.6 Soil and Geology
- EIS Technical Paper 6 – Water Quality Assessment
- A preliminary investigation and Technical Memorandum of Actual/Potential ASS was prepared by Golder (2018).

5.1 Topography

The topography along the Project corridor is predominantly undulating, with flat areas along creek floodplains and Parramatta CBD area. West of the Parramatta CBD, the Project corridor follows Hawkesbury Road north of Westmead Station, over a low ridge at approximately 20m - 25m above sea level. The Project descends to cross the Parramatta River and its associated floodplain around Cumberland Hospital, before following the edge of a low, flat ridge spur and descending through Parramatta North along Church Street south to the river where it crosses Lennox Bridge.

The Project alignment south of the river, through the CBD to the proposed junction at Camellia, is predominantly floodplain or low river terrace, less than 10m above sea level. North of the river, the floodplain and associated terraces are narrower as they are confined by the adjacent slopes of the Hornsby Plateau.

North of the proposed junction at Camellia, the Project corridor follows through a low, swampy region that results from the outflow of Vineyard and Subiaco Creeks in the industrial region west of Rydalmere. The Project ascends a ridge north through Dundas and Telopea towards Carlingford with the steepest rise from 45m to 100m at a gradient of 3.5 per cent.

Just south of Carlingford the alignment joins the higher ridgeline containing Pennant Hills Road and then follows a short descent of the upper slopes to terminate just north of the road at an elevation of about 100 metres.

5.2 Geology and soil

The Project corridor is located towards the boundary of the Cumberland Plain, a large low-lying and gently undulating region of the western Sydney Basin. To the north and east, the project intersects the elevated and highly dissected Hornsby Plateau. The majority of the Cumberland Plain is underlain by late Triassic shales of the Wiannamatta Group. The higher ground of the Hornsby Plateau to the north and east is composed of Hawkesbury Sandstone.

More recent Quaternary fluvial deposits associated with the drowned valley estuary of the Parramatta River are also evident, particularly to the south of the channel around James Ruse Drive. To the east of the Rosehill Gardens Racecourse, the project passes through an area mapped as manmade fill mixed with older estuarine deposits.

Where the project alignment crosses to the north of the Parramatta River and diverts to the Carlingford branch line, there is a small area of saline swamp along the fringe of the Hawkesbury Sandstone associated with the outflow of Vineyard and Subiaco Creeks comprising organic mud, peat, clay, silt, marine sand and fluvial sand.

Soils landscapes along the project alignment are varied, reflecting the influence of the diverse underlying geologies and topography of the project area. Much of the project alignment is within existing roads or the Carlingford Rail line and as such, the upper soil profiles will be dominated by road or rail formation.

5.3 Acid Sulphate Soils

Acid Sulphate Soils (ASS) are naturally occurring soils that contain sulphides that oxidise when exposed to air and produce sulfuric acid, toxic quantities of aluminium and other heavy metals. These soils are found in coastal floodplains and adjacent to rivers and creeks at elevations below 5m. Reaction products are at a high risk of being released into the surrounding environment and polluting nearby surface water.

The locations identified for probable locations for ASS are near the Parramatta River, including:

- Parramatta River Bridge and James Hardie Underpass
- Bridge Road Bridge
- James Ruse Drive Bridge
- Vineyard Creek
- Utility Works and Sewer Upgrades/Replacement (risks throughout the Project)
- Overhead Line Equipment (throughout the Project).

In areas of ASS, construction activities such as excavation, land clearing and drainage risk disturbing ASS. Dewatering activities also have potential to oxidise potential ASS by lowering the groundwater table, generating actual ASS and acidic run-off.

A preliminary investigation and Technical Memorandum of Actual/Potential ASS was prepared by Golder (2018), which identifies key locations where ASS is likely to be encountered during construction. Overall, there is a risk of encountering ASS throughout the Project, with highest areas of risk close to the Parramatta River.

Appendix C provides further details and maps of the ASS risk along the Project alignment.

5.4 Surface water

The project lies within the Parramatta River catchment which encompasses an area of approximately 297 square kilometres. The Parramatta River Catchment is made up of 29 sub-catchments and is largely referred to as the Upper and Lower Parramatta River. The Upper Parramatta River refers to the freshwater section of the river and is controlled by a series of weirs including Kiosk Weir and Upstream Weir in Parramatta Park, Marsden Weir and Charles Street Weir in the Parramatta CBD which defines the tidal boundary with the Lower Parramatta River.

The project traverses the following waterways:

- Parramatta River (Upper) at the Cumberland Hospital, North Parramatta
- Parramatta River (Upper) where Church Street Bridge enters Eat Street and Parramatta CBD
- Clay Cliff Creek on Tramway Avenue, Rosehill
- Parramatta River (Lower) at the Carlingford Railway Crossing, Camelia
- Vineyard Creek on the Carlingford Railway at Rydalmere.

The Parramatta River catchment has undergone significant development, comprising of a variety of land uses including residential, commercial, industrial. Once heavily industrialised, the catchment is known to contain contaminated sediments. In addition to contaminated sediments, there are areas that have a high probability of occurrence for Acid Sulfate Soils (ASS) throughout the catchment.

Clay Cliff Creek drains a small catchment area of 3.1 square kilometres extending from Merrylands in the west to Harris Park in the east. The creek is largely an open concrete lined channel (used for the conveyance of stormwater) that flows east and into the Parramatta River at James Ruse Drive Bridge.

Vineyard Creek drains a small catchment area of five square kilometres that flows south and discharges into the Parramatta River downstream of the Parramatta River CBD. The catchment and the creek are highly modified.

5.4.1 Water Quality Objectives

Water Quality Objectives are values or uses of the environment that are important for a healthy ecosystem or for public benefit or health. They are values that require protection from the effects of pollution and waste discharges (ANZECC/ARMCANZ, 2000).

The nominated Water Quality Objectives for the Upper Parramatta River, which is highly urbanised and largely impacted by stormwater and wastewater overflows, include:

- Aquatic ecosystems
- Visual amenity
- Secondary contact recreation
- Primary contact recreation (by 2025).

The nominated Water Quality Objectives for the Lower Parramatta River, which is classified as the upper estuary and is characterised by a mix of fresh and saline waters, the nominated environmental values include:

- Aquatic ecosystems
- Visual amenity
- Secondary contact recreation
- Primary contact recreation
- Aquatic foods (cooked).

The numerical trigger values associated with relevant Water Quality Values are summarised in **Table 5-1**.

Table 5-1: Water Quality Objective Indicator Trigger Values

Water Quality Objective	Indicator	Numerical Criteria (Trigger Values)	
		Lowland River	Estuary
Aquatic ecosystems	Total phosphorus	25 µg/L	30 µg/L
	Total nitrogen	350 µg/L	300µg/L
	Chlorophyll-a	5 µg/L	4 µg/L
	Turbidity	6–50 NTU	0.5–10 NTU
	Salinity (electrical conductivity)	125–2200 µS/cm	n/a
	Dissolved oxygen	85–110%	80–110%
	pH	6.5–8.5	7.0–8.5
Visual amenity	Visual clarity and colour	Natural visual clarity should not be reduced by more than 20%. Natural hue of the water should not be changed by more than 10 points on the Munsell Scale. The natural reflectance of the water should not be changed by more than 50%.	
	Surface films and debris	Oils and petrochemicals should not be noticeable as a visible film on the water, nor should they be detectable by odour. Waters should be free from floating debris and litter.	
	Nuisance organisms	Macrophytes, phytoplankton scums, filamentous algal mats, blue-green algae, sewage fungus and leeches should not be present in unsightly amounts.	

Water Quality Objective	Indicator	Numerical Criteria (Trigger Values)	
		Lowland River	Estuary
Secondary contact recreation	Faecal coliforms	Median bacterial content in fresh and marine waters of < 1000 faecal coliforms per 100 mL, with 4 out of 5 samples < 4000/100 mL (minimum of 5 samples taken at regular intervals not exceeding one month).	
	Enterococci	Median bacterial content in fresh and marine waters of < 230 enterococci per 100 mL (maximum number in any one sample: 450-700 organisms/100 mL).	
	Algae & blue-green algae	< 15 000 cells/mL	
	Nuisance organisms	Use visual amenity guidelines. Large numbers of midges and aquatic worms are undesirable.	
	Chemical contaminants	Waters containing chemicals that are either toxic or irritating to the skin or mucous membranes are unsuitable for recreation. Toxic substances should not exceed values in tables 5.2.3 and 5.2.4 of the ANZECC 2000 Guidelines.	
	Visual clarity and colour	Use visual amenity guidelines.	
	Surface films	Use visual amenity guidelines.	
Primary contact recreation	Turbidity	6 NTU	6 NTU
	Faecal coliforms	< 150 faecal coliforms per 100 mL, with 4 out of 5 samples < 600/100 mL (minimum of 5 samples taken at regular intervals not exceeding one month).	
	Enterococci	Median over bathing season of < 35 enterococci per 100 mL (maximum number in any one sample: 60-100 organisms/100 mL).	

Water Quality Objective	Indicator	Numerical Criteria (Trigger Values)	
		Lowland River	Estuary
	Protozoans	Pathogenic free-living protozoans should be absent from bodies of fresh water. (Note, it is not necessary to analyse water for these pathogens unless temperature is greater than 24 degrees Celsius).	
	Algae & blue-green algae	< 15 000 cells/mL	
	Nuisance organisms	Use visual amenity guidelines	
	pH	5.0-9.0	
	Temperature	15°-35°C for prolonged exposure	
	Chemical contaminants	Waters containing chemicals that are either toxic or irritating to the skin or mucus membranes are unsuitable for recreation.	
	Visual clarity and colour	Use visual amenity guidelines	
	Surface films	Use visual amenity guidelines	
Aquatic foods (cooked)	Faecal coliforms	median faecal coliform concentration should not exceed 14 MPN/100mL; with no more than 10% of the samples exceeding 43 MPN/100 mL	
	Toxicants (as applied to aquaculture activities)	Copper: less than 5 µgm/L. Mercury: less than 1 µgm/L. Zinc: less than 5 µgm/L.	
	Physico-chemical indicators (as applied to aquaculture activities)	Suspended solids: less than 40 micrograms per litre (freshwater) Temperature: less than 2 degrees Celsius change over one hour.	

5.4.2 Existing Water Quality

The EIS Technical Paper 6 – Water Quality Assessment provided baseline water quality values for the Upper Parramatta River and Vineyard Creek based on a review of available monitoring data collected from 2012 to 2016 incorporating seasonal and rainfall effects. These are presented in **Table 5-2**. Data was not provided for the tidal Parramatta River (Lower) or Clay Cliff Creek. Based on the available baseline data, the existing water quality complies with the nominated water quality objectives (refer to Section 5.4.1).

Table 5-2 Summary of Existing Water Quality

Indicator	Parramatta River Upper (Lennox Bridge)	Vineyard Creek
pH	7.9	7.35
Conductivity	453	341
Dissolved Oxygen (% saturation)	105.35	Not available
Turbidity (NTU)	11.7	28
TSS (mg/L)	13	26

5.5 Groundwater

There are two major aquifer systems identified in the Project area:

- A shallow groundwater system comprising shallow weathered sandstone and shale overlain by alluvial deposits and fill; and
- A regional groundwater unit is expected to exist within the deeper confined Hawkesbury Sandstone.

It's expected that the groundwater throughout the Project area will follow the topography and flow broadly towards Parramatta River.

A shallow groundwater table within 1.3m to 8.8m has been identified along the estuarine deposits adjacent to the Parramatta River and in Camellia. In elevated areas, groundwater is expected in bedrock and perched groundwater may be present above the bedrock.

5.5.1 Groundwater dependent vegetation communities

The location of groundwater dependant ecosystems (GDEs) within the Sydney Basin is mapped by the Bureau of Meteorology Atlas of Groundwater Dependent Ecosystems (2017). A review of the *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011* indicates there are no listed high priority GDEs located in the project area, and no GDEs reliant on the surface expression of groundwater within or near the project area. Furthermore, previous investigation concerning GDE's (WSP, 2017) found that wetland vegetation relies on surface water sourced from the Parramatta River with no direct link to groundwater.

An exception is four vegetation communities in Vineyard Creek Reserve at Telopea and some vegetation along the Parramatta River and Duck River which has been identified as potentially partially reliant on subsurface groundwater (WSP, 2017). The vegetation types reliant on groundwater were:

- Flax-leaved Paperbark, Coastal Swamp Forest
- Forest Red Gum, Coastal Floodplain Wetlands
- Mangrove Forests, Swamps

- Swamp Oak, Coastal Floodplain Wetlands.

This vegetation is considered likely to interact with groundwater from the shallow water table or in the capillary zone (WSP, 2017).

Most watercourses within the project area are highly urbanised, with low flow velocities/ stagnant water conditions, and most flow events occur in direct response to major rainfall events rather than receiving baseflow contribution from the underlying aquifer.

5.5.2 Groundwater chemistry

The following contaminants have potential to present unacceptable risk to human health and the environment during construction and/or operation of the Project if not managed correctly (Coffey, 2017):

- Bore HA01: Polycyclic aromatic hydrocarbon (PAH) and total recoverable hydrocarbon (TRH) impacted surface soil (fill)
- Bore TP53: PAH impacted soil (fill)
- Bore TP55A: Lead impacted surface soil (fill)
- From the four groundwater samples collected from within the disturbance footprint (BH25, BH19B, BH20A, and BH16), significant contamination has not been identified. Trace levels of petroleum hydrocarbons including benzene, toluene, ethylbenzene and xylene compounds were detected in groundwater samples, but at concentrations below the adopted criteria.

5.6 Rainfall

Table 5-3 and **Figure 5-1** summarises monthly mean rainfall and the mean number of rainfall days for the project area based on observations from the Bureau of Meteorology Parramatta North weather station (site number 066124). Rainfall is characterised by generally increasing rainfall quantities in Summer to Autumn and dryer periods in later winter and spring.

Table 5-3 Mean Rainfall Information (source Bureau of Meteorology)

Monthly Mean Rainfall – 1965-2019													
	Jan	Feb	Mar	Apr	Mar	Jun	July	Aug	Sep	Oct	Nov	Dec	Ann.
Mean (mm)	73.4	102.2	121.3	110.4	91.0	67.2	92.8	44.5	55.3	51.1	68.7	84.6	967.1
Days >1mm	7.7	8.8	9.2	9.7	7.2	6.9	7.5	5.4	5.2	5.9	7.6	8.7	89.8

Parramatta North (Masons Drive) Weather Station (site Number 066124)

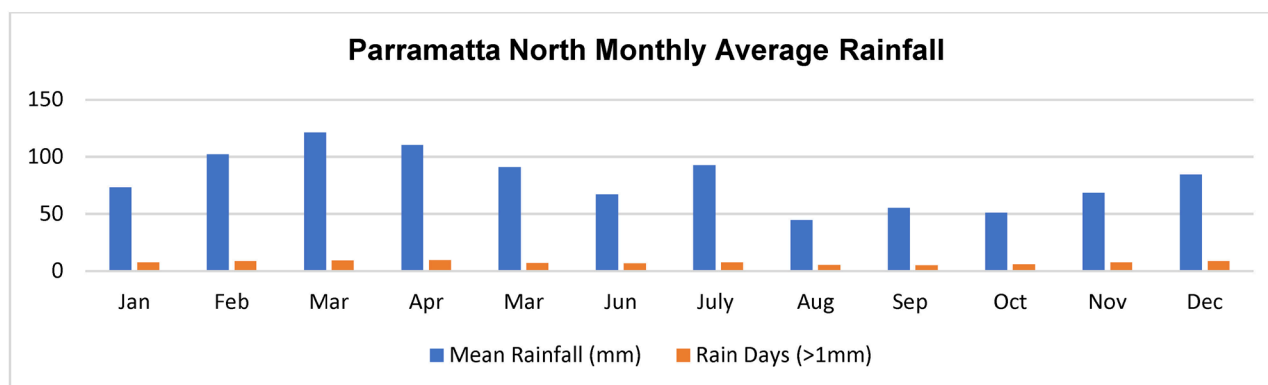


Figure 5-1: Parramatta North Average Monthly Rainfall

5.7 Rainfall erosivity factor

The rainfall erosivity factor is a measure of the ability of rainfall to cause erosion (referred as “R” in the Revised Universal Soil Loss Equation RUSLE). The rainfall erosivity factor is used to determine the soil loss in tonnes per hectare over one year, and is used in calculations when sizing construction sediment basins.

The Project has a Rainfall Erosivity Factor of 1774.5 SI. Parramatta North weather station (site number 066124) is the closest location with detailed R-factor data and is detailed below in **Table 5-4** below.

Table 5-4 Monthly % and annual rainfall erosivity (R - factor) values for Parramatta North

Monthly % and annual rainfall erosivity (R – factor) values													
	Jan	Feb	Mar	Apr	Mar	Jun	July	Aug	Sep	Oct	Nov	Dec	Year
%	8	11	13	11	9	7	10	5	6	5	7	9	100
R - Value	135	188	224	204	168	124	171	82	102	94	127	156	1775

5.8 Flooding

Localised overland flow flooding is the accumulation of surface runoff water and is known to occur on a frequent basis where the existing council drainage system, consisting mainly of pits and pipes, has limited capacity.

Riverine flooding is generally confined to the banks of the Parramatta River between the Westmead precinct and O’Connell Street Bridge on the western edge of the Parramatta CBD precinct in all events up to the one per cent AEP. Further downstream of this point, riverine flooding also occurs in Brickfield Creek and Clay Cliff Creek, which discharge to the Parramatta River. In some flood events, the high-water levels in Parramatta River prevent the overland flow runoff from draining out of the Brickfield Creek and Clay Cliff Creek catchments.

The management of risks associated with flooding during construction is addressed in the Flood Management Sub-plan.

6 Environmental aspects and impacts

6.1 Construction activities

Key aspects of the Project that could result in adverse impacts to soils and water include:

- Bulk earthworks
- Vegetation clearing and topsoil stripping
- Site access
- Enabling works / demolition
- Utility realignment works (all utility providers)
- Construction of drainage pits and pipes
- Bridge construction and piling (in-stream works)
- Slope or embankment creation/stabilisation processes
- Temporary Works in waterways
- Compounds operation including fuel and chemical storage, refuelling and chemical handling
- Concrete paving activities and concrete cutting
- Asphalt paving and bitumen sprayers
- Dewatering of excavations and sediment basins.

Refer also to the Environmental Risk Register included in Appendix A2 of the CEMP.

6.2 Impacts

The potential for impacts on soil and water will depend on many factors. Primarily impacts will be dependent on the nature, extent and magnitude of construction activities and their interaction with the natural environment. Construction-related risks associated with climate change which may include more frequent extreme rainfall events, extreme heat and wind conditions and increased bushfire risks may exacerbate the below impacts.

Potential impacts attributable to construction might include:

- Erosion and sediment mobilisation from disturbed areas or stockpiles resulting in increased turbidity in receiving waters and/or deposition of sediment in stormwater pits and drainage
- Discharge of turbid water from excavations and sediment basins impacting receiving waters
- Interception of groundwater aquifers
- Disturbance acid sulfate soils resulting in generation of acidic leachate entering receiving waters
- In-stream works mobilising sediments in waterways
- Chemical spills resulting in pollution of surface waters or contamination of groundwater
- Concrete works and washout resulting in discharge of cementitious water contaminating land, groundwater or surface waters
- Hydrocarbon runoff from asphalt paving or bitumen seals
- Flooding runoff reaching site areas (compounds, stockpiles, vehicles, sediment basins).

Some impacts on soil and water attributable to the Project are anticipated. Relevant aspects and the potential for related impacts have been considered in a risk assessment at Section 1.5.1 and Appendix A2 of the CEMP. Chapter 7 provides a suite of mitigation measures that will be implemented to avoid or minimise those impacts.

7 Environmental control measures

7.1 Design Review

An Environmental Design Review Report will be prepared for each stage of each design package by a suitably qualified environmental specialist. To complete the design review, the Environmental Coordinator will review the design drawings and design package report, attend value engineering and safety in design workshops and liaise directly with the design engineers.

7.2 Environmental control measures

Specific measures and requirements to meet the objectives of this SWMP and to address impacts on soil and water are outlined in Table 7-1.

Table 7-1 Soil and water management and mitigation measures

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
Design Management Controls					
SW-01	Crossing design will adhere to relevant policies and guidelines including the fish friendly passage guidelines (Fairfull and Witheridge, 2003) for waterway crossings and avoid/minimise disruption to fish movements and the Policy and guidelines for fish habitat conservation and management (Department of Primary Industries, 2013).	Environmental design review reports	Detailed design	Design Manager	REMMM BI-3
SW-02	The design of stormwater outlets will consider the need for scour protection measures. Typical scour protection might include concrete energy dissipating structures or dumped stone rip rap.	Environmental design review report	Detailed design	Design Manager	REMMM HY-9
SW-03	The construction planning for new bridges, and modification of new existing bridges, will consider measures to minimise impacts on waterways. This will include consideration of:	Environmental design review reports	Detailed design	Design Manager	REMMM- HY-10
SW-04	Maximising use of pre-cast elements to minimise construction works within the floodplain.	Environmental design review reports	Detailed design	Design Manager	REMMM- HY-10
SW-05	Minimising temporary formwork requirements and removal of formwork as soon as possible after completion of each work stage.	Environmental design review reports.	Detailed design	Design Manager	REMMM- HY-10

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-06	The extent and duration of temporary structures required within the waterway be kept to a minimum.	ECM	Construction	Area Manager	REMMM- HY-10
SW-07	Works will be staged to minimise the duration of construction activities within the waterway.	ECM	Construction	Area Manager	REMMM- HY-10
SW-08	Water quality control measures shall be installed as early as possible in the construction program and will be designed / selected to meet identified receiving water objectives.	ECM	Construction	Area Manager	Best practice
Erosion and Sediment Control					

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-09	All erosion and sediment controls at the premises must be maintained until all disturbed areas are stabilised. Erosion and sediment control plans will be prepared and implemented for each worksite in accordance with Volume 2D of Managing Urban Stormwater: Soils and Construction (Landcom, 2004 prior to the commencement of construction and be updated and managed throughout as relevant to the activities during construction. Climate change risks associated with increased frequency and severity of rainfall events would be considered during the development of erosion and sediment control plans. For areas or activities of low erosion and sediment control risk, the ESCP may be incorporated into the ECM at the discretion of the Environment and Sustainability Manager. The Erosion and Sediment Control Plan Procedure is provided in Appendix A.	Erosion and sediment control plans	Prior to construction/ Construction	Environment Coordinator	CoA E111 REMMM-SG3 REMMM CC-2
SW-10	Non-site water flowing into or through the site will be identified on erosion and sediment control plans. Non-site water will be diverted around the work site (or isolated from site water) prior to ground breaking activities.	Erosion and sediment control plans	Prior to construction	Environment Coordinator Site Supervisor	REMMM SG-3

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-11	The extent and duration of all exposed surfaces (particularly those works that have the greatest potential to disturb soils that are contaminated or have a high erosion and runoff hazard) will be minimised as far as practical. This will include: • Only commence works when resources are available. • Only disturbing areas required to complete the works. • Installation of temporary stabilisation of disturbed areas as quickly as possible (e.g. wrapping batters with bidum geo-fabric progressively during earthworks).	Erosion and sediment control plans	Construction	Environment Coordinator Site Supervisor	REMMM HY-6
SW-12	Stabilised surfaces will be reinstated as quickly as practicable after construction. This may include including partial reinstatement of areas available.	ECM	Construction	Site Supervisor	REMMM-SG3

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-13	Sediment controls will be installed to prevent sediment from moving off-site and sediment laden water prevented from entering any watercourse, drainage line or drainage inlet. Sediment controls will include: • Sediment basins where soil loss is greater than 150 cubic metres per year. • Sediment filters and sediment fences where soil loss is less than 150 cubic metres per year. • Coir logs. • Stormwater drainage pit controls including drain wardens.	Sediment fences materials Coir logs Sandbags Drain Wardens	Construction	Site Supervisor Environment Coordinator	REMMM-SG3
SW-14	Where required, sedimentation basins will be constructed prior to the commencement of bulk earthworks.	Temporary works design	Construction	Site Supervisor	Best practice
SW-15	Space permitting, basins will be designed to capture and treat all run off from an 85th percentile, 5-day rainfall event and identified and located in the document titled "Parramatta Light Rail Package 4 Discharge Point Register" and maintained on electronic file EF19/29672 by the EPA.	Temporary works design	Design	Environment and Sustainability Manager	Best practice
SW-16	Basin inlets and spillways must be constructed as soon as possible using rock protection / rock filled woven galvanised steel mattresses or concrete laid on a needle punched, mechanically bonded, non-woven geotextile filter fabric before any outflow from the basin.	Signage	Construction	Environment and Sustainability Manager	Best practice

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-17	Each sediment basin will be clearly signed. The sign will provide the basin ID, design capacity and means to indicate if the basin is suitable for discharge.	Signage	Construction	Environment and Sustainability Manager	Best practice
SW-18	The cycle time to empty and return to maximum storage capacity any individual construction water quality basin prior to the next rainfall event shall not exceed 5 days unless permitted by the Project Environmental Protection Licence.	Signage	Construction	Environment and Sustainability Manager	Standard EPL condition
SW-19	Clean out sediment basins/traps in accordance with the maintenance schedule or whenever the accumulated sediment exceeds 30 per cent of the sediment storage zone.	Signage	Construction	Environment and Sustainability Manager	Blue Book
SW-20	All feasible and reasonable measures to minimise soil or mud from the premises being deposited on public roads in the vicinity of the premises. Apply wheel-wash or rumble grid facilities as appropriate to remove loose material and prevent the tracking of spoil debris onto local roads. Road surfaces subject to tracking of material by vehicles leaving the premises are cleaned at the end of each work day.	Wheel wash	Construction	Site Supervisor Environment Coordinator	REMMM AQ-1 EPL O5.5
SW-21	Clean loose materials and debris from the tailgate of vehicles unloading materials to stockpiles prior to departure from site.	Labourer	Construction	Site Supervisor Environment Coordinator	REMMM AQ-1 EPL Condition O5.5

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-22	Erosion and sediment control measures will be left in place until the works are complete and areas are stabilised.	-	Construction	Site Supervisor Environment Coordinator	REMMM-SG3
SW-23	Erosion and sediment control measures will be regularly inspected (particularly following rainfall events) to ensure their ongoing functionality.	Erosion and sediment control plans / ECM	Construction	Site Supervisor Environment Coordinator	REMMM-SG3
SW-24	All stockpiled materials will be stored in bunded areas (where there is a risk of sediment run-off) and kept away from waterways to avoid sediment entering the waterways.	Erosion and sediment control plans / ECM	Construction	Site Supervisor Environment Coordinator	REMMM-SG3

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-25	Stockpiles during construction will be stabilised within 20 working days of inactivity (even though works might continue later). Stabilisation constitutes a C-factor of 0.15 which may be achieved by one of the following (in order of preference): • Cover with mulch and temporary seeding • Cover with biodegradable jute matting and temporary seeding • Hydro mulching / hydroseeding / bonded fibre • Application of polymer soil stabilisers • Cover with non-biodegradable fibres (bidum geofabirc) Refer to the Blue Book Table A3 Soil Stabilisation Control Matrix for other alternatives.	Jute matting Cover crop seed Hydro mulch / hydroseed Polymer soil stabilisers, water truck or furphy water cart Bidum geofabirc	Within 20 working days of inactivity	Site Supervisor	Blue Book REMMM AQ-1
Construction water reuse and discharge					
SW-26	During construction, any water collected from the worksites will be treated and discharged in accordance with current guidelines to avoid any potential contamination or local stormwater system impacts. These guidelines include: • The Blue Book - Managing Urban Stormwater: Soils and Construction (Landcom, 2004 and DEC 2008). • Transport for NSW Water Discharge and Reuse Guideline 7TP-SD-024.	Erosion and sediment control plans. Water Discharge Permit procedure	Construction	Site Supervisor Environment Coordinator	REMM HY-7

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-27	All water (including groundwater) requiring disposal during construction will be tested and treated in accordance with the Transport for NSW Water Discharge and Reuse Guideline 7TP-SD-024 and the Waste Classification Guidelines (OEH, 2016) prior to disposal.	Water Discharge Permit procedure	Construction	Site Supervisor Environment Coordinator	REMMM HY-7
SW-28	Water may only be discharged from the premises at locations permitted by and in accordance with the criteria and locations specified in an EPL.	Water Discharge Permit	Construction	Site Supervisor Environment Coordinator	EPL condition.
SW-29	Water may be reused on site, for example, for dust suppression, to assist with compaction or for watering landscape/bush regeneration areas. The TSS criterion does not apply to if the reuse will not be discharged to any waters. However, pH testing and a visual inspection for oil or grease must be undertaken.	Water Discharge Permit	Construction	Site Supervisor Environment Coordinator	TfNSW Water Discharge and Reuse Guideline (7TP-SD-146/4.0)
SW-30	Reuse of water on site is only permitted where: - it can be applied without causing erosion - any runoff generated by the reuse is controlled entirely within the site boundary - appropriate sediment controls are installed and maintained in accordance with the Blue Book.	Water Discharge Permit	Construction	Site Supervisor Environment Coordinator	TfNSW Water Discharge and Reuse Guideline (7TP-SD-146/4.0)

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-31	If required, water treatment will occur to ensure guidelines are met prior to water disposal. Treatments may include sediment basins and pH neutralisation. Sediment basins will be designed by hydrologic engineer in accordance with the sizing requirements of the Blue Book. If the receiving catchment of a basin increases from that calculated during design, the sizing will be reviewed by a Soil Conservationist (Certified Erosion and Sediment Control Professional).	Water Discharge Permit Acid, Ag Lime, Gypsum or another flocculant.	Construction	Site Supervisor Environment Coordinator Design Engineer Soil Conservationist (Certified Erosion and Sediment Control Professional).	REMMM HY-07
SW-33	Oil and grease will be assessed visually immediately prior to discharge (e.g. sheen, discolouration). Water will not be discharged if oil and grease is visually evident.	Water Discharge Permit	Construction	Site Supervisor Environment Coordinator	TfNSW Water Discharge and Reuse Guideline (7TP-SD-146/4.0)
SW-34	Water contaminated with oil and grease the must either be disposed of at a licenced disposal facility, or treated using appropriate absorbent materials, which must be spread on the surface.	Water Discharge Permit	Construction	Site Supervisor Environment Coordinator	TfNSW Water Discharge and Reuse Guideline (7TP-SD-146/4.0)
SW-35	pH should be assessed using a pH probe or water quality metre prior to discharge. Water will not be discharged if pH is not within the range 6.5 – 8.5 or limits specified within an EPL.	Water Discharge Permit	Construction	Site Supervisor Environment Coordinator	TfNSW Water Discharge and Reuse Guideline (7TP-SD-146/4.0)

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-36	If pH is outside the range 6.5–8.5 the water will need to be neutralised by: • mixing with other site water of a higher or lower pH to achieve pH 6.5-8.5 • if the water is above 8.5, acid (such as citric or hydrochloric) is used to lower the pH; • if the water is below 6.5 a base (such as Ag lime) is used to raise the pH. Re-test the water pH following treatment – repeat as necessary, until the acceptable pH 6.5 – 8.5 range is reached.	Water Discharge Permit Citric or hydrochloric acid Ag Lime	Construction	Site Supervisor Environment Coordinator	TfNSW Water Discharge and Reuse Guideline (7TP-SD-146/4.0)
SW-37	Total suspended solids (TSS) will be assessed prior to discharge off site to surface water based on a laboratory assessment.	Water Discharge Permit	Construction	Site Supervisor Environment Coordinator	TfNSW Water Discharge and Reuse Guideline (7TP-SD-146/4.0)
SW-38	A statistical correlation which identifies the relationship between NTU and TSS for water quality in the sediment basin/s to determine the NTU equivalent of 50 mg/L TSS before its use if permitted by the EPA.	NTU and TSS Statistical correlation agreed to by EPA	Construction	Environment and Sustainability Manager	Standard EPL condition.

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-39	Water with TSS > 50 mg/L (or equivalent NTU) must be treated prior to discharge off site, or disposed as liquid waste at a suitably licensed facility TSS treatment may include: • natural settlement • flocculation – chemical treatment with a flocculent (e.g. gypsum). • Filtration through a filtration medium • Water treatment plant. Re-testing of water is required once treatment has been undertaken to ensure criterion for TSS is met.	Water Discharge Permit Gypsum or other flocculant or a water treatment plant Discharge Impact Assessment	Construction	Site Supervisor Environment Coordinator	TfNSW Water Discharge and Reuse Guideline (7TP-SD-146/4.0)
SW-40	Suitable location for discharge will be selected with consideration to: • Direction of groundwater flow • Erosion and scour protection • Sensitive flora and fauna • Flooding.	Water Discharge Permit Discharge Impact Assessment Nominated discharge locations agreed by EPA	Construction	Environment Coordinator	TfNSW Water Discharge and Reuse Guideline (7TP-SD-146/4.0)

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-41	The flow from discharge outlet must be directed onto a non-erodible surface or material and, for discharges to waters, sufficient energy must be dissipated before the flow enters the natural watercourse to ensure no erosion shall occur. This will be achieved by one of the following: • Utilising existing stabilised discharge points (e.g. stormwater drainage pits) • Installation of new water quality control measures early as possible in the construction program. • Temporary protection of disturbed areas between the discharge point and stormwater / receiving waters (e.g. bidum lined drains).	Water Discharge Permit	Construction	Environment Coordinator	TfNSW Water Discharge and Reuse Guideline (7TP-SD-146/4.0)
SW-42	Pump inlets must be placed so that it will not disturb or take in any sediment or sediment laden water.	Water Discharge Permit	Construction	Site Supervisor Environment Coordinator	TfNSW Water Discharge and Reuse Guideline (7TP-SD-146/4.0)
SW-43	The discharge must be monitored throughout to ensure that the water being syphoned or pumped: • complies with the discharge criteria • does not encounter any soil or exposed surfaces before discharging • does not mix with any sediment laden/untested water at either the inlet or outlet.	Water Discharge Permit	Construction	Site Supervisor Environment Coordinator	TfNSW Water Discharge and Reuse Guideline (7TP-SD-146/4.0)

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-44	Records of all water discharges undertaken in accordance with this guideline must be documented using the TPO form Discharge or Reuse Water Approval – 9TP-FT-207 or project-specific equivalent.	Water Discharge Permit	Construction	Environment Coordinator	TfNSW Water Discharge and Reuse Guideline (7TP-SD-146/4.0)
Groundwater					
SW-45	No new wells will be drilled to extract water for construction use. Existing wells or alternate potable or non-potable construction water sources will be utilised.	Existing water sources	Construction	Environment and Sustainability Manager	REMMM GW-5
SW-46	Excavation techniques will be adopted to minimise impacts on aquifers	ECM	Construction	Area Manager	REMMM GW-4
Acid sulphate soils (ASS)					
SW-47	The presence of ASS along the project alignment will be confirmed through intrusive testing of soils in areas where ASS is likely to occur.	ASS management Procedures	Prior to construction	Environment and Sustainability Manager	REMMM-SG4
SW-48	Should ASS be identified during intrusive investigations at any section along the project, an ASS management plan will be required for construction of the project in these areas. An EWMS and ECM would be prepared where ASS is identified to detail the implementation of the Acid Sulfate Soil Management Procedure. Refer to Appendix C for the project's Acid Sulfate Soil Management Procedure.	ASS management Procedure EWMS ECM	Prior to construction	Environment and Sustainability Manager	REMMM-SG4

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
In-stream activities					
SW-49	Develop and implement adequate water quality control measures prior to the carrying out of significant earthwork or bridge construction activities. Adequate water quality control measures to be determined through the development of the ECMs.	Environmental Control Map	Construction	Environmental Coordinator	REMMM HY-6
SW-50	Where feasible, barges, platforms or temporary wharfs will be used in preference to in-stream work platforms or weirs for instream construction works.	Environmental Control Map	Construction	Area Manager	REMMM BI-3
SW-51	Use of floating booms around work zones.	Floating booms	Construction	Site Supervisor Environment Coordinator	REMMM BI-3
SW-52	Use of silt curtains around new piers during piling to restrict turbidity.	Silt curtains	Construction	Site Supervisor Environment Coordinator	REMMM BI-3
SW-53	Bund integrity of equipment wash-downs will be maintained for all works on/near river banks.	Nominated and established equipment wash-down areas	Construction	Site Supervisor Environment Coordinator	REMMM BI-3

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-54	Prohibition dumping of excavated materials or untreated runoff water in the river. All waste materials (including litter) must be removed from the flood zone and places in suitable containment (e.g. skip bins) or removed from site.	Training Alternative waste disposal options Suitable waste bins	Construction	Environment and Sustainability Manager Site Supervisor	REMMM BI-3
SW-55	Remediation and revegetation of disturbed watercourse bed banks and aquatic habitats as soon as possible following disturbance in accordance with the Guidelines for watercourse crossings on waterfront land (Department of Primary Industries, 2012) and the Policy and guidelines for fish habitat conservation and management (Department of Primary Industries, 2013). An EWMS would be prepared to manage risks associated with this activity.	EWMS	Construction	Site Supervisor Environment Coordinator	REMMM BI-3
SW-56	The relevant mitigation and management measures for in-stream works will be shown on Environmental Control Maps in accordance with Transport for NSW's Guide to Environmental Control Map.	Environmental Control Map	Construction	Area Manager Environment Coordinator	REMMM BI-3

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
Chemical Storage and Spill Response					
SW-57	The storage of hazardous materials, and refuelling/maintenance of construction plant and equipment will be carried out in clearly marked and bunded areas within the construction site that are designed to contain spills and leaks in accordance with Australian Standards and DECCW guidelines. Where refuelling of plant and equipment is undertaken at alternative locations, a bunded pallet must be placed below the connection point and the site must be located a minimum of 40m from a watercourse/drain.	ECM Nominated and established chemical storage, plant maintenance and refuelling areas.	Construction	Site Supervisor Environment and Sustainability Manager	REMMM HR-5 TfNSW Chemical Storage and Spill Response Guidelines
SW-58	Chemical storage and handling will be undertaken in designated areas that are located to minimise the potential for land and/or water pollution to occur within site compounds	Nominated and established chemical storage, plant maintenance and refuelling areas.	Construction	Site Supervisor Environment Coordinator	TfNSW Chemical Storage and Spill Response Guidelines
SW-59	Chemical storage areas will be located, where possible, in area that area: - inside a designated building/structure that can serve as a secondary containment area so that spills can be contained. - on sealed/impervious surfaces with suitable secondary containment measures and covered roofing to exclude rain water. - on level ground at least 50m from any waterway, aquatic habitat or sensitive environment.	Nominated and established chemical storage, plant maintenance and refuelling areas.	Construction	Site Supervisor Environment Coordinator	TfNSW Chemical Storage and Spill Response Guidelines

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-60	Chemical storage will not be permitted at locations with a high risk of water and/or land pollution such as: • areas adjacent to water courses, stormwater drainage systems or other immediate pathway to sensitive environments. • above waterways or sensitive environments (e.g. bridges, culverts, piers and wharves). • areas with sloping surfaces or flow paths (e.g. drainage lines) that lead to waterways, sensitive environments or off-site. • areas prone to runoff, flooding or inundation during heavy rainfall. • areas with high groundwater levels or aquifers. • bare ground or unsealed/pervious surfaces (note: crushed concrete, gravel, DGB surfaces are not considered to be impervious)	EWMS ECM Training	Construction	Environment and Sustainability Manager	TfNSW Chemical Storage and Spill Response Guidelines
SW-61	Chemicals in bulk storage should be properly labelled and have Material Safety Data Sheets available in the work area.	EWMS Training	Construction	Site Supervisor Safety Coordinator Environment Coordinator	Best practice

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-62	Chemicals and other hazardous liquids will be stored in areas or containers with secondary containment measures such as one of more of the following: • bunding – raised, impermeable barriers forming the perimeter of secondary containment areas (walls, speed humps, guttering, curbing, rubber barriers) • encasement – bulk fuel container, flammable liquid cabinet and diesel generator with built in secondary containment • grading of sealed surface areas to form a contained area • other requirements identified by the relevant guidelines or MSDS. An area is not a secondary containment area if there are any drains within it that allow liquid to escape from the contained area.	EWMS Bunded storage areas Flammable liquid cabinets Diesel generator with built in secondary containment	Construction	Area Manager	TfNSW Chemical Storage and Spill Response Guidelines
SW-63	Flammable liquid cabinets shall be included at each compound where liquid chemicals area being stored. The cabinet should be compatible with the liquid being stored and provide an impervious barrier to prevent spills from discharging outside the containment system.	ECM Flammable liquid cabinets	Construction	Area Manager	Best practice

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-64	Liquid chemicals shall be stored on bunded pallets during works and returned to flammable liquid cabinets at the end of shift.	Bunded pallets	Construction	Site Supervisor Environment Coordinator	Best practice
SW-65	Bunded pallets will be stored under roofed areas where possible, or covered to prevent the collection of rainwater. Any water collected in the storage area should be monitored for quality before appropriate discharge.	Bunded pallets	Construction	Site Supervisor Environment Coordinator	Best practice
SW-66	The effective volume of the secondary containment for tank storage needs to be at least 100% of total volume of the largest tank, plus enough additional capacity to contain rain or fire-fighting water. As a guide sufficient capacity should be allowed to cope with a one-in-twenty-year 24-hour storm.	Flammable liquid cabinets Bunded pallets	Construction	Site Supervisor Environment Coordinator	TfNSW Chemical Storage and Spill Response Guidelines
SW-67	For multiple container or drum storage, containment stores must have sufficient capacity to contain at least 25% of the total volume of the containers being stored and have adequate additional capacity to contain rain water or fire-fighting water.	Flammable liquid cabinets Bunded pallets	Construction	Site Supervisor Environment Coordinator	TfNSW Chemical Storage and Spill Response Guidelines
SW-68	Used packages (drums and containers) and containers storing waste liquids must be sealed.	Training	Construction	Site Supervisor Environment Coordinator	TfNSW Chemical Storage and Spill Response Guidelines

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-69	Labels of containers must be retained until the containers are washed, rinsed or removed from site.	Training	Construction	Site Supervisor Environment Coordinator	TfNSW Chemical Storage and Spill Response Guidelines
SW-70	All nozzles and valves used during the transfer of liquid between bulk fuel transport vehicle and storage containers must be fitted with shut-off valves to prevent overflow.	Nozzles and valves fitted with shut-off valves	Construction	Site Supervisor Environment Coordinator	TfNSW Chemical Storage and Spill Response Guidelines
SW-71	Transfer pumps must be provided with emergency shut-down devices.	Transfer pumps with emergency shut-down devices	Construction	Site Supervisor Environment Coordinator	TfNSW Chemical Storage and Spill Response Guidelines
SW-72	Storage and handling areas will be regularly checked for any signs of spills and to ensure the capacity of secondary containment is maintained.	Inspections	Construction	Site Supervisor Environment Coordinator	TfNSW Chemical Storage and Spill Response Guidelines
SW-73	Chemical spills will be cleaned up immediately, and waste must be disposed of in accordance with EPA Waste Classification requirements to mitigate any discharge to soil or waters.	Chemical spill kits / spill response materials Regular training	Construction	Site Supervisor Environment Coordinator	REMMM HR-5

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-74	All hazardous materials spills and leaks will be reported to site managers and actions will be immediately taken to remedy spills and leaks. Spill and leaks that result in potential or actual harm to the environment will also be reported in line with the Environmental Incident and Emergency Response presented in Appendix A5 of the CEMP.	Regular training Environmental Incident and Emergency Response Plan	Construction	Site Supervisor Environment Coordinator	REMMM HR-5
SW-75	During rainfall, spills will be covered and protected from stormwater runoff to the extent that it does not compromise clean-up activities.	Plastic sheeting	Construction	Site Supervisor Environment Coordinator	TfNSW Chemical Storage and Spill Response Guidelines
SW-76	Chemical spills should never be hosed by water, any water that encounters the spill should be treated as contaminated wastewater.	Regular training	Construction	Site Supervisor Environment Coordinator	TfNSW Chemical Storage and Spill Response Guidelines

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-77	Chemical spill kits / spill response materials must be readily available and accessible to construction workers in the event of a spill and will be: • Appropriate to the type of chemical and the environment (e.g. must be hydrophobic for use in water) • Sufficient to contain the spill or to direct the spill away from waters, land, sensitive environments or drains. • Clearly labelled for the type of chemical they are suitable for. Kits will be kept at site compounds and on specific construction vehicles.	Chemical spill kits / spill response materials	Construction	Site Supervisor Environment Coordinator	REMMM HR-5 TfNSW Chemical Storage and Spill Response Guidelines
SW-78	Other resources that may be required in the event of a spill should also be considered, such as plant to create earth embankments and pumping and containment equipment, will be detailed on work method statement.	Plant to create earth embankments and pumping and containment equipment	Construction	Site Supervisor Environment Coordinator	TfNSW Chemical Storage and Spill Response Guidelines
SW-79	Ensure that any used spill response materials (contaminated waste) are disposed appropriately.	Spill kit waste bins	Construction	Site Supervisor Environment Coordinator	TfNSW Chemical Storage and Spill Response Guidelines
SW-80	Spill response training and drills will be conducted regularly or as appropriate (such as following incident reviews). These will include correct use of spill kits.	Regular training and drills	Construction	Environment and Sustainability Manager	REMMM HR-5 TfNSW Chemical Storage and Spill Response Guidelines

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
Concrete Washout					
SW-81	Effective concrete washout areas will be established prior to commencement of any concrete pours and used to contain concrete slurry and liquids when the chutes of concrete mixers and hoppers of concrete pumps are rinsed out after delivery to a site. Examples of suitable concrete washout areas include: • Purpose built concrete washout bin • Sealed skip container • Excavated lined trap • Agitator chute trap (If there is very little concrete being used on site and the only washout required is the concrete chute).	EWMS Concrete washout areas / containers	Construction	Site Supervisor Concrete Contractors	TfNSW Concrete Washout Guideline
SW-82	The washout area will be located away from drainage lines, storm water drains and water bodies.	Regular training	Construction	Site Supervisor Environment Coordinator	TfNSW Concrete Washout Guideline 3TP-SD-112/2.0
SW-83	The concrete washout area will be conveniently located relative to the concrete pour for washing out equipment and clearly signposted.	ECM Signage	Construction	Site Supervisor Environment Coordinator	TfNSW Concrete Washout Guideline 3TP-SD-112/2.0

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-84	All wash down water is to be contained within the designated impervious bund.	Concrete washout areas / containers	Construction	Site Supervisor Concrete Contractors	TfNSW Concrete Washout Guideline 3TP-SD-112/2.0
SW-85	Concrete washout areas will not be used for the collection of excess concrete unless specifically designed to do so.	Site receptacle designated for concrete and masonry	Construction	Site Supervisor Concrete Contractors	TfNSW Concrete Washout Guideline 3TP-SD-112/2.0
SW-86	Where possible, excess concrete waste will be returned to the local batching plant for treatment and re-use.	Contractual agreement with batch plant	Construction	Commercial Manager	TfNSW Concrete Washout Guideline 3TP-SD-112/2.0
SW-87	Where excess concrete waste cannot be returned to the local batching plant, excess concrete will be placed in a site receptacle designated for concrete and masonry, and allowed to set.	Site receptacle designated for concrete and masonry	Construction	Site Supervisor Concrete Contractors	TfNSW Concrete Washout Guideline 3TP-SD-112/2.0
SW-88	To minimise the amount of washout water generated, excess concrete should be scraped off the equipment before it is washed and placed in a site receptacle designated for concrete and masonry.	Site receptacle designated for concrete and masonry Training	Construction	Site Supervisor Concrete Contractors	TfNSW Concrete Washout Guideline 3TP-SD-112/2.0
SW-89	A high pressure, low volume water spray nozzle reduces water use.	Hoses with high pressure, low volume water spray nozzle	Construction	Concrete Contractors	TfNSW Concrete Washout Guideline 3TP-SD-112/2.0

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW-90	The details of the concrete washout area should be included on the ECM.	ECM	Construction	Environment Coordinator	TfNSW Concrete Washout Guideline 3TP-SD-112/2.0
SW-91	Site personnel, particularly those responsible for concrete delivery and pumping, will be made aware (via site induction, toolbox talks, pre-starts etc.) that a wash-down area is available on-site and when and how it is to be used.	Training	Construction	Environment and Sustainability Manager	TfNSW Concrete Washout Guideline 3TP-SD-112/2.0
SW-92	Concrete hopper spill trays will be used beneath pumping systems of mobile concrete pump trucks and concrete chutes when operating.	Concrete hopper spill trays	Construction	Site Supervisor Environment Coordinator	TfNSW Concrete Washout Guideline 3TP-SD-112/2.0
SW-93	Plastic drop sheets will be installed beneath the pumping systems of mobile concrete pump trucks and concrete chutes when operating on non-sealed surfaces (such as concrete or asphalt).	Plastic sheeting	Construction	Site Supervisor Environment Coordinator	TfNSW Concrete Washout Guideline 3TP-SD-112/2.0
SW-94	Stormwater pit protection will be installed at downstream pits when concrete pours are occurring on non-sealed surfaces such as concrete or asphalt.	Sand bags / pit wardens	Construction	Site Supervisor Environment Coordinator	TfNSW Concrete Washout Guideline 3TP-SD-112/2.0

7.3 Trigger, Action and Response Plan

The Trigger, Action and Response Plan (TARP) outlined below provides an outline of remedial actions and responses for dealing with significant surface water quality observations and monitoring results.

Table 7-2 Soil and Water Quality Trigger, Action and Response Plan

Source	Trigger Criteria	Action Response	Responsibility
Weather forecast	Rainfall forecast exceeding the 5-day 80th %tile (25.8mm) and 85th%tile (33.1mm) rainfall depths	Specific notification to site crews Review planned works Review erosion and sediment controls Equipment and materials liable to float away and potentially polluting substances, products and materials to be removed from flood zones Review sediment basin condition and capacity Place gypsum in basin inlets	Environmental Coordinator Site Supervisor
Weather Observation	Rainfall event exceed 20mm	Complete Erosion and Sediment Control Measures Rainfall Inspection Complete Wet Weather Water Quality (Turbidity) monitoring (refer to Appendix D) Reinstate basin capacity within 5 days of cessation of rainfall	Environmental Coordinator Site Supervisor
	Rainfall event exceed 5-day 80th %tile (25.8mm) and 85th%tile (33.1mm) rainfall depths	Notification to site crews Complete Basin overtopping inspection (refer to Section 8.3) Reinstate basin capacity within 5 days of cessation of rainfall	Environmental Coordinator Site Supervisor

Source	Trigger Criteria	Action Response	Responsibility
Visual surveillance of water quality	Oil and grease present in receiving waters.	Notify Site Supervisor and Environmental Coordinator	Everyone
	Visual difference in water quality (turbidity) from upstream to down of works or site discharge.	Cease discharge or works causing change in water quality Notify Site Supervisor and Environmental Coordinator Undertake Incident Investigation Water Quality Monitoring (refer to Appendix D) Review controls or work methods	Environmental Coordinator
	Other pollution event evident in waterway including discolouration, fish kill or strong odour.	Notify Site Supervisor and Environmental Coordinator Notify EPA Pollution Hotline (131 555) Undertake Incident Investigation Water Quality Monitoring (refer to Appendix D) Review controls or work methods	Everyone Environmental Coordinator
Inspections (Daily / Weekly / Post Rainfall)	Soil and water quality mitigation measures require maintenance, in state of disrepair, inadequate or ineffective.	Review Erosion and Sediment Control Plan. Revise if required. Maintain existing control or implement supplementary / alternate controls.	Environmental Coordinator Site Supervisor
Basin overtopping inspection	Basin overtopping and discharging untreated water.	Prepare Sediment Basin Discharge Report (Section 8.4) Complete Basin Overtopping Water Quality (Turbidity) monitoring (refer to Appendix D)	Environmental Coordinator

Source	Trigger Criteria	Action Response	Responsibility
Review of ESCPs	ESCP not relevant to site conditions or state of works	Revise ESCP Implement revised controls	Environmental Coordinator Site Supervisor
	Soil loss from catchment exceeds 150m ³ / annum or basins design capacity	Apply alternate ground cover to reduce soil loss Break catchment Install or modify sediment basin	Soil Conservationist Site Supervisor
Quarterly Sediment Basin Inspections	Basin inlet or outlet unstable (eroding)	Stabilise inlet / outlet to prevent erosion	Site Supervisor
	Basin storage zone filled with sediment	Desilt basin and reinstate design storage zone capacity	Site Supervisor
	Basin signage, marker post, fence or other safety control absent or in disrepair	Rectify or replace signage, marker post, fence or other safety control	Environmental Coordinator
Water Quality Monitoring – field sampling	Downstream water quality targets are not met	Refer to Trigger Action Response Plan in the Water Quality (Turbidity) Monitoring Program in Appendix D	Environmental Coordinator

Notes: 1. Each rainfall event is consisted to occur following 5 days since the cessation of rainfall.

8 Compliance management

8.1 Roles and responsibilities

The JV Project Team's organisational structure and overall roles and responsibilities are outlined in Section 3.2 of the CEMP. Specific responsibilities for the implementation of environmental controls are detailed in Section 7 of this Sub-plan.

Key roles with relevant to the management of soil and water are identified in **Table 8-1**.

Table 8-1 Roles and Responsibilities

Role	Authority and Responsibility
Environment and Sustainability Manager	• Oversee implementation and compliance with this Sub-plan • Prepare Environmental Design Review Reports.
Environmental Coordinators	• Complete inspections and monitoring (refer to Section 8.3) • Complete reporting (refer to Section 8.4) • Prepare ECMs to outline the controls in this Sub-plan relevant to each work activity • Delivery toolbox / prestart presentation (or other specific training) to inform work crews of the controls documented in the ECMs. • Respond to environmental incidents and non-conformances.
Project Environmental Consultant	• Investigate the extant (horizontal and vertical) of acid sulfate soils • Prepare site-specific action management plans for ASS that will be disturbed by the works.
Soil Conservationist (Certified Professional in Erosion and Sediment Control)	• Prepare and update Erosion and Sediment Control Plans in accordance with the Blue Book including calculations of soil loss from site and basin sizing.
Area Managers	• Review and provide resources to implement the controls identified in the ECMs.
Site Supervisor	• Install and maintain environmental control in accordance with ESCPs and ECMs • Attend inspections with the Environmental Coordinator, TfNSW / ER, Soil Conservationist or other stakeholders • Implement corrective actions raised during environmental inspections in agreed timeframes

Role	Authority and Responsibility
	- Obtain and comply with Water Discharge Permits prior to any discharge of water from site - Notify the Environmental Coordinator of any observations of Visual difference in water quality (turbidity) from upstream to down of works or site discharge or other pollution event evident in waterway including discolouration, fish kill or strong odour.
All personnel	Notify Site Supervisor of any observations of Visual difference in water quality (turbidity) from upstream to down of works or site discharge or other pollution event evident in waterway including discolouration, fish kill or strong odour.

8.2 Training

All employees, contractors and utility staff working on site will undergo site induction training relating to soil and water management issues. The induction training will address elements related to soil and water management including:

- Relevant legislation
- Roles and responsibilities for soil and water management
- Water reuse and dewatering procedure
- Erosion and Sediment Control Plans
- The location of ASS or PASS
- Water quality management and protection measures.

Targeted training in the form of toolbox talks or specific training will also be provided to personnel with a key role in soil and water management.

- ERSED control planning and installation methodology
- Stockpile location criteria
- Sediment basin construction
- Sediment basin maintenance
- Working near or in waterways
- Preparedness for high rainfall events
- Chemical storage and spill response
- Concrete washout requirements
- Emergency response measures in high rainfall events/ Pollution Incident Management Response Plan.

Further details regarding staff induction and training are outlined in Section 3.4 of the CEMP.

8.3 Monitoring and inspection

Monitoring and Inspections requirements relevant to the management of soil and water including avoidance, minimisation and management of erosion is identified in **Table 8-2**.

The Water Quality (Turbidity) Monitoring program will be completed in accordance with the Water Quality Monitoring Program in Appendix D. The Water Quality (Turbidity) Monitoring program will continue until the completion of the construction unless otherwise agreed to by EPA, DPI Water and relevant councils.

8.4 Licences and permits

The requirements of the Environmental Protection Licence (EPL) are identified in Appendix A1 of the CEMP. The EPL will prescribe water quality parameters to be measured and associated discharge criteria outlined in the Construction Site Dewatering and Discharge Procedure (Appendix B) and Acid Sulfate Soil Management Procedure (Appendix C).

The JV was issued EPL Number 21347 on the 3 January 2020 for Railway activities - railway infrastructure construction. The EPL includes conditions relating to pollution of waters, discharge concentration limits and erosion and sediment control requirements.

8.5 Reporting

Reporting requirements relevant to the management of soil and water including avoidance, minimisation and management of erosion are identified in **Table 8-3**. Water quality (turbidity) monitoring reporting requirements are detailed in Appendix D (Table D-5)

8.6 Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this Sub-plan, CoA and other relevant approvals, licenses and guidelines.

Audit requirements are detailed in Section 3.8.4 of the CEMP.

Table 8-2 Inspection and Monitoring Requirements

Item	Scope	Timing	Frequency	Responsibility	Records / Reporting
Weather forecasts	Monitoring of weather forecasts from the Parramatta North weather station (site number 066124) to determine when adverse weather conditions are predicted. Specific notifications will be made if rainfall exceeding the 5-day 80th %tile (25.8mm) and 85th%tile (33.1mm) rainfall depths are forecast.	Construction	Weekly forecast Daily updates when adverse weather is predicted	Environmental Coordinator / Graduate	Email alerts Pre-starts
Weather observations	Weather observations from the Parramatta BoM Parramatta North AWS.	Construction	Monthly	Environmental Coordinator / Graduate	Monthly Environmental Monitoring Report
	Specific notifications will be made if rainfall exceeding the 5-day 80th %tile (25.8mm) and 85th%tile (33.1mm) rainfall depths are forecast.	Construction	Daily updates when adverse weather is occurring	Environmental Coordinator / Graduate	Email alerts Pre-starts
Visual surveillance of water quality	Surveillance of discharges or in-stream works for visual alteration of receiving water quality.	Construction	Continual	Site Supervisors	Report by exception in Daily Diary Notification of issues / incidents / non-compliance to Environmental Coordinator

Item	Scope	Timing	Frequency	Responsibility	Records / Reporting
Daily visual observations	Daily site checks of maintenance of soil water management measures between weekly inspections.	Construction	During any works	Site Supervisors	Report by exception in Daily Diary Notification of issues / incidents / non-compliance to Environmental Coordinator
Weekly Inspections	Inspection of the environmental controls and implementation of the soil and water quality mitigation measures outlined in Table 6-1 include: • Erosion and sediment controls • Measures to prevent tracking of material onto the surrounding road network • Construction water reuse and discharge inspection practices • Acid Sulfate Soil treatment areas • In-stream controls (use of barges / platforms, floating booms, silt curtains) • Chemical and fuel storage and spill response readiness • Refuelling areas • Concrete disposal and washout facilities.	Construction	Weekly	Environmental Coordinator & Site Supervisor	Weekly Environmental Inspection Checklist ER Inspection Report

Item	Scope	Timing	Frequency	Responsibility	Records / Reporting
Water Quality (Turbidity) Monitoring	Filed and laboratory monitoring of surface water quality in receiving waterways with reference to baseline data and upstream site. Refer to Appendix D for details	Pre-construction Construction	Refer to Appendix D	Environmental Coordinator	Monthly Monitoring Report Annual Environmental Report
Discharge Water Quality	Field testing of water quality in sediment basins and settling containers to confirm compliance with the EPL Water and/or Land Concentration Limits.	Construction	Prior to each discharge event	Environmental Coordinator	Dewatering and discharge permits Monthly EPL Report EPL Annual Return
Erosion and sediment control measures	Ensure that all erosion and sediment control measures installed on the premises are inspected and works undertaken to repair and/or maintain these controls if practicable and safe to do so.	Construction	At least weekly Daily during periods of rainfall Immediately before site closure greater than 48 hours Within 24 hours of the cessation of a rainfall event causing	Environmental Coordinator	Environmental Inspection Checklist

Item	Scope	Timing	Frequency	Responsibility	Records / Reporting
			runoff to occur on or from the premises and Prior to any major rainfall event forecasted.		
Basin overtopping inspection	Inspection of the status of basins during rainfall events that exceed the specified construction basin design rainfall event size that will result in overtopping of untreated water from the basin. 5-day 80th %tile - 25.8mm rainfall 5-day 85th%tile - 33.1mm rainfall	Construction	Following rainfall events that exceed the 5-day basins design rainfall event	Environmental Coordinator	Sediment Basin Discharge Report
Review of ESCPs	The ESCPs will be reviewed and revised as required by the Environmental Coordinators to ensure coverage of all active work areas. The reviews will check: - the ESCPs are relevant to the works and areas of disturbance - the sediment basin catchments are reviewed and soils loss calculations reflect the catchment on site - the suitability of the planned controls.	Construction	As required in response to material changes in active work areas	Environmental Coordinator Soil Conservationist	Updated or reviewed ESCPs

Item	Scope	Timing	Frequency	Responsibility	Records / Reporting
Quarterly Sediment Basin Inspections	Targeted sediment basins inspections will be completed quarterly to support the quarterly review of the ESCPs. The sediment basins inspections will confirm: • basin signage with basin ID and capacity has been installed • basin inlets are stable and not causing erosion • basin outlets are stable and not causing erosion • basin sediment storage zone has not been exceeded (does the basin need desilting).	Construction	Monthly	Environmental Coordinator Soil Conservationist	Environmental Inspection (Sediment Basin) Checklist
Building Condition Assessments in areas of potential drawdown	A condition assessment of existing buildings and infrastructure located in those areas that may potentially be affected by groundwater drawdown because of the project will be carried out prior to and following construction to monitor the risk of settlement from groundwater drawdown.	Pre- and post-construction	Once off	Property Manager	Pre- and post-construction Building Condition Reports

Table 8-3 Reporting Requirements

Report	Scope	Timing	Frequency	Responsibility	Submission
Environmental Design Review Reports	Consideration of environmental constraints and opportunities	Design	With each stage of each design package	Environment and Sustainability Manager with input from Soil Conservationist where relevant	Independent Certifier
Baseline Water Quality Monitoring Report	Report on the base line water quality monitoring with reference to EIS data and the Water Quality Objective Trigger Vales in Section 5.4.1.	Prior to the commencement of construction in each precinct (excluding low impact works)	Once	Environment and Sustainability Manager	TfNSW IC EPA
Discharge Impact Assessment	Subject to the EPL Condition E2, the JV will prepare a water discharge impact assessment to determine appropriate discharge criteria. This assessment will be used to inform discharge criteria for inclusion in this licence for the duration of the project.	To be submitted to the EPA within 30 days of the issue of this licence.	Once	Environment and Sustainability Manager	EPA

Report	Scope	Timing	Frequency	Responsibility	Submission
Monthly Environmental Monitoring Report	Summary of months: • Weather observations • Key erosion and sediment control / water quality control measures and actions • Water Quality (Turbidity) monitoring results • Issues / incidents / non-compliances	Within seven Business Days after the relevant month end	Monthly	Environment and Sustainability Manager	TfNSW IC DoI Water EPA CoPC Cumberland Council
Annual Environment Report	Annual review of the monitoring and reporting requirements of the CEMP Sub-plans including this Sub-plan.	Construction	Within 10 Business Days after the end of the relevant calendar year	Environment and Sustainability Manager	TfNSW IC DPIE EPA CoPC
Quarterly Environment Report (Compliance Tracking Program)	Compliance reporting against the Planning Approval and CEMP including the requirements identified in this plan (Table 3-2 and Table 3-3).	Within seven Business Days after the relevant quarter end	Quarterly	Environment and Sustainability Manager	TfNSW IC

Report	Scope	Timing	Frequency	Responsibility	Submission
Sediment Basin Discharge Report	Record of the status of sediment basins following rainfall events that exceed the specified construction basin design rainfall event size that will result in overtopping of untreated water from the basin. 5-day 80th %tile - 25.8mm rainfall 5-day 85th%tile - 33.1mm rainfall. Report on capacity of basins and date when basin capacity is reinstated.	Preliminary issued within 24hr of rainfall events that exceed 5-day design rainfall event. Final report 7 days following the cessation of rainfall.	Following rainfall events that exceed the 5-day basins design rainfall event	Environment and Sustainability Manager	Internal
Pre-Construction Building Condition Assessments in areas of potential drawdown	Report of pre-construction condition assessment of existing buildings and infrastructure located in those areas that may potentially be affected by groundwater drawdown because of the project.	Pre-construction	Once off	Property Manager	TfNSW IC Property Owners
Post-Construction Building Condition Assessments in areas of potential drawdown	A post construction condition assessment of existing buildings and infrastructure located in those areas that may potentially be affected by groundwater drawdown because of the project.	Post construction	Once off	Property Manager	TfNSW IC Property Owners

Report	Scope	Timing	Frequency	Responsibility	Submission
EPL Monthly Report	In accordance with the POEO Action Section 66(6), EPL monitoring data that relates to pollution including discharge data and any non-compliances relating to Pollution of Waters.	Within 14 days of obtaining monitoring data For duration of period in possession of EPL	Monthly	Environment and Sustainability Manager	EPA Publicly available on company website
EPL Annual return	On the anniversary of the EPL, an Annual Return must be provided including a summary of the discharges and any non-compliances with the conditions of the license. Relating to Soil and Water, the Annual Return will require records of all discharge events and non-compliance with the discharge criteria.	Within 60 days after the end of each reporting period (3 March)	Annually	Environment and Sustainability Manager	EPA
EPL R3 Written Report	A report to be provided the EPA where an authorised officer of the EPA suspects on reasonable grounds that an event has caused, is causing or is likely to cause material harm to the environment.	As specified by an authorised officer of the EPA	Upon request from an authorised officer of the EPA	Environment and Sustainability Manager	EPA

9 Review and improvement

9.1 Continuous improvement

Continuous improvement of this Sub-plan will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance
- Determine the cause or causes of non-conformances and deficiencies
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies
- Verify the effectiveness of the corrective and preventative actions
- Document any changes in procedures resulting from process improvement
- Make comparisons with objectives and targets.

9.2 SWMP update and amendment

The processes described in Section 3.8 to Section 3.11 of the CEMP may result in the need to update or revise this Sub-plan. This will occur as needed.

Only the Environment and Sustainability Manager, or delegate, has the authority to change any of the environmental management documentation.

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to Section 3.10.2 of the CEMP.

Appendix A – Erosion and Sediment Control Procedure

Scope of this Procedure

This procedure outlines the fundamental principles and process that will be followed in the development of Erosion and Sediment Control Plans to ensure they are planned and implemented in accordance with Managing Urban Stormwater: Soils and Construction. Landcom, (4th Edition) March 2004 (reprinted 2006) (the “Blue Book”) Volume 1 and Volume 2.

It is noted that the Blue Book is a comprehensive technical guideline and this procedure only addresses the key management principles that are likely to be relevant to the Parramatta Light Rail Stage 1 – Infrastructure works. Where relevant, other erosion and sediment control techniques that are outlined in the Blue Book, however not included in this procedure, may be used.

Preparation of Erosion and Sediment Control Plans

Erosion and sediment control plans (ESCP) will be prepared for each worksite in accordance with Managing Urban Stormwater: Soils and Construction (Landcom, 2004) Volume 1 and Volume 2.

ESCPs will be established prior to the commencement of construction in each work area and be updated and managed throughout as relevant to the activities during construction

In areas of, or for activities, low erosion and sediment control risk the ESCP may be incorporated into the Environmental Control Maps (ECMs) at the discretion of the Environment and Sustainability Manager.

In areas of moderate to high erosion and sediment control risk, the ESCP will be developed separately to the ECM and will be reviewed by an IECA Certified Professional in Erosion and Sediment Control (CPESC).

ESCPs will be reviewed and revised quarterly by the environmental coordinator. Major changes to the ESCPs will be reviewed by the CPESC.

Design of Sediment Basins

The size and location of construction and operational sediment basins will be included in the earthworks design for catchments where soil loss is predicted (based on RUSLE) to exceed 150 tonnes per annum. Catchment size and soil loss will be reviewed throughout construction based on the maximising capture of run-off from construction areas.

Sediment basins will be designed by a hydrologic engineer. During construction reviews of the soil loss of each catchment will be completed during Quarterly ESCP Reviews.

If the receiving catchment of a basin increases from that calculated during design, the sizing will be reviewed by a Soil Conservationist (Certified Erosion and Sediment Control Professional).

Key Management Principles

Managing Urban Stormwater: Soils and Construction (Landcom, 2004) Volume 1 and Volume 2 is a comprehensive guideline that will be used as reference in the planning and implementation of the erosion and sediment control measures. **Table A-1** provide a summary of the key principles of the Blue Book. It is acknowledged that this table does not cover all the requirements of the Blue Book.

Table A-1 Key Erosion and Sediment Control Principles

Key principle	Control measures	Evidence of compliance
Minimise Extent and Duration of Disturbance	• Limit the extent of disturbance to the area required for construction. • Clearly delineate the limits of disturbance on ESCP. • Program works to minimise the duration of works in sensitive environments (e.g. in stream works) • Install temporary / construction phase stabilisation as soon as practical such as: ○ Wrap batters in geofabric ○ Installation of stabilised aggregate on working platforms.	ESCPs Site inspection records
Control Stormwater Flows onto, through and from the Site	• The separation of 'clean' run-on water from 'dirty' or construction run-off (e.g. turbid). • Early construction of permanent drainage structures including: ○ sediment basins and traps; ○ catch drains; ○ culverts and associated inlet and outlet protection (e.g. dissipaters). • Maximising the diversion of turbid construction run-off into sediment basins. • Control of run-off during the construction of embankments (e.g. fill shaping and the construction of temporary dykes and batter drains). • Diversion run-off from stabilised areas into pits and the stormwater drainage system as soon as practical to reduce surface flow lengths.	ESCPs Site inspection records

Key principle	Control measures	Evidence of compliance
Erosion Control Measures	• Protection of disturbed areas as soon as practical. Short to medium term protection (0-3 months) may include: ○ Geotextile or plastic linings / covers ○ Soil polymer application • Longer term protection may include: ○ Geotextile linings or ○ Topsoil, jute matting and seeding with cover crop ○ Hydromulching / hydroseeding. • Geotextile or plastic linings areas of concentrated flow such as flow channels or batter chutes. • The siting of stockpiles of soil material in low hazard areas clear of watercourses. • Additional protection to be afforded with vegetation, diversion banks and sediment fences if required.	ESCPs Site inspection records
Sediment controls	• Utilisation of cleared/mulched vegetation for sediment traps and filters. • Installation of diversion bunds or sediment fences around the perimeter or work areas. • Used of sand bags / coir logs / rock checks to break slopes. • Construction of control measures as close to the potential source of sediment as possible. • Controlling the deposition of mud and soil material onto local road (wheel wash / rumble grids).	ESCPs Site inspection records

Key principle	Control measures	Evidence of compliance
Sediment basins	- Sediment basin management of turbid water immediately after rain as required with one or a combination of: - Flocculation with gypsum (or approved alternative flocculant); - Pump-out for construction purposes or dust control. - Water will not be released from sediment basins prior to achieving acceptable water quality standards. - Regulating water quality during dewatering activities (e.g. filtering techniques and flocculation with gypsum or approved alternative flocculant).	Sediment basin monitoring records Dewatering and discharge permits
Stormwater pit controls	Installation of stormwater pit control around live stormwater pits.	ESCPs Site inspection records
Rapid stabilisation of disturbed areas	Progressive revegetation of disturbed areas utilising appropriate species at the completion of works.	Site inspection records

Inspection and Review

The Environment and Sustainability Manager (or delegate) will undertake weekly inspection and will assess compliance against the controls and requirements of Section 7 including the installation, maintenance and effectiveness of Erosion and sediment controls.

The ESCPs will be reviewed and revised quarterly by the Environmental Coordinators to ensure coverage of all active work areas. The reviews will check:

- ESCPs are relevant to the works and areas of disturbance
- Sediment basin catchments are reviewed and soils loss calculations reflect the catchment on site
- Suitability of the planned controls.

New ESCPs or major revisions will be reviewed by the Soil Conservationist (Certified Professional in Erosion and Sediment Control).

Targeted sediment basins inspections will be completed quarterly to support the quarterly review of the ESCPs. The sediment basins inspections will confirm:

- Basin signage with basin ID and capacity has been installed
- Basin inlets are stable and not causing erosion
- Basin outlets are stable and not causing erosion
- Basin sediment storage zone has not been exceeded (does the basin need desilting).

Competency, Training and Awareness

Persons involved in the preparation and quarterly review of ESCPs will have completed the IECA-Approved Erosion and Sediment Control Workshops, Blue Book Training (4 days).

The Primary ESCP and major revisions ERSPs will be reviewed by the CESPC.

Targeted training in the form of toolbox talks or specific training will also be provided to personnel with a key role in soil and water management including:

- ERSER control planning and installation methodology
- Stockpile location criteria
- Sediment basin construction
- Sediment basin maintenance
- Working near or in waterways
- Preparedness for high rainfall events.

Appendix B – Construction Site Dewatering and Discharge Procedure

Scope of this Procedure

This procedure outlines how site dewatering and discharge activities will be undertaken to prevent pollution of waters. This procedure has been prepared in accordance with the requirements of the Transport for NSW's Water Discharge and Reuse Guideline (7TP-SD-024/3.0).

The dewatering procedure is presented in a flowchart in Attachment A.

The Dewatering and Discharge Permit template is presented in Attachment B.

This procedure is not applicable to assessment and permitting of discharging of water from Area of Environmental Interest where contamination is present. Discharge from these sites will be subject to the recommendations of the detailed site investigation, remediation action plan or environmental management plan developed in accordance with the Construction Contaminated Land Management Sub-Plan.

Background

Activities during construction which have the potential to require dewatering includes the following (but are not limited to):

- Sediment basins or sediment sumps
- Excavations
- Culverts, drainage controls and pits.

This procedure will be implemented for all dewatering on site.

Accountabilities and Responsibilities

The JV is accountable for undertaking and supervising all dewatering activities whether in direct control or being undertaken by sub-contractors.

The JV will ensure all personnel on site are informed of and comply with this procedure to the extent they are obligated to under the Contract. Training will be provided to key personnel responsible for the management / monitoring of dewatering activities to convey key risks and emergency response measures.

The Environment and Sustainability Manager is responsible for the management of the Dewatering and Discharge Permit system. Persons authorised by the Environment and Sustainability Manager to issue or receive Dewatering and Discharge Permits will be required to complete a Dewatering and Discharge Verification of Competency (VoC) prior to being recognised to issuing or receive Dewatering and Discharge Permits.

Assess opportunities for re-use

On site re-use of stormwater or groundwater detained in excavations should be considered as a priority for all dewatering activities. Examples of on-site re-use include: the utilisation of water for dust suppression, earthworks compaction and vegetation establishment / rehabilitation. The re-use of water from dewatering must not cause further ponding or result in surface run-off leaving the construction site, which will be considered an unauthorised discharge from site.

Water quality discharge criteria

It is an offence under section 120 of the *Protection of the Environment Operations Act 1997* (POEO Act) to pollute waters. The Project will obtain an Environment Protection Licence (EPL) prior to construction to allow discharge from the Project. The EPL will detail discharge criteria and this section will be updated to reflect the content of the approved EPL.

Subject to the EPL Condition E2, the JV will prepare a water discharge impact assessment to determine appropriate discharge criteria.

This assessment will be used to inform discharge criteria for inclusion in this licence for the duration of the project.

Table B-1 Standard project water quality criteria

Parameter	Criteria	Sampling method	Analytical method
pH	6.5-8.5	probe or grab sample	field analysis and confirmed as required with laboratory assessment
Turbidity	31 NTU ¹ .	grab sample	field analysis and confirmed as required with laboratory assessment, regularly updating correlations and having a factor of conservatism
Total Suspended Solids	50mg/L	grab sample	laboratory analysis
Oil and Grease	no visible	grab sample	field analysis and confirmed as required with laboratory assessment

Notes: NTU subject to update based on the discharge impact assessment and the TSS / NTU Correlation Assessment.

It should however be noted that, compliance with the criteria in Table B-1 does not provide a defence to an alleged breach of section 120 of the POEO Act if other pollutants are determined to have been discharged. For example, water discharged with TSS below 50mg/L may still cause pollution and breach section 120 of the POEO Act, if the receiving waters have a TSS less than 50mg/L at the time the discharge occurs.

Therefore, the testing of water for more pollutants should be considered where the water has encountered, or likely to have encountered, the following activities:

- General earthworks in soils with known contamination issues
- Earthworks in acid sulphate soils
- Hydrocarbon spills
- Concrete works (including batching operations)
- Stabilised pavements
- Pre-coat aggregates and spray sealing.

Disposal of water

Water which does not meet the project's discharge water quality criteria will require treatment prior to disposal. This may include

- Flocculated with gypsum (or other approved flocculant / coagulant) to address suspended solids
- Adjustment of pH using hydrated lime (for acidic waters) or hydrochloric acid (for alkaline waters) (or similar chemical pH treatment)
- Removal of visible oil and grease.

Where test results indicate that the Project's water quality criteria cannot be complied with, or there is a concern that the water may pollute the receiving environment, the water will be treated on site with utilising a water treatment plant or removed off site and disposed of at a suitable facility that is licensed to receive liquid waste.

Water which complies with the project's water quality criteria, and which will not pollute the receiving environment, may be discharged to land once a Dewatering and Discharge Permit is issued by a person recognised by the Environment and Sustainability Manager.

Discharge to land within the site boundary shall only occur if:

- Water complies with Project's water quality criteria or in discharge criteria / conditions of an EPL should one apply
- Water quality complies with the TfNSW Water Reuse and Discharge Guideline, including the undertaking of appropriate testing and documentation
- No surface runoff will be generated from the discharge and there is no potential for discharged water to reach any watercourse (within or outside the site)
- No erosion will be caused from the discharge and appropriate erosion and sediment control are installed in accordance with Managing Urban Stormwater: Soils & Construction (Landcom, 2004)
- All discharge water can be wholly contained within the site boundary.

In addition to meeting all the requirements stipulated above, the following additional requirements are applicable when considering an off-site discharge location (but not limited to):

- Direction of groundwater flow – recharging groundwater that will subsequently flow either back onto site, into excavations or low-lying areas should be avoided; and
- Erosion – the receiving area should have complete groundcover (e.g. grass) and established vegetation to minimise the risk of erosion
- Flora and fauna – water must not be discharged to areas where there is potential to have an adverse effect on any flora or fauna species
- Flooding – the receiving area must have the infiltration capacity to receive the volume of water to be discharged, without causing flooding or significantly increasing the risk of flooding should subsequent rainfall occur.

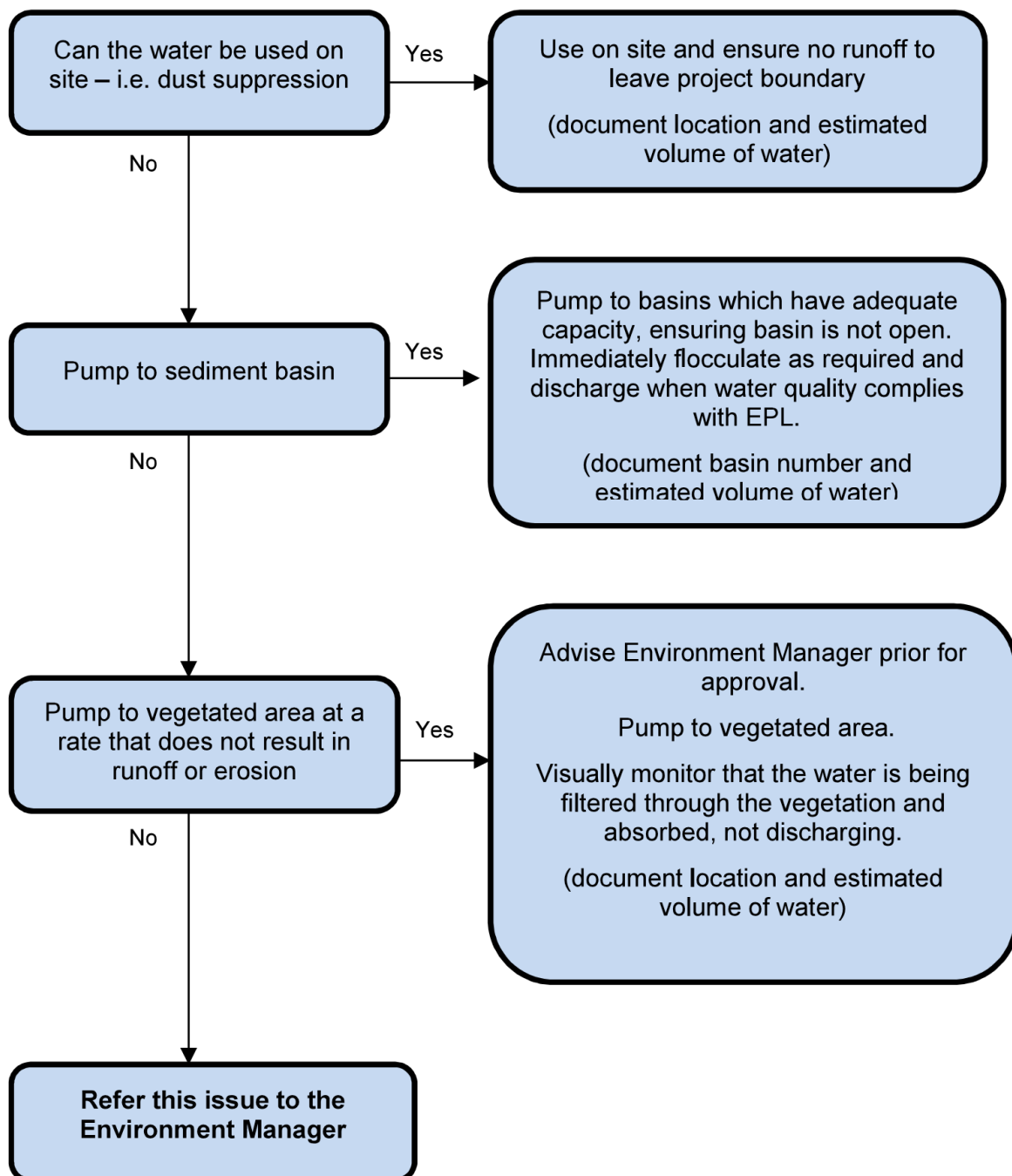
Discharging to a suitable location off-site, in the absence of an Environment Protection Licence, is an activity that should only be undertaken when there is strong documented evidence to demonstrate that the activity is not breaching section 120 of the POEO Act.

Maintenance of Records

Dewatering and Discharge Permit (refer to Attachment B) are to be maintained for the duration of construction. The following details are to be recorded:

- Date, time and estimated volume of water released for each discharge location
- Water quality test results for each discharge
- Signed approval for the discharge of the water
- Evidence of discharge monitoring.

Attachment A - Dewatering Procedure Flowchart



Attachment B – Dewater and Discharge Permit Template

GENERAL DETAILS					
Area Supervisor		Work Area / Section		Location / Chainage:	
Permit No:		Expiry Date:		Approx. Volume to be released	
Date inspected:		Water release point no:		Location to be discharged to: (e.g.) watercourse, grassed area, sediment basin, sucker truck)	
CONTROL MEASURE		YES	NO	COMMENTS	
Pipe intake sited to avoid discharge of silty water					
Pipe outlet sited to avoid scouring or environmental damage at discharge point					
Float or similar device installed to prevent inlet from sinking into mud					
Spill Kit in place					
Pumping equipment checked and operational					
Water Testing Equipment Calibrated					
WATER QUALITY CRITERIA (relevant to site location)			ENTER THE FIELD TEST INFORMATION HERE		
pH	6.5 - 8.5		DATE: pH:		
Total Suspended Solids	31mg/L		TIME: Turbidity:		
Turbidity			METER: Visible Oil:		
Oil and Grease	Nil Visible		SAMPLE COLLECTED BY		DATE OF DISCHARGE
Other			(BASIN) DISCHARGED BY		TIME OF DISCHARGE
What type and how much flocculent was applied? Type: Dose: Kg/L			SUPERVISORS NOTES Check Everymins. Pump Is Running OK (Y/N)..... Suction Hose is Clear of Silt (Y/N)..... Discharge is going to where it should (Y/N)..... Discharge is not causing any discolouration/oily film (Y/N) Other		
DISCHARGE APPROVED BY (Environment Manager or Delegate) NAME: _____ SIGNED: _____					
PERMIT ISSUE					
Permit Issuer		Signature		Date & Time	
PERMIT ACCEPTANCE					
Permit Holder		Signature		Date & Time	

Appendix C – Acid Sulfate Soil Management Procedure

Scope of this Procedure

The purpose of this (Acid Sulfate Soil Management Procedure) ASSMP is to outline the mitigation and management measures that the JV will use to address potential impacts as a result disturbance of Acid Sulfate Soils (ASS) during the construction of the PLR Stage 1 Infrastructure Works.

The ASSMP is applicable to all activities during construction of the Project, including all areas where physical works will occur or areas that may be otherwise impacted by the construction works, and under the control of the JV. All the JV staff and sub-contractors are required to operate fully under the requirements of this plan and related environmental management plans, over the full duration of the construction program.

Background

Acid Sulfate Soils (ASS) are soils that contain sulphides which oxidise when exposed to air and produce sulfuric acid and toxic quantities of aluminium and other heavy metals (including arsenic). These soils are naturally occurring and are found in coastal floodplains and in the soils adjacent to rivers and creeks at elevations below 5 metres.

ASS incorporates both Actual Acid Sulfate Soils (AASS), where iron sulphides have been exposed to air and have oxidised, and Potential Acid Sulfate Soil (PASS), where iron sulphides are located below the water table in waterlogged soil and are therefore oxygen deficient.

If drained into waterways, the acidic runoff off from AASS can deoxygenate receiving waterways causing fish kills and mass mortalities of micro and macroscopic organisms. It can increase light penetration through water bodies and contribute to loss of habitat, including causing the death or stunted growth of aquatic flora and fauna. It can also mobilise metals from contaminated sediments as well as damage soil structure and built structures (ASSMAC, 1998).

The acid leachate can damage infrastructure by corroding concrete and limestone and create persistent iron coatings.

ASS can also release hydrogen sulphide gas, which can be hazardous to humans at high concentrations, or if exposed for extended periods of time. Contact with ASS can cause skin irritation, eye damage, irritation of the gastrointestinal tract, respiratory and heart problems, headaches and insomnia.

In areas identified as possessing ASS, construction activities involving excavation, stockpiling may result in exposing PASS to oxygen resulting in the production of sulfuric acid. Dewatering activities also have potential to oxidise PASS by lowering the groundwater table, thereby generating AASS and acidic run-off.

ASS Classification Scheme

There are five Classes of land based on the probability of acid sulfate soils being present. For each class, the Acid Sulfate Planning Maps identify the type of works likely to present an environmental risk if undertaken within that class of land. A summary of this is shown in the **Table C-1**.

Table C-1 Classification scheme and types of construction works likely to present risk

Class	Type of works
1	Any works
2	Works below the natural ground surface. Works by which the water table is likely to be lowered.
3	Works beyond 1 metre below natural ground surface Works by which the water table is likely to be lowered beyond 1 metre below natural ground surface
4	Works beyond 1 metre below natural ground surface Works by which the water table is likely to be lowered beyond 1 metre below natural ground surface
5	Works within 500 metres of adjacent class 1, 2, 3 or 4 land that is below 5 metres Australian Height Datum (AHD) and by which the water table is likely to be lowered below 1 metre AHD on adjacent Class 1, 2, 3 or 4 lands.

Source: ASSMAC (1998)

ASS Class Zone Summary

Local Environment Plan ASS planning maps were reviewed for the length of the PLR project alignment and summarised in the Golder Technical Memorandum (PLR1-GLD-DAN-0014). These maps were taken from the City of Parramatta and Hills Shire Council Local Government Areas. The distribution of ASS Classes is outlined in **Table C-2**.

Table C-2 ASS Class Zone Summary for the Parramatta Light Rail project alignment

Chainage (m)	ASS Class	Comment
10,000 – 30,125	5	Westmead and North Parramatta Precincts
30,125 – 30,150	1	Parramatta River
30,150 – 32,400	4	Parramatta CBD Precincts
40,000 – 41,250	4	Camellia Precinct

Chainage (m)	ASS Class	Comment
50,000 – 50,525	4	T6 Carlingford Line, south of Parramatta River
50,525 – 50,575	1	Parramatta River
50,575 – 54,875	5	T6 Carlingford Line, north of Parramatta River
54,875 – 55,100	Not mapped	No ASS Planning Maps for this area included the Hills Shire Council LEP 2013. Inferred low risk of ASS impacts due to high elevation (95-100 m AHD)

Adapted from Golder Technical Memorandum (PLR1-GLD-DAN-0014)

Key identified locations of risk

The key areas identified where acid sulfate soils are likely to be encountered by are summaries in the **Table C-3**. These areas are illustrated in Attachment A.

Table C-3 Identified locations of high ASS risk

Location	Mapped class	ASS test result	Bore	Proposed works	Impact
Paramatta North Bridge	Class 5	Potential presence	BH25	New bridge construction: piling, dewatering	Excavations may disturb ASS Dewatering and lowering of the groundwater table, generating AASS
James Ruse Drive Bridge	Class 4	ASS identified on northern side of alignment	BH16	Bridge works: piling, foundation treatment for 7 bridge piers and 2 abutments	Excavations may disturb ASS Dewatering and lowering of the groundwater table, generating AASS
Paramatta River Bridge and James Hardie Underpass	Paramatta River sediment: Class 1 - North of river: Class 5 - South of river: Class 4		-	Piling, foundation treatment, shallow excavations, embankment widening	Excavations may disturb ASS Embankment widening may increase loads, and expose and oxidise PASS material currently below the groundwater table, generating AASS runoff
Vineyard Creek	Class 5	ASS identified	BH23	New bridge construction: piling, foundation treatment	Excavations may disturb ASS
Utility works and Sewer Upgrades / Replacement	(Throughout project)	-	-	Excavation, Dewatering	Excavations may disturb ASS Dewatering and lowering of the groundwater table, generating AASS
Overhead Line Equipment	Classes 4 & 5 (Throughout project)	-	-	Installation over all tracks (except wire-free zones) with foundations at 5-7 m below ground level	Dewatering and lowering of the groundwater table, generating AASS

Identification of Acid Sulfate Soils

Geotechnical assessment

Suitably qualified and experienced persons (Project Environmental Consultant) will further investigate the extent (horizontal and vertical) of acid sulfate soils at the locations identified in Table C-3 prior to the commencement of excavation or dewatering works. Samples will be analysed in a NATA certified laboratory using a POCAS (Peroxide Oxidation Combined Acidity and Sulfate) or CRS (Chromium Reducible Sulphur) method.

The results of which will inform more precise demarcation of ASS locations, and advise liming rates where treatment of PASS and AASS is necessary. Assessment, classification, handling, treatment and disposal of ASS on site will be undertaken in accordance with the Waste Classification Guidelines Part 4: Acid Sulfate Soils (NSW EPA, 2014).

The detailed design will consider the potential impacts on elements that are buried or in contact with identified ASS and determine management and mitigation measures for minimising impacts.

Field Assessment

There may be instances where a field assessment may be required to assist in the identification of ASS. The following method may be employed to assess ASS in the field. All field assessments should be substantiated with POCAS or CRS tests.

AASS Characteristics

Any of the following characteristics may indicate the presence of acid sulfate soils ASS:

- Soil pH of <4
- A sulfurous smell following soil disturbance
- Pale yellow surface encrustations or iron oxide mottling in any excavated material left exposed, surface encrustations or in auger holes
- Excessive iron staining on drain or pond surfaces or stream banks, or iron stained drain water and orange red ochre deposits around water bodies
- Excessive corrosion of concrete and/or steel structures exposed to ground or drainage waters, or rapid corrosion of fresh steel in the soil
- Water of <pH 5.5 in adjacent streams, drains, groundwater or ponding on the surface
- Clear or milky-blue green drain water flowing from or within the area (caused by aluminium released from the AAS acting as a fluctuating agent).

High risk indicators for potential acid sulfate soils (PASS) could include:

- Low position in the landscape
- Native estuarine soils
- Waterlogged soil from beneath the water table
- Blue-grey, blue-green or grey waterlogged soils
- Sulfur odour (rotten egg odour)
- Neutral to acidic water or soil pH.

Field inspections should investigate the presence of both actual and potential acid sulfate soils. Often, actual acid sulfate soils are found overlaying potential acid sulfate soils, and both are often covered by a non-acid sulfate alluvial topsoil.

Field pH test

A field soil pH test offers a quick indication of the presence and severity of “actual” acid sulfate soils. The field pH is a qualitative method only that cannot be used as a substitute for laboratory analysis in the identification of acid sulfate soils for assessment purposes. When using this test to provide an initial screen for the presence of PASS, field pH readings should be taken at regular intervals down the soil profile. It is recommended this test be done every 0.25m down the profile but at least every 0.5m interval or horizon whichever is the lesser.

- Field pH readings ≤ 4 suggest that “actual” acid sulfate soils are present where the sulphides have been previously oxidised, resulting in acid soils and soil pore water
- Field pH values > 4 and < 5.5 are acid and may be the result of some previous or limited oxidation of sulfides, but is not a definite confirmation of actual ASS. Substantial exchangeable / soluble aluminium and hydrogen ions usually exist at these pH values. Other factors such as excessive fertiliser use, organic acids or strong leaching can cause pH > 4 - < 5.5 . Field pH alone cannot indicate “potential” ASS as they may be neutral to slightly alkaline when unoxidized.

To test for PASS that contain unoxidised sulfides, 30% hydrogen peroxide is used to rapidly oxidise the iron sulphides (usually pyrite), which produces acid with a corresponding drop in pH.

Field Peroxide pH Test

To test for the presence of unoxidised sulfides and therefore PASS, the oxidation of the soil with 30% (100 volume) hydrogen peroxide can be performed in the field. If the pH of analytical grade peroxide may be as low as 3 as manufacturers stabilise technical grade peroxide with acid. The peroxide pH should be checked on every new container and regularly before taking to the field and adjusted to 4.5 - 5.5 with a few drops of 0.1M sodium hydroxide (NaOH) if necessary. False field pHFOX (pH post-reaction) readings could result if this step is not undertaken.

Note: Hydrogen peroxide of 30% is a strong oxidising agent and should be handled carefully with appropriate eye and skin protection. This test should be only undertaken by trained personnel.

The most common method for a field peroxide pH test is as follows:

A small soil sample of approximately 5 g is placed in a glass container and approximately 20 mL of hydrogen peroxide is dropped onto the soil.

The resulting reaction should be observed and the rate of reaction should be noted. The reaction could be instantaneous, or it could take more than 10 minutes. This could be (in part) due to ambient temperature, so heating the container over hot water or leaving it in direct sunlight could be necessary to start the reaction on cool days or if the peroxide is cold.

Note: Allow the digested solution to cool after the reaction. A pH probe will only measure to 60°C.

After oxidation, the pH is measured a second time, with the result referred to as pHFOX.

Potentially positive reactions for PASS include one or more of the following:

- A change in soil colour from grey tones to brown tones
- Effervescence
- The release of sulfurous odours including sulfur dioxide or hydrogen sulfide
- A final pH (of pHFOX) of < 3.5 and preferably < 3
- Lowering of soil pH by at least one pH unit (i.e. pHF - pHFOX) > 1

The strength of the reaction is a useful indicator. The peroxide test is most useful and reliable with clays and loams containing low levels of organic matter. This is because high levels of organic matter (surface soil, peat, mangrove/estuarine mud, marine clays) and other soil constituents (particularly manganese oxides) can also react to generate acid and cause a false positive. The test is therefore less appropriate on coffee rock, sands or gravels, particularly dredged sands with

low levels of sulfuric material (e.g. <0.05 % S). If the pH of soils with organic matter and pyrite will not remain below 4 on extended oxidation. However, given the risk of false positives, it is generally advisable that positive tests on surface soils that appear well drained should still be treated with caution and confirmed with laboratory testing.

pH After Oxidation

Of importance is the change in pH following oxidation, as it's a powerful indicator for the presence of sulfuric material and can give an early indication of the distribution of sulfide down a core / profile or across the site. However, the pH after oxidation test is not a substitute for analytical test results.

If the pHFOX value is at least one unit below field pHF, it may indicate potential acid sulfate soils. The greater the difference between the two measurements, the more indicative the value is of a potential acid sulfate soils. The lower the final pHFOX value is, the better the indication of a positive result.

- If the pHFOX < 3 and there was a strong reaction to the peroxide, there is a high level of certainty of a potential acid sulfate soils. The further below a pHFOX of 3, the more likely the presence of sulfides.
- A pHFOX of 3-4 is less positive and laboratory analyses will be necessary to confirm if sulphides are present. Sands are particularly likely to give confusing field test results and must be confirmed by laboratory analysis.
- For pHFOX of 4-5, the test results should be interpreted as neither positive nor negative. Sulphides may still be present in small quantities and could be poorly reactive under quick field test conditions. Other reasons for this result could include the presence of shell/carbonate in the sample that neutralises some or all the acid produced by oxidation. In other cases, the pHFOX value may be due to the production of organic acids and there may be no sulphides present. When this is suspected to be the case, analysis for sulfur using the Peroxide Oxidation Combined Acidity and Sulfate (POCAS) method is recommended to check for the presence of oxidisable sulphides.
- For pH >5 and little or no drop in pH from the field value, little net acid generating ability is indicated. However, the sulfur trail of the POCAS method is recommended to check samples and confirm the absence of oxidisable sulphides.

The interpretation of this test when conducted on highly reactive soils must be done with care. Some soil minerals such as manganese react vigorously with peroxide but may only show small pH changes.

It's recommended that certain controls are used to increase the consistency of field peroxide tests, particularly when multiple samples are taken. These include using a scoop to react a fixed volume of soil with a fixed volume of peroxide, and are left to react for a fixed amount of time (i.e. 1 hour). The sample should also be made up to a fixed volume with deionised water before reading. However, these controls procedures take time in the field and may be better suited to a 'field shed' situation.

When effervescence has ceased, additional peroxide should be dropped into the solution until the reaction appears complete. If the reaction is violent, it is recommended that deionised water be added to cool and dilute the reaction before measuring the pHFOX. With particularly violent reactions, the test may need to be repeated such that a small amount of water is added to the soil prior to peroxide addition.

Management and mitigation measures

Excavation procedures

In areas where ASS is suspected to occur, the following excavation procedure is to be undertaken.

1. The Site Supervisor is to visually inspect material being excavated for the following observations, of which ASS material may have one or more characteristics:
 - A sulphurous or tar-like smell during excavation
 - Blue or green material
 - Pale yellow staining or mottling within excavated material
 - Water-logged soils, soft buttery blue-grey or dark green-grey mud
 - Mid to dark-grey estuarine silty sands or sand
 - Dark grey to black bottom sediments of estuaries
2. If ASS is identified during excavation or in excavated material, immediately stop excavation activities and notify the construction supervisor.
3. Immediately bund excavated material and await confirmation on whether ASS is present.
 - ASS bunds must be impervious and have a sump to collect acid leachate
 - Consider laying lime under the stockpile to neutralise leachate
 - ASS must be kept wet always to reduce its exposure to oxygen during excavation, handling, transport and storage.
4. Environmental Coordinator to conduct a visual assessment and testing to determine if materials are positive for the presence of ASS.
 - Field pH and Indicator Test Screening (refer to section 10 of this Appendix for process).
 - SPOCAS or equivalent to confirm liming requirements
 - Appoint specialist consultant to assess results and advise on management procedure.
5. If material is identified as ASS, site-specific actions are to be developed. This includes an ongoing, detailed management plan in consultation with the Project Environmental Consultant.
 - Agree on immediate action to manage ASS
 - Testing and treatment plans are to be consistent with ASSMAC (1998)
 - If disposal is to take place, it must be done in accordance with the NSW EPA (2014) Waste Classification Guidelines Part 4: Acid Sulfate Soils.
6. After use, wash equipment in contact with ASS and seek advice from specialist consultant for further action if required.

Dewatering procedures

Dewatering on site will be in accordance with the Project specific dewatering procedure detailed in the SWMP. The procedure has been prepared in accordance with the Transport for NSW Water Discharge and Reuse Guideline (7TP-SD-024/3.0).

Acid Sulfate Soil Treatment Areas (ASSTAs) have potential to generate leachate with low pH due to oxidation of sulphides, high pH (from lime added to neutralise acid), or dissolved metals (Aluminium or Iron). Testing for dissolved aluminium and iron requires samples to be collected for lab analysis of prior to discharge off site.

ASSTA discharge points must be identified on the EPL Attachment of licensed discharge points. In addition to the water quality parameters outlined in the Construction Site Dewatering and Discharge Procedure (Appendix B), discharge from ASSTAs must also meet the water pollutant limits outlined in **Table C-4**.

Table C-4 Discharge water quality criteria FROM Acid Sulfate Soil Treatment Areas

Parameter	Criteria	Sampling method	Analytical method
Aluminium (dissolved)	0.055	grab sample	laboratory analysis
Conductivity	200	probe or grab sample	field analysis and confirmed as required with laboratory assessment
Iron (dissolved)	0.3	grab sample	laboratory analysis
pH	6.5-8.5	probe or grab sample	field analysis and confirmed as required with laboratory assessment
Turbidity	To be determined based in establishment of a TSS correlation	grab sample	field analysis and confirmed as required with laboratory assessment, regularly updating correlations and having a factor of conservatism
Total Suspended Solids	50mg/L	grab sample	laboratory analysis

Dissolved aluminium and iron should only be sampled after the pH has been effectively neutralised.

Lowering of the water table

Excavation in areas of Acid Sulfate Soil that results in lowering of the water table may result in oxidation of potential acid sulfate soils (referred to the cone of depression) and the release of acid. Measures to mitigate potential impacts resulting from lowering of the water table must be addressed in site-specific action management plans for ASS to be prepared by the Project Environmental Consultant.

Temporary stockpiles

If AASS/PASS cannot be immediately transported to the ASS Treatment Area, it is to be stockpiled in short term temporary stockpiles in accordance with the QASSIT (2002) Soil Management Guidelines (refer to **Table C-5** below) (SG-4).

Table C-5 Short Term Stockpile Durations

Texture range (McDonald <i>et al.</i> 1990)	Approx. clay content (%)	Short term stockpiles
<i>Coarse texture</i> Sands to loamy sands	≤ 5	Overnight
<i>Medium texture</i> Sandy loams to light clays	5 – 40	2 days
<i>Fine texture</i> Medium to heavy clays and silty clays	≥ 40	5 days

Temporary stockpiles should be limited in both the volume and duration of acid sulfate soil storage. The location of temporary stockpiles must either be elevated or located outside of the 10% AEP flood level. Temporary stockpile locations must also be kept away from waterways and drainage lines and they must be assessed and approved by Project Environmental and Sustainability Manager. Temporary ASS stockpiles should be close to the excavation and stockpiled separately from other materials. ASS stockpiles should be separated from the underlying soil by a guard layer (plastic) and the ASS material kept moist to exclude air.

The material should be removed for treatment as soon as possible, however if it's necessary to store ASS/PASS for more than three days, a bed of aglime (5kg/m²) should be spread over the storage location. If it's necessary to store untreated ASS/PASS for more than five days, the stockpile must be contained within adequately bunded areas. All runoff must be treated in the same way as leachate from ASS Treatment Areas.

Any required medium-term stockpiling must occur in the designated ASS Treatment Area.

Prevent the oxidation of sulfide

If ASS is disturbed, it is important that mitigation strategies are taken immediately to prevent the soil from oxidising. Please note that if there is any soil or soil layers that have already been oxidised and are currently acidic (field pH > 4.5), that denial of oxygen alone is unlikely to prevent further oxidation. As such, a neutralising agent such as lime is necessary in these circumstances.

To further prevent oxidation, the following steps can be taken:

1. In accordance with the *NSW EPA (2014) Waste Classification guidelines part 4: Acid Sulfate Soils*, ASS must be kept wet always to reduce its exposure to oxygen. This may be achieved by sealing (compacting the surface) of stockpile and covering with plastic to reduce evaporation.
2. Reduce the time ASS is exposed to the air. It is worth assessing the type of soil as certain soils like sandy sediments can oxidise and leach more rapidly (with significant amounts of acid produced within a few hours) than other soil types, such as clays (a few days).
3. Keep ASS in anaerobic conditions wherever possible and minimise any time spent in oxygenated environments.
4. Short term disturbance of acid sulfate soils can be staged to minimise costs to the environment. This includes reburying ASS into anaerobic conditions as quickly as possible prior to the generation of acid.

- a. Neutralising agents can be mixed with excavated material to neutralise any acid that may have been or will be produced from the time spent aerated.
5. Place any excavated ASS immediately under water or raise the water table to maintain saturation of potential acid sulfate soils.
 - b. If immediate disposal is not possible, the material should be capped with water and/or with non-porous clay soils to limit oxidation. As a precaution, lime should be added and the pH of the water should be monitored and treated if below 6.5.

Transport of AASS/PASS material

AASS/PASS material must be transported by haulage trucks with adequate tailgates to prevent spillage of material or drainage water onto public or construction access roads.

Haulage routes should be regularly monitored and inspected for AASS/PASS material. Spills are to be cleaned appropriately and spilled material is to be moved to the ASS Treatment Area as soon as possible.

AASS/PASS Treatment

AASS/PASS treatment must occur within a designated ASS Treatment Area (ASSTA). Material contained in ASSTAs must be treated and removed before new material is introduced to the area to ensure there is no mixing of treated with contaminated material.

The management of onsite treatment is the responsibility of the JV Foreman, with assistance from the JV Environmental team.

Aglime used in treatment is to be stored in 'dry areas' such as elevated holding bins or zero permeability bunded stockpiles. Stockpiles should be covered with tarpaulins to minimise dust generation and to keep the aglime dry as it is difficult to handle when wet.

Immediate reuse

Immediate reuse where excavations are backfilled within a day is **only appropriate** if PASS is of low strength, as temporary exposure can oxidise PASS and gradually generate AASS. It is therefore recommended that lime is applied prior to backfilling as a precautionary measure, and that material is backfilled in reverse order (last out, first in).

Immediate reuse is **not appropriate** for most situations where PASS is excavated. A specialist consultant should be consulted and the decision to employ this technique can only be made by the Environment Manager.

ASS Treatment Area

ASSTA are to be set up prior to the commencement of excavation. Designated ASSTAs should be constructed and discussed with construction personnel as part of ongoing toolbox talks. The foreman is to ensure these areas must be clearly signposted and for ASS/PASS material only. Material other than ASS/PASS that requires treatment needs to be assessed and treated in a separate location.

Mixing of Aglime (or alternative) and ASS

Aglime (or alternative) must be added according to the ratios defined by the results of Chromium Suite Validation testing. For details of the validation testing, see *Acid Sulfate Soils: Laboratory Methods Guidelines (DNRME 2004)*.

Two options are available for aglime treatment processes:

The first option is for disturbed ASS/PASS material to be returned to the excavation site once the excavation is complete (i.e. for service relocations). For these situations, aglime should be added over the area of disturbance in appropriate quantities prior to the commencement of excavation to

encourage early mixing and neutralisation. Specific liming rates are to be advised according to laboratory analysis (see Figure below).

The second option applies where ASS/PASS is excavated and relocated to the ASS Treatment Area. In these situations, the following process is to be followed:

1. One third of the total aglime required for the excavated material (determined from lab testing) will be placed as a bed over the proposed treatment location.
2. A layer of ASS or PASS material no more than 350 mm in depth must be placed on top of the aglime and allowed to dry.
3. When the material is dry (expected 1-2 days in hot dry weather, much longer in cool or wet weather), another 1/3 of the total lime shall be added to the top and sides of the stockpile and thoroughly mixed, using either small or large mechanical equipment such as a disc plough or rotary hoe attached to a tractor or other suitable equipment.
4. If necessary, the partially treated stockpile should again be allowed to dry.
5. The remaining 1/3 of lime should be added to the top and sides of the stockpile.
6. Thoroughly mix the stockpile using a rotary hoe (either on a tractor or as an excavator attachment). Where an excavator is to be used, increase the lime application rate using a safety factor to 2-2.5 dependent on the difficulty of mixing lime into the material.
7. Validation testing as required.
8. Once validated, the treated soil can be neutral and can be reused as general fill material. The final location of the neutral soil shall then be tracked and recorded in the Treated ASS Tracking Register.

Note: the ratios of aglime to be added may be varied on approval by the JV EPSM.

Any water contained within collection sumps will require sampling to assess requirements of water treatment prior to discharge.

The tonnes (t) of pure fine aglime, CaCO₃ required to fully treat the total weight/volume of acid sulfate soils (ASS) can be read from the table at the intersection of the weight of disturbed soil [row] with the existing plus potential acidity [column]. Where the exact weight or soil analysis figure does not appear in the heading of the row or column, use the next highest value.

Disturbed ASS (tonnes) (=m ³ ×BD) †	Soil Analysis ‡ – Existing Acidity plus Potential Acidity (converted to equivalent S% units)													
	0.03	0.06	0.1	0.2	0.4	0.6	0.8	1	1.5	2	2.5	3	4	5
1	0	0	0	0	0	0.03	0.04	0.05	0.1	0.1	0.1	0.1	0.2	0.2
5	0	0	0	0.05	0.1	0.1	0.2	0.2	0.4	0.5	0.6	0.7	0.9	1.2
10	0	0.03	0.05	0.1	0.2	0.3	0.4	0.5	0.7	0.9	1.2	1.4	1.9	2.3
50	0.1	0.1	0.2	0.5	0.9	1.4	1.9	2.3	3.5	4.7	5.9	7.0	9.4	12
100	0.1	0.3	0.5	0.9	1.9	2.8	3.7	4.7	7.0	9.4	12	14	19	23
200	0.3	0.6	0.9	1.9	3.7	5.6	7.5	9.4	14	19	23	28	37	47
250	0.4	0.7	1.2	2.3	4.7	7.0	9.4	12	18	23	29	35	47	59
350	0.5	1.0	1.6	3.3	6.6	10	13	16	25	33	41	49	66	82
500	0.7	1.4	2.3	4.7	9.4	14	19	23	35	47	59	70	94	117
600	0.8	1.7	2.8	5.6	11	17	22	28	42	56	70	84	112	140
750	1.1	2.1	3.5	7.0	14	21	28	35	53	70	88	105	140	176
900	1.3	2.5	4.2	8.4	17	25	34	42	63	84	105	126	168	211
1000	1.4	2.8	4.7	9.4	19	28	37	47	70	94	117	140	187	234
2000	2.8	5.6	9.4	19	37	56	75	94	140	187	234	281	374	468
5000	7.0	14	23	47	94	140	187	234	351	468	585	702	936	1170
10000	14	28	47	94	187	281	374	468	702	936	1170	1404	1872	2340

L	Low treatment: (≤0.1 tonnes lime)
M	Medium treatment: (>0.1 to 1 tonne lime)
H	High treatment: (>1 to 5 tonnes lime)
VH	Very High treatment: (>5 to 25 tonnes lime)
XH	Extra High treatment: (>25 tonnes lime)

Note: Lime rates are for pure fine aglime, CaCO₃ assuming an NV of 100% and using a safety factor of 1.5. A factor that accounts for Effective Neutralising Value is needed for commercial grade lime. (See the *Information Sheets on Neutralising Agents – Neutralising Considerations*).

† An approximate soil weight (tonnes) can be obtained from the calculated volume by multiplying volume (cubic m) by bulk density (t/m³). (Use 1.7 if B.D. is not known.) Dense fine sandy soils may have a BD up to 1.7, and hence 100 m³ of such soil may weigh up to 170 t. In these calculations, it is necessary to convert to dry soil masses, since analyses are reported on a dry weight basis.

‡ Potential acidity can be determined by Chromium Reducible Sulfur (S_{CR}), Peroxide Oxidisable Sulfur (S_{POS}) and Total Oxidisable Sulfur (S_{TOS}). For samples with pH <5.5, the existing acidity must also be determined by appropriate laboratory analysis eg. Titratable Actual Acidity (TAA). Soils with retained acidity eg. jarosite or other similar insoluble compounds have a less available acidity and will require more detailed analysis. The amount of treatment required may be reduced if the self-neutralising capacity of the soil is appropriately measured. Consult the *Queensland Acid Sulfate Soils Technical Manual, Laboratory Methods Guidelines*.

Figure C-1 Indicative Liming Rates

Treated ASS/PASS Monitoring

Once treated and allowed to dry further (if necessary), laboratory testing of the mixture should be conducted according to the Chromium Suite Validation method to determine if the criteria for sulphur and acid trails have been met. The testing frequency is to be conducted at a minimum of once every 500 m³ of treated soil, but may be done more frequently on advice from the Project Environmental and Sustainability Manager if considered necessary.

Composite samples containing a maximum of three discrete samples per composite may be used to account for potential variability that may occur with uneven mixing of lime. In situations requiring composite samples, suitable techniques must be employed to ensure the composite is representative of the treated material.

Field peroxide pH testing and tracking via the lime register can be used to assess the success of the treatment technique, and confirm the neutralisation of ASS material. Treated ASS/PASS will be determined to be neutral if results for the acid and/or sulphur trails are below the criteria agreed following consultation with the NSW Office of Water (NOW).

Further aglime mixing will be required until acid and sulphur criteria are met. The required amounts of any additional treatment product can be informed by the results of the acid and sulfur trails. The material must remain banded until acceptable validation results are available. Once testing shows the criteria are met, and the pH of the soils and leachate pond are above 6.5, then no further treatment is required and the material can be reused on site. A record of where this treated material is transported to must be kept via a Treated ASS Tracking Register.

If the pH of the leachate pond falls below 6.5, the material must continue to be treated using hydrated lime in the appropriate ratio prior to discharge (see Figure C-1).

ASS/PASS material should be treated and reused onsite as much as possible. In the unlikely event that the treated material is unable to be reused on-site for other purposes, the material must be disposed of appropriately. The D&CJV ESM / EO are responsible for coordinating the disposal process to an appropriate licensed waste disposal facility.

Monitoring and inspection

The following table provides a summary of the required monitoring, inspection and record keeping requirements associated with the management of ASS.

Table C-6 ASS monitoring, inspection and record keeping

Activity	Responsibility	Records / Evidence	Timing
Detailed ASS investigation in areas identified as ASS risk.	Project Engineer	Geotechnical factual report including laboratory results and interpretation.	Prior to the commencement of excavation or dewatering.
Establishment of new AAS stockpiles and / or treatment areas	Project Engineer	EWMS ASSTA added to Environmental Control Maps	Prior to the commencement of excavation or dewatering
Inspection of new AAS stockpiles and / or treatment areas.	Environmental Coordinator	ASS Stockpile / Treatment Area inspection record.	Upon establishment. Weekly during storage or treatment of ASS.
ASS Neutralisation	Project Engineer	Geotechnical factual report including laboratory results and interpretation.	Prior to the disposal or reuse of ASS.

Attachment A – PLR 1 Acid Sulfate Soil Class and Risk Maps

Coffey (2017), Parramatta Light Rail Geotechnical Data Report, Coffey Service Pty Ltd, 31 October 2017, document reference: 754-SYDEN196019-R11 (INFO DOC 03.16.01).

Made available to Beca Pty Ltd through - Golder Associates Pty Ltd (2018), Design Advice Notification (DAN) Technical Memorandum Preliminary Assessment of Acid Sulfate Soils Distribution and Management Requirements.

Appendix D – Water Quality (Turbidity) Monitoring Program

D.1 Scope of this Procedure

The purpose of this Water Quality Monitoring Program (WQMP) is to outline the Water Quality (Turbidity) Monitoring program as required by CoA C9 - Construction Monitoring Programs (**Table D-1**) and nominated REMMMs (**Table D-2**).

This WQMP forms part of the Construction Environmental Management Plan (CEMP) for the Parramatta Light Rail Stage 1 – Infrastructure Works (the Project).

D.2 Purpose

The WQMP has been prepared in accordance with the Australian and New Zealand guidelines for Fresh and Marine Water Quality (2000) and the identified water quality objectives as detailed below.

Given the present condition of the Project catchment, which has been described in the EIS as degraded, water quality criteria for construction works will be aligned with the baseline water quality as opposed to the aspirational ANZECC/ARMCANZ (2000) targets which are currently exceeded across the project.

D.3 Objectives

The objective of the WQMP is to maintain or improve the existing conditions of surface water and groundwater, as defined by the pre-construction sampling (baseline review), through the identification of potential impacts and implementation of the WQMP for appropriate response.

D.4 Targets

The targets for the WQMP are:

- Verify baseline studies of existing receiving water environment and provide pre-construction sampling (baseline review)
- Verify baseline data to establish suitable water quality goals with reference to the NSW Water Quality Objectives
- Outline a monitoring program of water discharges and receiving waters is undertaken at appropriate intervals and at times of discharge during construction
- Monitoring demonstrates no exceedances of water discharge or water quality goals.

D.5 Ministers Conditions of Approval and REMMMs

Relevant CoAs and REMMMs are listed in Table D-1 and Table D-2 respectively. These tables include references to the required outcomes, timing of when the commitment applies, relevant documents or sections of the environmental assessment influencing the outcome and implementation.

Table D-1 Conditions of Approval relevant to the Water Quality Monitoring Program

CoA No.	Condition Requirements	Document Reference	How Addressed
A5	Where the terms of this approval require a document or monitoring program to be prepared or a review to be undertaken in consultation with identified parties, evidence of the consultation undertaken must be submitted to the Secretary with the document or monitoring program or review. The evidence must include: (a) documentation of the engagement with the party(ies) identified in the relevant condition of approval before submitting the document for approval; (b) log of the points of engagement or attempted engagement with the identified party(ies) and a summary of the issues raised by the identified party(ies); (c) documentation of any follow-up with the identified party(ies), where feedback has not been provided, to confirm that the identified party(ies) has none or has failed to provide feedback after repeated requests; (d) outline of the issues raised by the identified party(ies) and how they have been addressed, including evidence that the party(ies) is satisfied the issues have been addressed; and (e) where there are outstanding issues raised by the identified party(ies) that have not been adopted, the reasons why they have not been/could not be adopted must be provided, including evidence of consultation with the relevant party(ies).	Section 4 Appendix E.	The Water Quality (Turbidity) Monitoring Program has been included in the SWMP and developed in consultation with DoI Water, EPA, City of Parramatta Council and Cumberland Council. Details of consultation requirements and relevant stakeholders are specified in Section 4 of the SWMP. Consultation feedback will be incorporated into this Sub-plan and summarised in Appendix E.

CoA No.	Condition Requirements	Document Reference	How Addressed
C10	Each Construction Monitoring Program must provide:	-	-
	a) details of baseline data available;	Section D.6	Baseline data has been taken from the EIS Technical Paper 6 – Water Quality Assessment for the Upper Parramatta River and Vineyard Creek based on monitoring data collected from 2012 to 2016. Data was not provided for the tidal Parramatta River (Lower) or Clay Cliff Creek.
	b) details of baseline data to be obtained and when;	Section D.7 Section D.8 Section D.9 Section D.10	Pre-construction sampling (baseline review) has been completed to check the baseline data from the EIS from 2012 to 2016 is still representative of the existing environment. This baseline review concluded that the EIS baseline data was representative (where available) of the existing environment. The results of this monitoring have been included in Section D.6 and Table D-3.
	c) details of all monitoring of the project to be undertaken;	Section D.12	Table D-4 provides a schedule of the water quality (turbidity) monitoring program sampling.
	d) the parameters of the project to be monitored;	Section D.10	Two sets of water quality parameters have been defined: - Field parameters to be assessed with a field water quality probe - Laboratory Samples to be analysed at a NATA accredited laboratory.

CoA No.	Condition Requirements	Document Reference	How Addressed
	e) the frequency of monitoring to be undertaken;	Section D.7 Section D.8 Section D.9 Section D.12	Sampling phase, type and frequency are outlined and summarised in the sampling schedule presented in D.12.
	f) the location of monitoring;	Section D.11 Figure D-1	Sampling sites has been selected up and down stream of the construction site within each waterway to provide control and impacts sites during each sampling event.
	g) the reporting of monitoring results against relevant criteria;	Section D.13	A tabulated schedule of the water quality (turbidity) monitoring program reporting requirements is provided.
	h) procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory; and	Section D.14	A Trigger, Action and Response Plan (TARP) outlined provides an outline of remedial actions and responses for dealing with significant surface water quality monitoring results
	i) any consultation to be undertaken in relation to the monitoring programs	Appendix E Section D.13	The Water Quality (Turbidity) Monitoring Program has been included in the SWMP and developed in consultation with DoI Water, EPA, City of Parramatta Council and Cumberland Council. The Water Quality (Turbidity) Monitoring Program reporting requirements outlines who and when results from the monitoring program will be provided to interested parties.

CoA No.	Condition Requirements	Document Reference	How Addressed
C14	Construction must not commence until the Secretary has received all of the required Construction Monitoring Programs, and all relevant baseline data for the specific construction activity has been collected.	Appendix D – Water Quality Monitoring Program Section D.6 Section D.12 and D.13.	The Water Quality Monitoring Program has included relevant baseline data from the EIS Technical Paper 6 – Water Quality Assessment. The Pre-construction sampling (baseline review) water quality (turbidity) monitoring has been completed to confirm the baseline water quality objectives prior to the commencement of construction and assess where the NSW Water Quality Objectives are being achieved in the existing environment. The results of this monitoring have been included in Section D.6 and Table D-3. Construction will not commence until this Water Quality Monitoring Program has been provided to the Secretary and all relevant baseline data has been collected.

Table D-2 Revised Environmental mitigation and management measures relevant to this Water Quality Monitoring Program

Ref #	Commitment	Timing	SWMP Reference	How Addressed
HY-1	A water quality management program would be developed in consultation with the Department of Industry (Lands and Water) and the EPA, and established prior to construction to ensure compliance with identified water quality objectives and enable potential impacts on surface and groundwater to be identified, controlled and reported. This would include targeted baseline monitoring of receiving waters and shallow groundwater prior to construction to identify baseline water quality conditions.	Construction	Appendix D	The Water Quality Monitoring Program for the Infrastructure Works has been presented in this Sub-plan. The Water Quality Monitoring Program will be developed in consultation with Department of Industry (Lands and Water) and the EPA. Evidence of consultation with these agencies will be included in Section 4 and Appendix E in accordance with CoA A5.

D.6 Baseline Water Quality Objectives

The EIS Technical Paper 6 – Water Quality Assessment provided baseline water quality values for the Upper Parramatta River and Vineyard Creek. Data was not provided for the tidal Parramatta River (Lower) or Clay Cliff Creek. In accordance with this monitoring program, pre-construction screening to confirm water quality objectives prior to the commencement of construction and assess where the NSW Water Quality Objectives are being achieved in the existing environment has been completed. The results of this phase of monitoring is presented in the Pre-construction sampling (baseline review) water quality (turbidity) monitoring report.

The conclusions of the pre-construction sampling and the established site-specific trigger values water quality parameters are presented in **Table D-3**.

D.7 Sampling phase

Two phases of water quality monitoring will be completed:

- **Pre-construction screening** to confirm water quality objectives prior to the commencement of construction and assess where the NSW Water Quality Objectives are being achieved in the existing environment
- **Construction Phase** to assess for impacts to receiving water quality during construction with temporal reference to the upstream control sites.

D.8 Sampling Type

Six sampling types have been defined:

- **Dry weather event** – sampling during non-rainfall periods (minimum 5 days following the cessation of rainfall)
- **Wet Weather Event** – during surface water flow events resulting from rainfall exceeding 20mm in 24hr (or high intensity storms resulting in localised flooding). Each rainfall event is consisted to occur following 5 days since the cessation of rainfall
- **Basin overtopping event** – during rainfall events that exceed a construction basin design rainfall event and result in discharge of untreated water from the basin
- **In-stream works** – during active construction activities within waterways including piling, bank works or bypass pumping
- **Incident investigation** – in response to discharges, in-stream works, incidents or complaint observed to result in visual impact to water quality
- **Construction site dewatering and discharge monitoring** - sampling of water prior to discharge to confirm compliance of water quality with the standard project water quality criteria (refer to Appendix B).

Table D-3 Baseline Water Quality Objectives

Indicator	Freshwater		Estuarine	
	Pre-construction monitoring results	Site Specific Trigger Values (SSTV)	Pre-construction monitoring results	Site Specific Trigger Values (SSTV)
Turbidity	Within ANZECC Guidelines	6 – 50 NTU Align with ANZECC Guidelines:	Outside of ANZECC Guidelines during wet weather	6 – 50 NTU Align with freshwater ANZECC Guidelines
pH	Outside of ANZECC Guidelines during wet weather	5.5 – 8.5 Align with upper trigger value, decrease lower trigger value.	Outside of ANZECC Guidelines during wet and dry weather	5.5 – 8.5 Align with freshwater SSTV
Dissolved Oxygen	Outside of ANZECC Guidelines during wet and dry weather	60% - 200% ¹ Increase upper trigger value and decrease lower trigger value	Outside of ANZECC Guidelines during wet and dry weather	60% - 200% Align with freshwater SSTV
Electrical conductivity	Within ANZECC Guidelines	125–2200 µS/cm Align with ANZECC Guidelines	Within ANZECC Guidelines	No limit Align with ANZECC Guidelines
Sulfate	Within ANZECC Guidelines	400 mg/L Align with ANZECC Guidelines	Within ANZECC Guidelines	No limit Align with ANZECC Guidelines

Indicator	Freshwater		Estuarine	
	Pre-construction monitoring results	Site Specific Trigger Values (SSTV)	Pre-construction monitoring results	Site Specific Trigger Values (SSTV)
Chloride	Within ANZECC Guidelines	400 mg/L Align with ANZECC Guidelines	Within ANZECC Guidelines	No limit Align with ANZECC Guidelines
Aluminium	Outside of ANZECC Guidelines during wet and dry weather.	(PR1, CC1) Increase trigger value: 1000 µg/L (DC1, VY2) Increase trigger value: 800 µg/L	Outside of ANZECC Guidelines during wet and dry weather	800 µg/L Increase trigger value
Copper	Outside of ANZECC Guidelines during wet and dry weather.	30 µg/L Increase trigger value	Outside of ANZECC Guidelines during wet and dry weather.	100 µg/L Increase trigger value
Lead	Within ANZECC Guidelines (except for Clay Cliff Creek)	(PR1, DC1, VY2) Align with ANZECC Guidelines. (CC1) Align with estuarine SSTV: 8.0 µg/L	Outside of ANZECC Guidelines during wet and dry weather	8.0 µg/L Increase ANZECC Guideline for estuarine waters.
Manganese	Within ANZECC Guidelines	Align with ANZECC Guidelines	Within ANZECC Guidelines	Align with ANZECC Guidelines

Indicator	Freshwater		Estuarine	
	Pre-construction monitoring results	Site Specific Trigger Values (SSTV)	Pre-construction monitoring results	Site Specific Trigger Values (SSTV)
Iron	Outside of ANZECC Guidelines during wet and dry weather.	(PR1, CC1, VY2) Increase trigger value: 1200 µg/L (DC1) Align with estuarine SSTV: 1000 µg/L	Outside of ANZECC Guidelines during wet and dry weather	1000 µg/L Increase trigger value
Hydrocarbons	Within ANZECC Guidelines	Align with ANZECC Guidelines	Within ANZECC Guidelines	Align with ANZECC Guidelines

Notes: ¹If monitoring occurs in proximity to the Domain Creek weir during wet weather monitoring, increase upper SSTV to 250%. Aeration from water falling over the weir will increase the %DO.

D.9 Monitoring Frequency

The frequency of the various water quality monitoring types is based on:

- **Pre-construction sampling (baseline review)** – four wet weather (weather permitting) and four dry weather events prior to construction.
- **Construction Phase**
 - Dry Weather – quarterly
 - Wet weather – during rainfall events exceeding 20mm
 - Basin overtopping events - during each basin overtopping events
 - Incident investigation - in response to any discharge, in-stream works, incident or complaint observed to result in impact to water quality.
 - Construction Site Dewatering and Discharge monitoring – prior to any discharge or construction water from site.

Refer to **Table D-5** for further details on the Water Quality (Turbidity) Monitoring type, frequency and parameters.

Refer to **Table D-6** for a summary of the Water Quality (Turbidity) Monitoring reporting requirements.

D.10 Water quality parameters

Two sets of water quality parameters have been defined:

- Field parameters to be assessed with a field water quality probe
 - Turbidity (NTU)
 - pH
 - Conductivity
 - DO %
 - Oil and grease (visual assessment)
 - Temperature.
- Laboratory Samples
 - TSS
 - Salinity (EC)
 - pH
 - Sulfate
 - Chloride
 - Metals
 - Phosphorus
 - Nitrogen
 - Hydrocarbons (TPH, TRH).

The following additional information will be collected with all sampling events:

- Preceding rainfall
- River / creek water level
- Tidal sequence in tidal reaches
- Visual observations for litter, debris, oil, grease and large pollutants
- Summary of relevant construction activities and discharges
- Observations of other non-construction contributors to variations in water quality (e.g. stormwater)
- Photos.

D.11 Sampling sites

Table D-4 provides a summary of the proposed sampling locations in the Parramatta River, Clay Cliff Creek, Vineyard Creek, Subiaco Creek, Domain Creek and A'becketts Creek.

- The monitoring should be undertaken as close as possible to the proposed discharge points of the proposed project to the receiving waters
- The sampling locations should be representative of where the site discharge mixes with the receiving waters.

It is noted that the North Parramatta Bridge (Bridge Street near Cumberland Hospital District) was initially proposed as a sampling location (PR.2). Further investigations determined that this location cannot be safely accessed and the area downstream is blocked by fencing. As such, the PR.2 sampling location has been removed from the monitoring program.

In response to the program of works at Rosehill, two additional sampling locations have been proposed on A'becketts Creek. The locations are upstream (AC.1) and downstream (AC.2) of the works and are reflected in Table D-4.

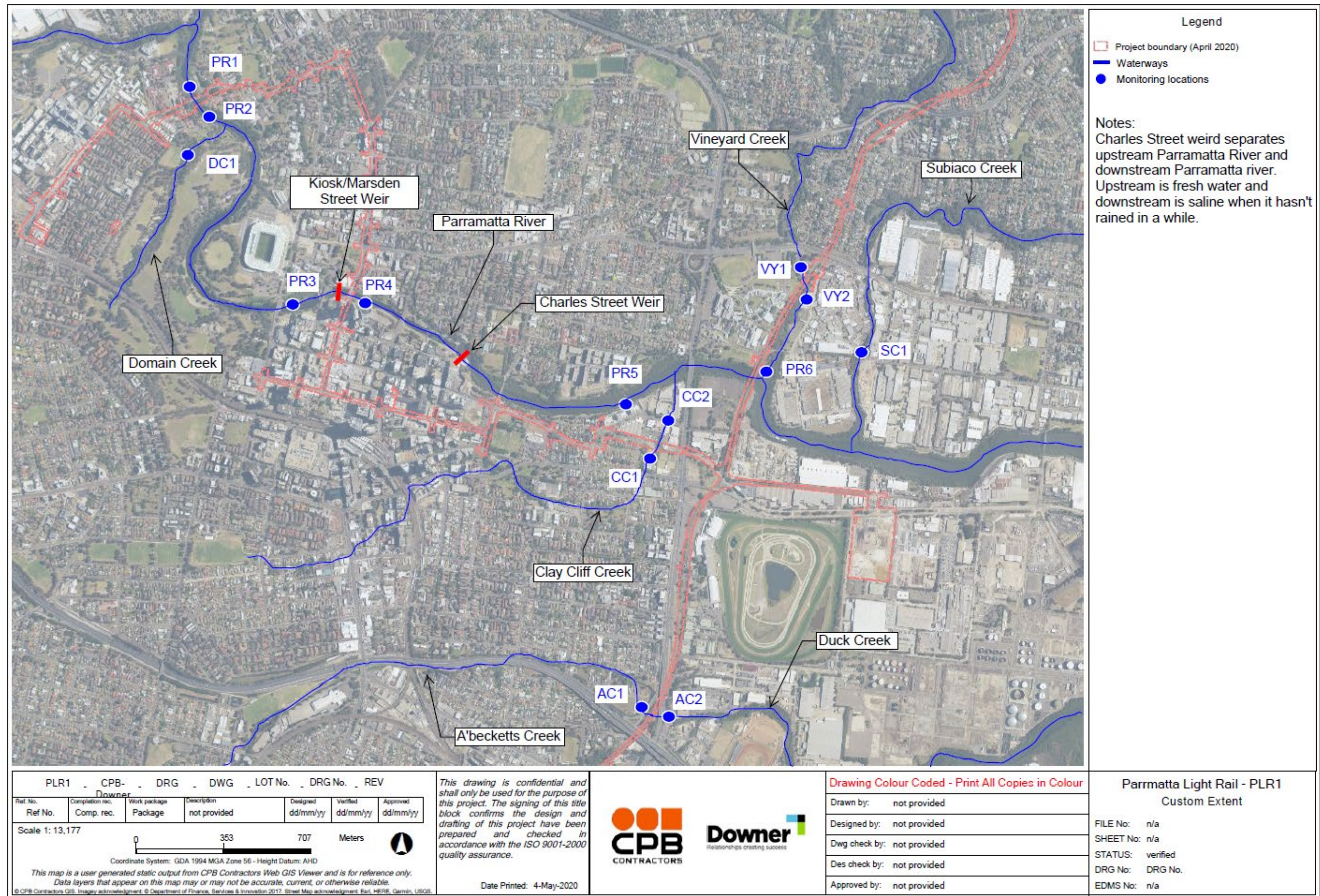
Table D-4 Summary of recommended surface water monitoring locations

Water Body	Sampling location	Comments	Map reference
Parramatta River	Upstream (US) of project	Control sample upstream of works (freshwater section of river, upstream of Charles St Weir).	PR.1 (US)
	Downstream of Bridge Road Bridge	Immediately downstream of bridge works. Due to current access restrictions, monitoring will be delayed until commencement of bridge construction (which will include partial removal of fencing at the river)	PR.2
	O'Connell St Compound	At discharge entry point to Parramatta River.	PR.3
	Lennox Bridge (Church St)	Immediately downstream of bridge works.	PR.4
	Charles Street Weir – upstream of works in the saltwater section of the river	Control sample upstream of works (saltwater section of river, downstream of Charles St Weir).	PR.5
	Parramatta River bridge south of Western Sydney Parramatta Campus (existing rail bridge) Parramatta River Bridge compounds (compounds on both north and south sides of river)	WQ monitoring point immediately downstream of bridge works to capture effects of bridge modification and compounds.	PR.6

Water Body	Sampling location	Comments	Map reference
Clay Cliff Creek	Upstream (US) of Vineyard Creek bridge and compounds	Control sample upstream of works.	CC.1 (US)
	James Ruse Drive bridge (new bridge over Clay Cliff Creek near Tramway Ave)	Immediately downstream of bridge works.	CC.2
Vineyard Creek	Upstream (US) of Vineyard Creek bridge and compounds	Control sample upstream of works.	VY.1 (US)
	Vineyard Creek bridge (new bridge construction adjacent to existing rail bridge)	WQ monitoring point immediately downstream of bridge works to capture effects of bridge and compounds.	VY.2
Subiaco Creek	Upstream of mouth of Subiaco Creek (exact location TBD according to proximity of potential sources of pollution to creek confluence with Parramatta River)	The project alignment does not immediately cross Subiaco Creek, however the creek as a potential alternative source of pollution is to be monitored. This site will only be monitored if observations indicated there were differences in the water quality of Parramatta River.	SC.1

Water Body	Sampling location	Comments	Map reference
Domain Creek	Upstream of mouth of Domain Creek (exact location TBD according to proximity of potential sources of pollution to creek confluence with Parramatta River)	The project alignment does not immediately cross Domain Creek, however the creek as a potential alternative source of pollution is to be monitored. This site will only be monitored if observations indicated there were differences in the water quality of Parramatta River.	DC.1
A'becketts Creek	Directly upstream of A'becketts Creek before Rosehill works.	Control sample upstream of works.	AC.1
	Directly downstream of A'becketts Creek after Rosehill works.	Immediately downstream of works.	AC.2

Figure D-1 Surface Water Quality Monitoring Locations



D.12 Monitoring Schedule

Table D-5 provides a schedule of the water quality (turbidity) monitoring program sampling.

Table D-5: Water Quality (Turbidity) Monitoring Sampling Schedule

Phase	Sampling Type	Parameters	Frequency	Sampling sites	Reporting
Pre-construction	Wet weather	Field parameters Laboratory Samples	Four events prior to construction (rainfall events permitting)	All	Baseline verification water quality (turbidity) monitoring report
	Dry Weather	Field parameters Laboratory Samples	Four events prior to construction	All	
Construction Phase ¹	Dry Weather	Field parameters	Quarterly	All	Monthly summary in the Project Performance Report Annual Water Quality monitoring summary report
		Laboratory Samples	Quarterly	All	
	Wet weather	Field parameters	During each rainfall event exceeding 20mm. Each rainfall event is consisted to commence following >5 days since the cessation of the previous rainfall event.	All	
		Laboratory Samples	Once per quarter	All	

Phase	Sampling Type	Parameters	Frequency	Sampling sites	Reporting
	In-stream	Field parameters	Following each rainfall event exceeding 20mm	All	
		Laboratory Samples	Once per quarter	All	
	Basin overtopping events	Field parameters	During each basin overtopping events	Receiving waters of construction sediment basins	Monthly summary in the Project Performance Report
		Laboratory Samples	Once per quarter during a basin overtopping events	Receiving waters of construction sediment basins	Annual Water Quality monitoring summary report
	Incident investigation	Field parameters	In response to any discharge, in-stream works, incident or complaint observed to result in impact to water quality	Sampling sites up and down-stream of observation	Incident report Monthly summary in the Project Performance Report
		Laboratory Samples	Any event that is associated with potential chemical pollution (e.g. hydrocarbon spill, ASSTA discharge, concrete washout entering waterways).	Sampling sites up and down-stream of observation	Annual Water Quality monitoring summary report

Phase	Sampling Type	Parameters	Frequency	Sampling sites	Reporting
	Construction Site Dewatering and Discharge monitoring	Field parameters	Sampling of water prior to discharge to confirm compliance of water quality with the standard project water quality criteria (refer to Appendix B).	EPL Licensed Discharge Points	Dewater and Discharge Permit Monthly summary in the Project Performance Report Annual Water Quality monitoring summary report Monthly EPL Report EPL Annual Return

Notes:

1. Water quality monitoring program for the Infrastructure Works will cease at the end of construction once all drainage and rehabilitation works are complete.

D.13 Reporting

Table D-6 provides a schedule of the water quality (turbidity) monitoring program reporting requirements.

Table D-6: Water Quality (Turbidity) Monitoring Reporting Schedule

Report	Scope	Timing	Frequency	Responsibility	Submission
Pre-construction sampling (baseline review) water quality (turbidity) monitoring report	Following the completion of the pre-construction water quality sampling events. This report will review the pre-construction water quality against the EIS baseline data and establish the water quality objectives for each water quality parameter.	Prior to construction	Once only	Environment and Sustainability Manager	TfNSW IC DPIE
Monthly Environmental Monitoring Report	Monthly Summary of: • Weather observations • Key works and activities (e.g. construction activities, instream works, erosion and sediment control works) • Key erosion and sediment control / water quality control measures and actions • Surface Water Quality Monitoring data • Issues / incidents / non-compliances	Within seven Business Days after the relevant month end	Monthly until the completion of construction	Environment and Sustainability Manager	TfNSW IC DoI Water EPA City of Parramatta Council Cumberland Council

Report	Scope	Timing	Frequency	Responsibility	Submission
Annual Environment Report	Annual review of the monitoring and reporting requirements of the CEMP Sub-plans including this Sub-plan and the Water Quality (Turbidity) Monitoring Program.	Within ten Business Days after the end of the relevant calendar year	Annually	Environment and Sustainability Manager	TfNSW IC DPIE DoI Water EPA City of Parramatta Council Cumberland Council
Incident Reports	Incident reports where incident investigations identify potential or actual pollutions of waters or non-compliances	Notification as soon as practical. Report within 24hrs	For each event	Environment and Sustainability Manager	EPA in accordance with POEO requirements
Monthly EPL Report	Monthly reporting of monitoring data referred to in the EPL including discharge monitoring data in accordance with Section 66 (6) of the POEO Act.	Within 14 days of obtaining data	Monthly	Environment and Sustainability Manager	Publicly available (website) EPA in accordance with POEO requirements
EPL Annual Return	Annual reporting of monitoring data referred to in the EPL including discharge monitoring data.	Within timeframe specified	Annual	Environment and Sustainability Manager	EPA in accordance with EPL requirements

D.14 Trigger, Action and Response Plan

The Trigger, Action and Response Plan (TARP) outlined in **Table D-7** provides an outline of remedial actions and responses for dealing with significant surface water quality monitoring results when the Site-Specific Trigger Values (**Table D-3**) are exceeded.

The action responses are suggested to increase the likelihood of identifying contributing factors and ensure relevant information is recorded at the time of the observation. If the action responses determine that an environmental emergency or pollution event has or is likely to occur, the Environmental Incident and Emergency Response Plan in the CEMP is to be implemented to implement corrective and preventative actions and required notifications.

Table D-7 Surface Water Quality Trigger, Action and Response Plan

Source	Trigger Criteria	Action Response	Responsibility
Water Quality Monitoring – field sampling	Downstream water quality fails to meet SSTV >20% increase in turbidity (NTU) relative to upstream	- Investigate and determine related contributing factors - Check discharge points and discharge permits - Review adequacy of erosion and sediment controls	Environmental Coordinator
	Downstream water quality fails to meet SSTV >20% variation in pH relative to upstream	- Investigate and record contributing factors - Check discharge points and discharge permits - Record concreting related activities occurring in receiving catchment	Environmental Coordinator
	Downstream water quality fails to meet SSTV >20% variation in Conductivity relative to upstream	- Investigate and record contributing factors - Review tidal patterns	Environmental Coordinator

Source	Trigger Criteria	Action Response	Responsibility
	Downstream water quality fails to meet SSTV >20% variation in DO % relative to upstream	- Investigate and record contributing factors - Check discharge points and discharge permits - Record any water utilities works occurring (testing, disinfection and dichlorination)	Environmental Coordinator
	Downstream Oil and grease evident	- Investigate and record contributing factors - Check discharge points and discharge permits - Investigate point sources (if evident) - Report any asphaltting works occurring in receiving catchment	Environmental Coordinator
Water Quality Monitoring – field sampling	Variation in field water quality exceeding SSTV >20% identified to be a result of project works.	- Report incident - Determine if impact is material harm or pollution of waters - Notify EPA Pollution Hotline	Environment and Sustainability Manager
		Implement preventative measures to cease impact to water quality (e.g. cease discharge)	Site Supervisor
		Collect Laboratory Samples	Environmental Coordinator
Water Quality Monitoring – field sampling	Impact is determined to be material harm	- Initiate Pollution Incident Response Plan - Notify EPA Pollution Hotline (131 555)	Environment and Sustainability Manager
	Laboratory monitoring are outside of the criteria	Resample	Environmental Coordinator

Source	Trigger Criteria	Action Response	Responsibility
Environment and Sustainability Manager	established in the Baseline Monitoring Report.	- Obtain specialist advice on interpretation of results - Investigate and determine related contributing factors	Environment and Sustainability Manager
Environment and Sustainability Manager	Deviation from established water quality criteria identified to be a result of project works.	- Report incident - Determine if impact is material harm or pollution of waters - Notify EPA Pollution Hotline	Environment and Sustainability Manager
		Implement preventative measures to cease impact to water quality (e.g. cease discharge)	Site Supervisor

Appendix E – Consultation Evidence

Table E-1: Log of consultation with City of Parramatta Council as per A5(b) and (c)

In / Out	Date and time	Method of contact	Details of contact
Out	19&20/06/19	Workshops	PLR Infrastructure Package CEMP and Sub-plan briefing sessions (attended).
Out	21/06/19, 17:36	Email	Issue of Soil and Water Management Sub-plan for review.
In	05/07/19, 17:01	Email	Response to CEMP and Sub-plan review received. No comments provided for the Soil and Water Management Sub-plan.

Table E-2: Log of consultation with Cumberland Council as per A5(b) and (c)

In / Out	Date and time	Method of contact	Details of contact
Out	19/06/19	Workshops	PLR Infrastructure Package CEMP and Sub-plan briefing sessions (attended).
Out	21/06/19, 18:40	Email	Issue of Soil and Water Management Sub-plan for review.
In	11/07/19, 17:01	Email	Response to CEMP and Sub-plan review received. No comments provided for the Soil and Water Management Sub-plan.
Out	16/07/19, 19:41	Email	Email requesting confirmation that Cumberland Council has no feedback on the Soil and Water Management Sub-plan.
In	17/07/19, 9:11	Email	Email confirming that Cumberland Council has no feedback on the Soil and Water Management Sub-plan.

Table E-3: Log of consultation with EPA as per A5(b) and (c)

In / Out	Date and time	Method of contact	Details of contact
Out	19/06/19	Workshops	PLR Infrastructure Package CEMP and Sub-plan briefing sessions (attended)
Out	21/06/19, 18:40	Email	Issue of Soil and Water Management Sub-plan for review.
In	05/07/19, 17:01	Email	Response to CEMP and Sub-plan review received with comment on the Soil and Water Management Sub-plan.
Out	17/07/19, 19:53	Email	Return of updated comments register confirming that recommendations had been incorporated into the plan.
In	31/07/19, 15:00	Email	Response from EPA to return of updated comments register stating EPA does not endorse or approve Management Plan documents, however we appreciate the opportunity to comment. No outstanding issues were raised in response to the comments register for the of Soil and Water Management Sub-plan.

Table E-4: Log of issues raised by EPA as per A5 (d) and (e)

Reference	Comment	How addressed	Management plan reference location
1.01	Table 7-1, SW-03 Reword unclear- "The construction planning will demonstrate that it has considered measures will be adopted for construction of new or bridges/modification of new existing bridges"	SW-03 reworded to: The construction planning for new bridges, and modification of new existing bridges, will consider measures to minimise impacts on waterways. This will include consideration of:	Table 7-1, SW-03

Reference	Comment	How addressed	Management plan reference location
1.02	Table 7-1, SW-06 Suggest Re-phrasing "Minimising extent and duration of use of temporary structures required within the waterway." to "We will minimise" or "this will be kept to a minimum"	SW-06 reworded to: The extent and duration of temporary structures required within the waterway be kept to a minimum.	Table 7-1, SW-06
1.03	Table 7-1, SW-07 Reword "staging works to minimise the duration of construction activities within the waterway" Suggested "Works will be staged to minimise the duration of construction activities within the waterway"	SW-07 reworded to: Works will be staged to minimise the duration of construction activities within the waterway	Table 7-1, SW-07
1.04	Table 7-1, SW-11 Amend to "The extent and duration of all exposed surfaces will be minimised".	SW-11 reworded to The extent and duration of all exposed surfaces (particularly those works that have the greatest potential to disturb soils that are contaminated or have a high erosion and runoff hazard) will be minimised as far as practical. Reference to contaminated or have a high erosion and runoff hazard has been retained as this is derived from REMMM HY-6 (Table 3-3).	Table 7-1, SW-11
1.05	Table 7-1, SW-35 Include "or limits specified within an EPL"	SW-35 reworded to pH should be assessed using a pH probe or water quality metre prior to discharge. Water will not be discharged if pH is not within the range 6.5 – 8.5 or limits specified within an EPL.	Table 7-1, SW-35

Reference	Comment	How addressed	Management plan reference location
1.06	Table 7-1, SW74 Include confirmation that all spills and leaks causing harm to the environment will also be reported in line with the Environmental Incident and Emergency Response section (9.3) of the Site Establishment Management Plan	SW74 reworded to All hazardous materials spills and leaks will be reported to site managers and actions will be immediately taken to remedy spills and leaks. Spill and leaks that result in potential or actual harm to the environment will also be reported in line with the Environmental Incident and Emergency Response presented in Appendix A5 of the CEMP.	Table 7-1, SW-74
1.07	Section 8.5 Reporting Include detail of reporting requirements to the EPA	EPL Monthly Reports In accordance with the POEO Action Section 66(6) and EPL Annual Returns have been added to the Table 8-3. The PLR Infrastructure Works is consistent with the definition of a Railway activities – railway infrastructure construction (clause 33) pursuant to Schedule 1 of the Protection of the Environment Operations Act 1997 (the Act) and as such will require an EPL. The CEMP and Sub-plans will be revised to be consistent with any additional requirements of the EPL including reporting requirements. Reporting of Notifiable Pollution Events is addressed in Section 3.7.2 of the CEMP.	Table 8-3

Reference	Comment	How addressed	Management plan reference location
1.08	Table 8-2 Monitoring and Inspection Requirements ERSD control measures post rain inspection Suggest amending to "Both Pre and Post rainfall events anticipated to exceed 20mm , to ensure erosion and sediment controls and ensure their ongoing functionality.	Suggestion included for both pre- and post-rainfall inspections.	Table 8-2
1.09	Appendix B, Construction Site Dewatering and Discharge Procedure Disposal of Water Suggest including a bullet point that indicates discharge shall only occur in line with discharge criteria / conditions of an EPL should one apply	Suggestion included: Discharge to land within the site boundary shall only occur if: Water complies with Project's water quality criteria or in discharge criteria / conditions of an EPL should one apply;	Appendix B
1.10	Table 8-3 Reporting Requirements Incident reports Submission box empty - Include "EPA in accordance with POEO requirements"	Suggestion included.	Table 8-3.

Table E-5: Log of consultation with DPI Fisheries as per A5(b) and (c)

In / Out	Date and time	Method of contact	Details of contact
Out	21/06/19, 18:50	Email	Issue of Soil and Water Management Sub-plan for review.
In	27/06/19, 18:04	Email	Confirmation that DPI Fisheries has reviewed the Soil and Water Management Sub-plan and has no comments or objections.

Table E-6: Log of consultation with Natural Resources Access Regulator (NRAR) as per A5(b) and (c)

In / Out	Date and time	Method of contact	Details of contact
Out	19&20/06/19	Workshops	PLR Infrastructure Package CEMP and Sub-plan briefing sessions (attended).
Out	21/06/19, 17:36	Email	Issue of Soil and Water Management Sub-plan for review.
Out	13/07/19, 15:35	Email	Request for comments or update on when comments may be received.
In	15/07/2019 9:44	Email	Response from NRAR that there are no comments on the Sub-plan

Appendix F – Environmental Representative Endorsement

26 November 2021

Transport for NSW

Attention to: [REDACTED]
A/Senior Manager Environment
Parramatta Light Rail
130 George St, Parramatta, NSW 2150

**Review of Appendix B5 – Soil and Water Management Sub Plan.
Infrastructure Contract -Parramatta Light Rail Stage 1
(PLR1INF-CPBD-ALL-WA-PLN-000001 Rev 11)**

Pursuant to SSI8285 Condition of Approval A23 (d) i), as the approved Environmental Representative, I confirm that I have reviewed the updated document Appendix B5 – Soil and Water Management Sub Plan, Infrastructure Contract, Parramatta Light Rail - Stage 1 (PLR1INF-CPBD-ALL-WA-PLN-000001, Rev 11), dated 25 November 2021, prepared by Parramatta Connect, which includes Appendix D – Water Quality (Turbidity) Monitoring Program, for consistency with the requirements of the Conditions of Approval.

The amendments to the aforementioned document are editorial in nature and do not increase the type or magnitude of impact on the environment. These amendments are classified as minor and are approved in accordance with Condition of Approval C8. The document continues to be consistent with the requirements included in or required under the terms of the Conditions of Approval for the Parramatta Light Rail (Stage 1) development.

Yours sincerely,

Australian Quality Assurance & Superintendence Pty Ltd (AQUAS)



[REDACTED]
[REDACTED]
[REDACTED]

Filename : AQ1148.05 PLR CPBD SWMP rev11 endorsement 211126

For more information about the Parramatta Light
Rail project, visit Parramattalightrail.nsw.gov.au

Call: 1800 139 389

Email: Parramattalightrail@transport.nsw.gov.au

