

Soil and Water Management Plan

Transport for NSW

**Supply, Operate, Maintain (SOM) Package
Parramatta Light Rail**

October 2020

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Approval and Certification

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Endorsed by Environmental Representative	Annabelle Tungol
Signed	
Dated	
Approved on behalf of Transport for NSW by	
Signed	
Dated	

About this release

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Glossary / Abbreviations

Abbreviations	Expanded text
ASS	Acid Sulfate Soil
CEMP	Construction Environmental Management Plan
CLMP	Contaminated Land Management Plan
CoA	Conditions of Approval
CSSI	Critical State Significant Infrastructure
DPI&E	NSW Department of Planning, Industry and Environment
DPI	NSW Department of Primary Industries
ECM	Environmental Control Map
EIS	Environmental Impact Statement
ESCP	Erosion and Sediment Control Plan
EPA	NSW Environment Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
EES	The Environment, Energy and Science Group is part of the Department of Planning, Industry and Environment and incorporates OEH
GRCLR	Great River City Light Rail
LTEMP	Long Term Environmental management Plan
PESCP	Progressive Erosion and Sediment Control Plan
PIRMP	Pollution Incident Response Management Plan
PLR	Parramatta Light Rail
REMMM	Revised Environmental Mitigation and Management Measure
RUSLE	Revised Universal Soil Loss Equation
SaMF	Stabling and Maintenance Facility

SPIR	Submissions and Preferred Infrastructure Report
SOM	Supply, Operate and Maintain
SWMP	Soil and Water Management Plan

1 Introduction

1.1 Context

This Soil and Water Management Plan (SWMP – the Plan) has been prepared by Great River City Light Rail (GRCLR) for the construction phase of the Stabling and Maintenance Facility (SaMF), part of the Parramatta Light Rail (PLR).

PLR is one of the NSW Government's major infrastructure projects being delivered to serve a growing Sydney. PLR will connect Westmead to Carlingford via Parramatta Central Business District (CBD) and Camellia. PLR is expected to be operational in 2023. More detailed description of the full PLR alignment corridor is provided in Section 1.2.

The PLR received planning approval on the 29 May 2018 (SSI 8285) and was subsequently modified twice with approvals issued on 21 December 2018 and 25 January 2019, respectively. This SWMP has been prepared to address the requirements of the Minister's Conditions of Approval (CoA), the Revised Environmental Mitigation and Management Measures (REMMM) and Environmental Performance Outcomes (EPO) listed in the *Parramatta Light Rail Stage 1 Westmead to Carlingford via Parramatta CBD and Camellia Environmental Impact Statement (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) (SPIR) and all applicable legislation.

1.2 Background and project description

PLR 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 PLR include:

- A new dual track light rail network of approximately twelve kilometres in length, including approximately seven 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 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 Facility (SaMF) located in Camellia for light rail vehicles 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, Rydalmer
- 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 the PLR route is shown in Figure 1-1 below.



Figure 1-1: Parramatta Light Rail Route

1.2.1 Statutory context

The PLR has been 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).

A detailed environmental impact assessment has been carried out and approved by the Minister for Planning. The Planning Approval for PLR is described in Section 1.2.2.

1.2.2 PLR planning approval

The PLR was approved by the Minister for Planning on 29 May 2018, under Section 5.19 of the Environmental Planning and Assessment Act (EP&A Act) 1979. An environmental impact statement (EIS) was prepared as part of the infrastructure application (SSI-8285) as was a submissions and preferred infrastructure report (SPIR) following public exhibition of the EIS.

The Infrastructure Approval has subsequently been modified twice under Section 5.25 of the EP&A Act, with approvals issued on 21 December 2018 and 25 January 2019, respectively. The modifications related to changes to conditions of approval (CoA) not the physical description of PLR.

The Infrastructure Approval, modifications and related environmental assessment documents can be found at: http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8285

The remediation of 6 Grand Avenue, Camellia was assessed under Division 5.1 of the EP&A Act via a Review of Environmental Factors (TfNSW October 2017) with Transport for NSW the proponent and the determining authority. The REF was determined, and the remediation approved to proceed in December 2017.

1.3 Staging of the PLR works

The PLR comprises approximately 12km alignment from Westmead to Carlingford via Camellia and consists of a mix of both on-street and dedicated corridor.

PLR is being delivered under five delivery packages as detailed in the Staging Report:

- 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 Facility (SaMF)
- Infrastructure Works (**Package 4**) – 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**) – The Project (subject of this Plan) 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 SaMF, 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 (TfNSW). 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

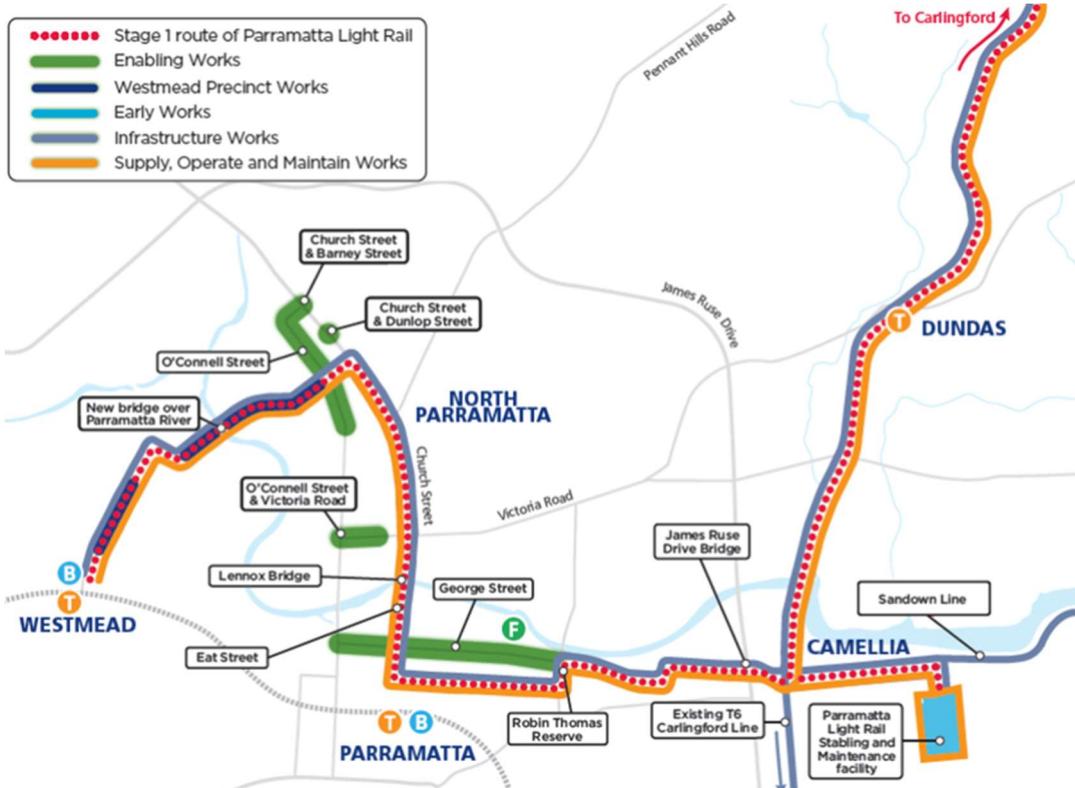


Figure 1-2 Parramatta Light Rail Delivery Package Interface

1.4 Project description for Supply, Operate and Maintain - Package 5

As System Integrator for PLR, the SOM Contractor's activities include:

- Delivery activities
- Light rail vehicle procurement
- Operation and maintenance.

The delivery activities include all investigation, selection, specification, design, approvals, construction, manufacture, installation, testing and commissioning, operational readiness and activities to transition from the delivery phase to the operations phase.

In summary the package includes the following. **Figure 1-3** further details these activities.

- All works above and additional to the platform concrete foundation slab at all stops
- Stabling and maintenance facility
- Central control system
- Light rail signalling system
- Elements of the road intersection signalling system
- Communications and passenger information systems
- Power Supply system
- Procurement of light rail vehicles (LRV)

- Maintenance plant and machinery for the LRVs
- Earthing & bonding, electrolysis and electromagnetic compatibility.

1.4.1 SOM roles and responsibilities

Great River City Light Rail (GRCLR) is responsible for the delivery of the SOM works for the PLR, including the SaMF. GRCLR has sub-contracted out the supply component of these works to Construcciones y Auxiliar de Ferrocarriles (CAF) who has engaged Thales, General Electric and Laing O'Rourke Australia (LORAC) to undertake the design and construction activities associated with the supply component of the works, which includes the design and construction related activities including testing and commissioning, and excludes all operational and maintenance activities.

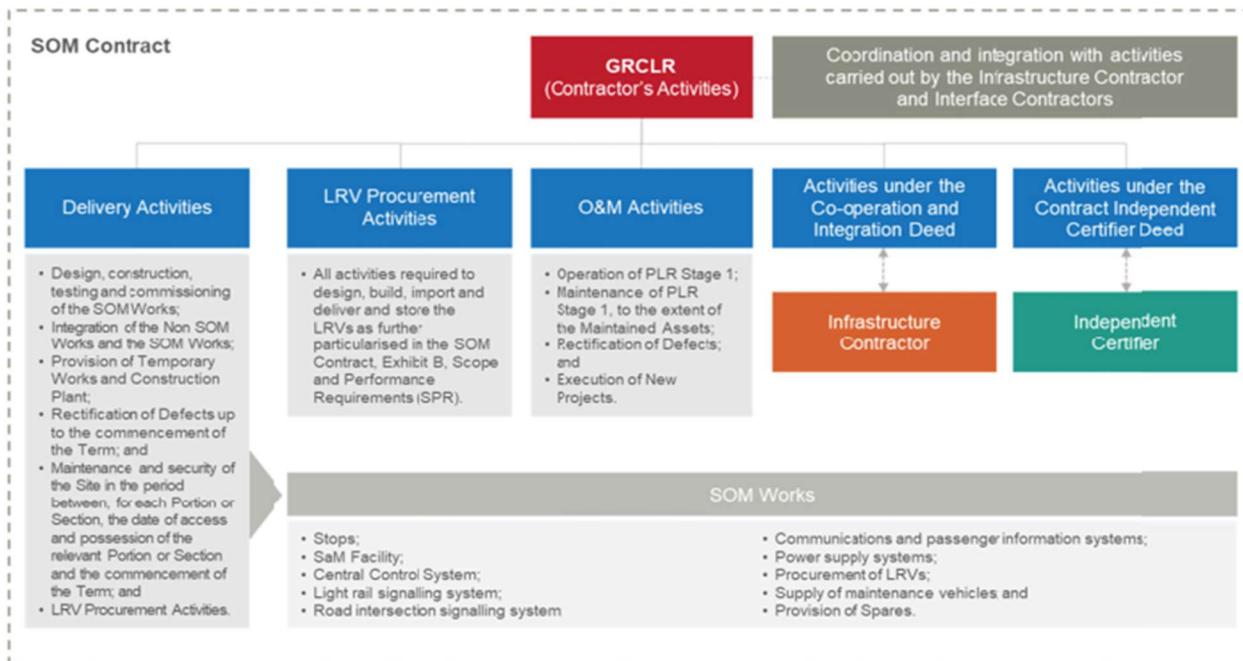


Figure 1-3: SOM contract activities for PLR

GRCLR is the owner of the Construction Environmental Management Plan (CEMP) and Sub-Plans, and is responsible for ensuring implementation of and compliance by all subcontractors during construction works of the SOM package, which include the construction of the light rail systems (including high-voltage power supply), stops above slab level, as well as the stabling and maintenance facility (the Project). Further detail on the Project is provided below.

1.4.2 Stops

Light rail stops would be constructed after the Infrastructure Contractor has completed the stop slabs and access, with works at each stop commencing progressively after the completion of the adjacent linear segment of track infrastructure. There are sixteen stops to be constructed.

The stops will be in the following locations:

- Westmead Station
- Westmead Hospital
- Children's Hospital at Westmead
- Cumberland Hospital

- Factory Street
- Fennell Street
- Prince Alfred Square
- Eat Street
- Parramatta Square
- Harris Street
- Tramway Avenue
- Camellia
- Rydalmerle
- Dundas
- Telopea
- Carlingford.

1.4.3 Stabling and maintenance facility

A stabling and maintenance facility (SaMF) will be constructed at 6 Grand Avenue, Camellia on a former industrial site adjacent to the Rosehill Gardens Racecourse. The facility will provide for maintenance, repair, refurbishing, upgrading, stabling, cleaning of light rail vehicles and a base for infrastructure maintenance activities and will operate 24 hours a day and 7 days a week.

Administration and staff facilities, as well as the operations control centre for the light rail network, will be located within the maintenance building. Parking for staff and visitors will be provided on site, including maintenance vehicle parking. An electrical substation will be located at the site to power the facility and light rail.

The site is currently undergoing remediation, including subsurface remediation works to render the site suitable for its proposed land use as a stabling and maintenance facility. This has removed all vegetation from the site. GRCLR will receive the site cleared of vegetation and with a capping layer.

This site is to be used as the main SOM compound. The facility will be established following completion of ground remediation works and capping of the site, which will be completed by others. GRCLR will receive the site along with a site audit statement from an EPA Accredited Site Auditor. Prior to establishment, the ground will be stabilised to minimise dust emissions and erosion.

The type and extent of works to construct the SaMF is summarised in Table 1-1 below.

Table 1-1 - Type and extent of works to construct the SaMF

Type of works	Works extent
Site establishment	<ul style="list-style-type: none"> • Site office and amenities during construction
Earthworks and subsurface works	<ul style="list-style-type: none"> • Combined service route • Drainage • Hydraulics (sewer, water, fire)

Type of works	Works extent
Civil works	<ul style="list-style-type: none"> • Fencing • Service roads • Footpaths • Carparks • Landscaping
Rail systems	<ul style="list-style-type: none"> • Track • Overhead wiring • DC feeders
Structures	<ul style="list-style-type: none"> • Administration and Maintenance building (construction of foundation and slab, structural frame, roofing and cladding, MEP fit out, finishes) • Outbuildings (fire pump house, sanding plant building, cleaners store, train wash building)
Operations Control Centre	<ul style="list-style-type: none"> • Operations Control Centre (construction of foundation and slab, structural frame, roofing and cladding, MEP fit out, finishes) • Outbuildings (fire pump house, sanding plant building, cleaners store, train wash building)
Rail stops	none

1.4.4 Substations

Traction Power Substations (TPS) would generally comprise prefabricated structures, which are manufactured off-site. On-site works would typically comprise excavation, foundation preparation and construction, and the installation of conduits and other in-situ works (i.e. electrical works) prior to the installation of the prefabricated substation building and security fencing surrounding the site. Note that the demolition of existing buildings at TPS sites will be undertaken by the Infrastructure Contractor and is outside of the scope of this plan. The construction of the TPS is outside the scope of this plan.

1.4.5 Rail systems

The installation of rail systems would include the installation of overhead wiring and jewellery, rail signalling and associated infrastructure and systems. The overhead wiring structures and footings will be constructed by the Infrastructure Contractor, as will be the combined services route within which the rail systems conduits will be installed.

1.5 Scope of the Plan

This Plan applies to the scope of works for the SaMF only as summarised in Section 1.4.3. The Plan will be revised to include the remainder of the SOM works in line with the delivery program of the SOM works, which are dependent on the works of other interface contractors.

The SWMP is applicable to all activities during construction of the SaMF, including all areas where physical works will occur, or areas that may be otherwise impacted by the construction works, and

which are under the control of the GRCLR. All GRCLR 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.

This plan may be submitted to DPIE along with, or subsequent to, the submission of the CEMP but in any event, no later than one month before construction.

1.6 Relationship with relevant work packages

1.6.1 Infrastructure contractor - Parramatta Connect (Package 4)

The Infrastructure Works is closely aligned to the Package 5, Supply, Operate and Maintain (SOM) Works. A graphical representation of the split in scope between the two packages is depicted in Figure 1-4. The reason for dividing this work into two packages is to ensure that suitably qualified and experienced sub-contractors are in place for each specialised component; civil infrastructure, and operational systems. The Infrastructure Works will deliver the civil infrastructure components and will not trigger the operational conditions, except for those that relate to detailed design.

An interface between the two packages has been established to monitor cumulative impacts and the coordination of environmental complaints management, site management controls, and the delineation of incident reporting and non-compliance management.

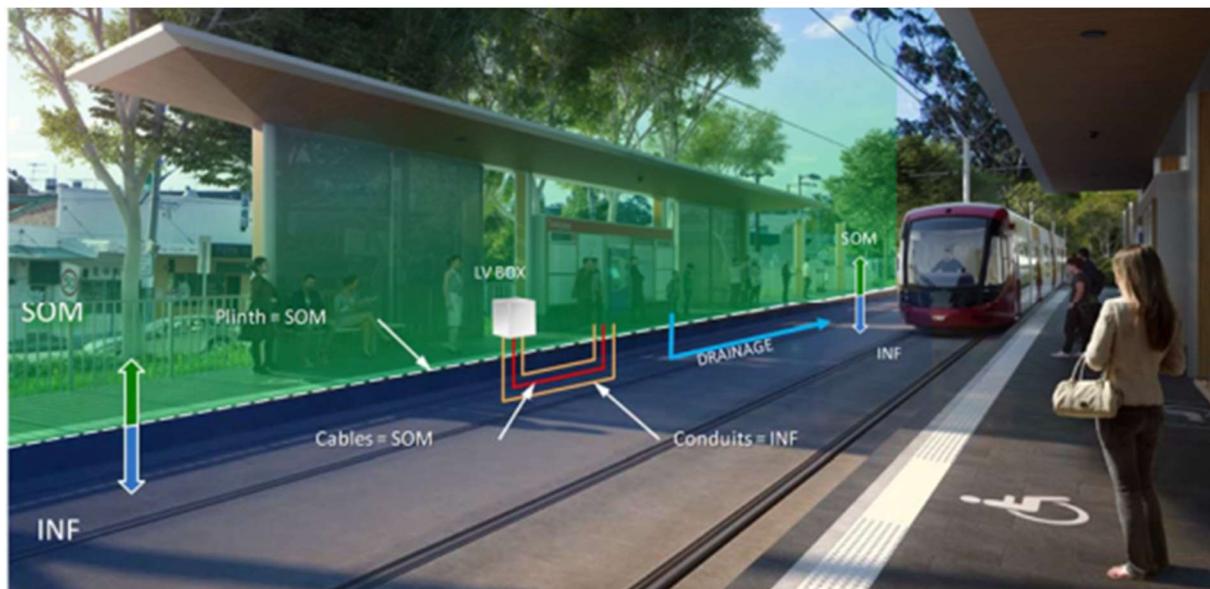


Figure 1.4 – Relationship between Infrastructure Works and SOM Works

1.6.2 Early Works Remediation Contractor – Ventia (Package 3)

The SOM contract is dependent on the completion of the remediation works at the stabling and maintenance facility (SaMF) site, by the remediation contractor.

The SaMF site is subject to historical contamination and is a listed contaminated site by the Environment Protection Authority (EPA). The works have been split to ensure that appropriately qualified contractor, experienced in remediating heavily contaminated sites, is managing the remediation of the site. The remediation contractor will complete their works and provide GRCLR a remediated site, complete with a site audit statement, and supporting management documentation, fit for purpose for site establishment, construction and operational activities associated with PLR.

The remediation works will deliver the remediated site, including any details of any ongoing management requirements, and will not trigger the construction and operational conditions, except

for those that relate to detailed design. The Remediation Contractor will provide GRCLR with a Long Term Environmental Management Plan (LTEMP) for the SaMF, the LTEMP will include all construction, operation, management, maintenance and monitoring requirements to protect and maintain the performance of the remediation infrastructure at for the SaMF. GRCLR will implement the requirements of the LTEMP relevant to the construction and operation of the Stabning and Maintenance facility.

Ongoing management for the remedial works on the SaMF site will be implemented through a LTEMP which will be approved by the Site Auditor, as part of the issuing of the Site Audit Statement (SAS) for the site. The LTEMP will be a stand-alone document, and all monitoring and reporting will be managed through the processes and procedures in the LTEMP, and not through the SOM CEMP and sub plans.

An interface between the two packages has been established to ensure the remediated site meets the design requirements for the construction, operation and maintenance of the site.

1.7 Environmental management systems overview

The environmental management system overview is described in section 4.1 of the CEMP.

The construction of the SaMF will be managed in accordance with the GRCLR Integrated Management System (IMS) which includes an Environmental Management System (EMS). The EMS will be adopted as the guiding environmental management framework for the Project. The EMS is compliant with AS/NZS ISO 14001:2015. The EMS is integrated with the project wide IMS which includes assurance, quality and health and safety, management systems

The EMS will guide the development of the Project's governance documentation, including this SWMP, the CEMP and associated management plans, procedures and management tools to achieve the commitments and intentions established by the GRCLR Environment and Sustainability Policy, to ensure environmental performance and sustainability objectives and targets are achieved.

- All works carried out on the site will be in accordance with:
- Minister's Conditions of Approval (CoA) SSI-8285
- Revised Environmental Mitigation and Management Measures (REMMMs)
- Environmental Performance Outcomes (EPO's)
- AS/NZ ISO 14001
- All applicable legislation
- Project Deed
- GRCLR IMS.

1.7.1 Construction Environmental Management Plan

A CEMP will be prepared for the SOM contract (Package 5). This CEMP provides the system to manage and control the environmental aspects of the SOM contract (Package 5) during construction. It also provides the overall framework for the system and procedures to ensure environmental impacts are minimised and legislative and other requirements are fulfilled.

The CEMP will be endorsed by the ER and provided to the Secretary for approval at least one month prior to the commencement of construction. In accordance with CoA C8 construction will not commence until the CEMP and the associated management plans specified in CoA C3 are approved by the Secretary or provided to the Secretary for information (as required by CoA C3).

1.7.2 Environmental Management Plans

Subject-specific environmental management plans will be prepared to support the CEMP. These documents are prepared to identify requirements and processes applicable to specific impacts or aspects of the SOM contract (Package 5). They address the relevant requirements of the CoAs, REMMMs and EPOs. A list of construction management plans for the SOM contract (Package 5) and their approval requirements are provided in Table 1-2.

Table 1-2 Environmental Management Plans

Document name	Document number	Approval pathway/ requirement
Traffic, Transport and Access Management Plan	PLR1SOM-GLR-ALL-PM-PLN-000032	REMMM GEN-1 CoA C3 (a) REMMM TT-25
Flora and Fauna Management Plan	PLR1SOM-GLR-ALL-PM-PLN-000033	REMMM GEN-1 CoA C3 (e) REMMM BI-3
Noise and Vibration Management Plan	PLR1SOM-GLR-ALL-PM-PLN-000034	REMMM GEN-1 CoA C3 (b) REMMM NV-1
Soil and Water Management Plan	PLR1SOM-GLR-ALL-PM-	REMMM GEN-1 and HY-6
Heritage Management Plan	PLR1SOM-GLR-ALL-PM-PLN-000037	REMMM GEN-1 CoA C3 (d) REMMM AB-2 REMMM HE-21
Air Quality Management Plan	PLR1SOM-GLR-ALL-PM-PLN-000038	REMMM GEN-1 and AQ-1
Construction Waste and Resource Management Plan	PLR1SOM-GLR-ALL-PM-PLN-000039	REMMM GEN-1 and WM-2
Contaminated Land Management Plan	PLR1SOM-GLR-ALL-PM-PLN-000040 Revision B	REMMM GEN-1 REMMM CM-3
Site Establishment Management	PLR1SOM-GLR-ALL-PE-PLN-001002	REMMM GEN-1

Document name	Document number	Approval pathway/ requirement
		CoA C18 REMMM GEN-2
Flood Management Plan	PLR1SOM-GLR-ALL-PM-PLN-000047	REMMM GEN-1 CoA C3 (c) REMMM HY-4

1.7.3 Interaction with other management plans

Key interactions for this Plan with other management plans include:

- Construction Waste and Resource Management Plan, which details the controls and requirements for managing waste and resources
- Contaminated Land Management Plan, which addresses management of the remediated SaMF and unexpected contamination finds chemical storage and spill response and stockpile management
- Air Quality Management Plan, which details the controls and requirements for managing dust and wind erosion
- Delivery Phase Sustainability Management Plan, which defines the sustainability targets, addresses the tracking and reporting of waste and energy, and provides detailed strategies to achieve resource reductions.

1.7.4 Progressive erosion and sediment control plans

Progressive Erosion and Sediment Control Plans (PESCP) are designed for use as a practical guide to manage risks to soil and water associated with construction activities. They may be produced in conjunction with an Environmental Work Method Statement (EWMS) which provide more detailed site-specific environmental mitigation measures.

In areas with low erosion and sediment control risk, the PESCPs may be incorporated into the Environmental Control Maps (ECMs). If areas contain moderate to high erosion and sediment control risk, the PESCPs will be developed separately to the ECMs and reviewed by the Environment and Sustainability Manager.

The PESCPs will be consistent with the Erosion and Sediment Control Plan Procedure (Appendix A), which describes the intentions and fundamental principles for erosion and sediment control management for the duration of the entire project. The PESCPs will be developed by the environment team in consultation with construction personnel. They will be developed prior to any construction works commencing in each work zone and will be modified as required when:

- Site conditions evolve.
- Flow paths change.
- Construction activities that affected the characteristics of ground conditions change.

A Project Soil Conservationist will be engaged and consulted throughout construction to provide advice on erosion and sediment control design, installation, maintenance and the development of PESCPs.

2 Purpose and objectives

2.1 Purpose

The purpose of this SWMP is to describe how GRCLR proposes to manage and protect water quality during construction of the SaMF.

The Plan includes management measures to minimise impacts on soil and water during the construction of the SaMF.

2.2 Objectives

The key objectives of the SWMP is to:

- ensure the SaMF is constructed in accordance with the relevant Conditions of Approval (CoA), Revised Environmental Mitigation and Management Measures (REMMs), Environmental Performance Outcomes (EPOs), the Project Deed (Section 1.8 of Exhibit B, SPR – Appendix D) and licence/permit requirements
- ongoing risk analysis for erosion, sedimentation and water quality issues potentially arising from the SaMF
- present overall soil and water management principles and guidelines for the construction phase of the SaMF
- describe how measures will be implemented to prevent or mitigate potential downstream inputs relating to soil and water
- identify safeguards, mitigation measures and undertake monitoring to manage soil and water quality during construction and implement progressive Erosion and Sediment Control Plans (ESCP's)
- outline the roles and responsibilities of those involved in the design and implementation of soil and water management controls
- outline an effective monitoring, auditing and reporting framework to assess the effectiveness of the controls implemented
- detail strategies, guidelines and requirements for the development of progressive ESCPs.

2.3 Targets

Targets for the management of soil and water impacts for the SOM contract are presented in Table 2-1 with key performance indicators (KPI) for each.

Table 2-1 Targets and KPIs for Soil and Water

Target	KPI	Records
Full compliance with the relevant legislative requirements, CoA, REMMMs, LTEMP and TfNSW specifications	No repeat non-conformances	Environmental inspection checklist, audits

Target	KPI	Records
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)	Nil soil and water pollution incidents including unplanned discharges, i.e. Penalty Infringement Notices (PINs) issued against the SaMF site	Environmental inspection checklist, audits
Ensure training on best practice soil and water management is provided to all construction personnel through site inductions.	Widespread project awareness of best practice soil and water management	Training and induction records

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 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.
- 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).
- Fairfull, S. and Witheridge, G. (2003) Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings. NSW Fisheries
- 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)

3.1.3 Water quality criteria

The ANZECC/ARMCANZ (2000) guidelines provide recommended trigger values for water quality and the protection of aquatic ecosystems (Table 3-1).

Table 3-1 Guidelines for the protection of aquatic ecosystems (ANZECC/ARMCANZ, 2000).

Indicator	Freshwater	Estuarine
Conductivity ($\mu\text{s}/\text{cm}$)	125-1200	-
pH	6.5-8.5	7-8.5
Dissolved oxygen (% saturation)	85-110	80-110
Turbidity (NTU)	6-50	0.5-10
Ammonia ($\mu\text{g}/\text{L}$)	<20	<15
Oxidised nitrogen ($\mu\text{g}/\text{L}$)	<40	<15
Total nitrogen ($\mu\text{g}/\text{L}$)	<350	<300
Total phosphorus ($\mu\text{g}/\text{L}$)	<25	<30
Filterable reactive phosphorus ($\mu\text{g}/\text{L}$)	<20	<5
Chlorophyll-a ($\mu\text{g}/\text{L}$)	<3	<4
Total aluminium ($\mu\text{g}/\text{L}$)	55	-
Total manganese ($\mu\text{g}/\text{L}$)	1900	-
Total lead ($\mu\text{g}/\text{L}$)	3.4	-
Total copper ($\mu\text{g}/\text{L}$)	1.4	-

3.2 Minister's Conditions of Approval

The CoA relevant to this Plan are listed in Table 3-2. A cross reference is also included to indicate where the condition is addressed in this Plan or other Project management documents.

Table 3-2: Conditions of Approval relevant to the SWMP

CoA No.	Condition Requirements	Document Reference	How Addressed
A1	<p>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:</p> <p>(a) the <i>Parramatta Light Rail (Stage 1) Westmead to Carlingford via Parramatta CBD and Camellia Submissions Report (incorporating Preferred Infrastructure Report) (February 2018)</i> (the SPIR);</p> <p>(b) SSI 8285 Administrative modification (November 2018) (MOD 1); and</p> <p>(c) SSI 8285 Correction to Administrative modification (January 2019) (MOD 2).</p>	This document	<p>The conditions of approval that are relevant to soil and water are addressed by this plan. Environmental Management Measures from the EIS, including that were revised as part of the SPIR, have been addressed in preparation of this plan.</p>
C4	The CEMP plans must state how:		
	a) the environmental performance outcomes identified in the documents listed in Condition A1 will be achieved;	This document	Table 3.1 (this table) will identify how the environmental

CoA No.	Condition Requirements	Document Reference	How Addressed
			performance outcomes of Condition A1 will be achieved.
	b) the mitigation measures identified in the documents listed in Condition A1 will be implemented;	Table 3.1 (this table)	This table, along with Table 6.1 identifies the mitigation measures from the EIS and documents listed in Condition A1, and details how they will be implemented.
	c) the relevant terms of this approval will be complied with; and	Table 3.1 (this table)	This table set out how the terms of the conditions of approval relevant to Soil and Water Management will be complied with.
	d) issues requiring management during construction, as identified through ongoing environmental risk analysis, will be managed.	Table 3.1 (this table)	Table 6.1 identifies any ongoing environmental risk management requirements and how these will be managed. Appendix A2 of the CEMP: Environmental Risk Assessment
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.	General note	Discussed in Section 1.5 and Table 6-1.

CoA No.	Condition Requirements	Document Reference	How Addressed
A5	<p>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:</p> <ul style="list-style-type: none"> (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, 	This document	<p>Consultation with the relevant government agencies listed in Condition C-9 will be undertaken to request an exemption from C9 (a) Water Quality (turbidity) for the SOM works.</p> <p>Consultation will be in the form of review of this SWMP.</p> <p>A record of that correspondence is documented in Appendix C of this SWMP. A record of that correspondence is documented in Appendix C of this SWMP.</p>

CoA No.	Condition Requirements	Document Reference	How Addressed
	including evidence of consultation with the relevant party(ies).		
C2 (c)	A program for ongoing analysis of the key environmental risks arising from the activities described in subsection (a) of this condition, including an initial risk assessment undertaken before the commencement of construction of the CSSI;	Section 3.4 of the CEMP	An Environmental Risk Assessment (ERA) was prepared for the PLR SOM. The ERA will be reviewed every three months (quarterly).
C2 (d)	Details of how the activities described in subsection (a) of this condition will be carried out to: i) meet the performance outcomes stated in the documents identified in Condition A1; and ii) manage the risks identified in the risk analysis undertaken in subsection (c) of this condition;	Section 7.3 of this document Section 3.4 and Table 3.4	Mitigation measures identified in the ERA to manage the risks and achieve compliance with the performance outcomes of the documents identified in A1 will be incorporated into the CEMP plans Compliance with the performance outcomes will be checked by the implementation of a comprehensive monitoring/inspection/auditing programme (Section 7.3).
C2 (e)	An inspection program detailing the activities to be inspected and frequency of inspections	Section 7.3 of this document	The D&C Environment Manager and/or delegate will undertake pre-work inspections, weekly and pre and post-rainfall inspections of the work site to

CoA No.	Condition Requirements	Document Reference	How Addressed						
			<p>evaluate the effectiveness of environmental controls.</p> <p>An environmental inspection checklist will be used to ensure that all environmental aspects are reviewed during inspection.</p> <p>The ER, AA, IA, TfNSW and Independent Certifier will also undertake inspections</p>						
C9	<p>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:</p> <table> <tr> <td data-bbox="422 854 691 933">Required Construction Monitoring Programs</td> <td data-bbox="781 854 1062 957">Relevant government agencies to be consulted for each</td> </tr> <tr> <td data-bbox="422 997 691 1108">(a) Water Quality (Turbidity) Monitoring</td> <td data-bbox="781 997 1062 1108">Dol Water, RELEVANT Council(s)</td> </tr> <tr> <td data-bbox="422 1148 691 1227">(b) Noise and Vibration Monitoring</td> <td data-bbox="781 1148 1062 1251">Relevant Council(s), EPA, NSW Health (as relevant)</td> </tr> </table>	Required Construction Monitoring Programs	Relevant government agencies to be consulted for each	(a) Water Quality (Turbidity) Monitoring	Dol Water, RELEVANT Council(s)	(b) Noise and Vibration Monitoring	Relevant Council(s), EPA, NSW Health (as relevant)	Section 4.2 of this document	<p>Consultation with the relevant government agencies listed in Condition C-9 will be undertaken to request an exemption from C9 (a) Water Quality (turbidity) for the SOM works.</p> <p>Consultation will be in the form of review of this SWMP.</p> <p>A record of that correspondence is documented in Appendix C of this SWMP.</p>
Required Construction Monitoring Programs	Relevant government agencies to be consulted for each								
(a) Water Quality (Turbidity) Monitoring	Dol Water, RELEVANT Council(s)								
(b) Noise and Vibration Monitoring	Relevant Council(s), EPA, NSW Health (as relevant)								

CoA No.	Condition Requirements	Document Reference	How Addressed
	(c) Grey-headed flying fox Monitoring OEH		
C10	<p>Each Construction Monitoring Program must provide:</p> <ul style="list-style-type: none"> (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 any consultation to be undertaken in relation to the monitoring programs. 	Section 4.2.1	<p>Consultation with the relevant government agencies listed in CoA C9 will be conducted in the form of the review of this SWMP.</p> <p>Water Quality (turbidity) is proposed not to be undertaken as part of the SOM works. See Section 4.2.1 and Appendix C for more details.</p>
C12	The Construction Monitoring Programs must be developed in consultation with relevant	Section 4.2.1	Consultation with the relevant government agencies listed in

CoA No.	Condition Requirements	Document Reference	How Addressed
	<p>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.</p>		<p>CoA C9 will be conducted in the form of the review of this SWMP.</p> <p>Water Quality (turbidity) is proposed not to be undertaken as part of the SOM works. See Section 4.2.1 and Appendix C for more details.</p>
C13	<p>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.</p>	Section 4.2.1	<p>Consultation with the relevant government agencies listed in CoA C9 will be conducted in the form of the review of this SWMP.</p> <p>Water Quality (turbidity) is proposed not to be undertaken as part of the SOM works. See Section 4.2.1 and Appendix C for more details.</p>
C14	<p>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.</p>	Section 4.2.1	<p>Consultation with the relevant government agencies listed in CoA C9 will be conducted in the form of the review of this SWMP.</p> <p>Water Quality (turbidity) is proposed not to be undertaken as part of the SOM works. See</p>

CoA No.	Condition Requirements	Document Reference	How Addressed
			Section 4.2.1 and Appendix C for more details.
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.	Section 4.2.1	Consultation with the relevant government agencies listed in CoA C9 will be conducted in the form of the review of this SWMP. Water Quality (turbidity) is proposed not to be undertaken as part of the SOM works. See Section 4.2.1 and Appendix C for more details.
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 .	Section 4.2.1	Consultation with the relevant government agencies listed in CoA C9 will be conducted in the form of the review of this SWMP. Water Quality (turbidity) is proposed not to be undertaken as part of the SOM works. See Section 4.2.1 and Appendix C for more details.
C17	Where a relevant CEMP Sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP Sub-plan .	Section 4.2.1	Consultation with the relevant government agencies listed in CoA C9 will be conducted in the form of the review of this SWMP.

CoA No.	Condition Requirements	Document Reference	How Addressed
			Water Quality (turbidity) is proposed not to be undertaken as part of the SOM works. See Section 4.2.1 and Appendix C for more details.
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).	Table 6.1: SW4, SW5, SW6, SW7, SW8, SW9, SW10, SW11, SW12, SW13 Appendix A	Appropriate erosion and sediment controls are discussed in Table 6.1. Progressive Erosion and Sediment Control Plans will be implemented and regularly maintained to prevent water pollution, as per the Blue Book guidelines.
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.	Table 3.1 Table 6.1: SW4, SW5, SW6, SW7, SW8, SW9, SW10, SW11, SW12, SW13	The erosion and sediment control measures set out in this plan, specifically those detailed in Table 6.1, will ensure that the works do not impact the water quality of the Parramatta River. This will contribute towards achieving and maintaining the NSW Water Quality Objectives.

3.3 Revised Environmental Mitigation and Management Measures

Relevant REMMMs are listed in Table 3-3. 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: Revised Environmental mitigation and management measures relevant to this SWMP

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	Not Applicable to the SaMF works. Consultation with the relevant government agencies listed in REMMM HY-1 will be undertaken to request an exemption from HY-1 water quality management program for the SOM works. Consultation will be in the form of review of this SWMP. A record of that correspondence is documented in Appendix C of this SWMP. A record of that correspondence is documented in Appendix C of this SWMP.		N/A
SG-1	A geotechnical investigation would be carried out to guide the detailed design and construction of the project. Detailed design would consider the potential impacts on elements that are buried or in contact with identified acid sulfate soils and	Not Applicable to the SaMF works. The SaMF site is being remediated separate to the Package 5 works. This remediation involves a surface		N/A

Ref #	Commitment	Timing	SWMP Reference	How Addressed
	determine mitigation and management measures for minimising impacts.	capping layer that will not be penetrated by the SOM works. See Sec 4.1.3		
GEN-1	<p>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:</p> <ul style="list-style-type: none"> • 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. 	Pre-Construction	This document	This SWMP documents the mechanisms for compliance with the commitments made in the Environmental Impact Statement, the submissions report and the Conditions of Approval that are relevant to soil and water management.

Ref #	Commitment	Timing	SWMP Reference	How Addressed
	<ul style="list-style-type: none"> • Site compound and ancillary works management. • Landscape and temporary works management. • Emergency and incident response management. <p>The CEMP would be prepared by the responsible contractor(s) and approved by the Secretary of the NSW Department of Planning, Industry and Environment.</p>			
GEN-2	<p>A construction compounds plan would be prepared for the SOM Package as part of the overall CEMP. This plan would set out details for each of the approved construction compounds, including stockpile areas, laydown areas and other ancillary activities required to construct the works. The plan would supplement, in greater detail, the information provided in the main body of the CEMP. The objectives and strategies of the construction compounds and ancillary facilities management plan would include the following:</p> <ul style="list-style-type: none"> • Minimise the impact of construction compounds on surrounding land uses and sensitive receivers. • Locate construction compounds away from sensitive land uses and receivers, wherever practical and feasible, or configure internal compound layouts in a manner that considers 	Pre-Construction	<p>Site Establishment Management Plan This document: Table 6-1: SW13, SW14</p>	<p>A Site Establishment Management Plan has been developed in accordance with the requirements of GEN-2 to document commitments to mitigate potential water and soil related impacts (highlighted in bold).</p> <p>Spoil stockpiles, plant and equipment will be stored away from drainage lines, watercourses and stormwater drains in accordance with Blue Book requirements, to minimise potential pollution of watercourses, groundwater.</p> <p>Stockpile sites will be selected by the EM and planned with consideration to REMM HY-8. These sites will have site specific ESCPs prepared to avoid impact on waterways.</p>

Ref #	Commitment	Timing	SWMP Reference	How Addressed
	<p>noise and light sensitive receivers (e.g. use of buildings to shield noisy activities, minimising the requirement for reversing vehicles, or locating noise intensive activities to maximise the distance to noise sensitive receivers).</p> <ul style="list-style-type: none"> • Manage stockpile areas to minimise potential pollution of watercourses, groundwater and local air quality. • Minimise the clearing of vegetation (e.g. street trees and trees within public open spaces) to the minimum amount necessary to construct the Project, particularly where construction compounds are proposed in public open spaces/parkland areas. • Locate construction compounds away from (or able to be managed in such a way so as to not impact on) heritage items and high retention value trees. • Locate construction compounds away from or implement management measures so as to not impact on waterways. • Flood response measures for compounds that are located on land affected by the 20-year ARI flood level (e.g. bridge support construction compounds). • Situate construction compounds and ancillary facilities on relatively level ground and avoid 			

Ref #	Commitment	Timing	SWMP Reference	How Addressed
	<p>excavation in construction compounds where risk of heritage impacts or disturbance of contaminated material.</p> <ul style="list-style-type: none"> Minimise the visual impact of construction compounds and ancillary facilities through either siting such facilities away from sensitive receivers (where practical and feasible) and/or providing screening. 			
BI-4	<p>The following measures would be adopted in the flora and fauna management plan to mitigate impacts on aquatic habitats during construction:</p> <p>» Implementing the soil and water mitigation and management measure s HY-7, SG-3, SG-4 and CM-3.</p> <p>» Preparation of acid sulfate soils/contaminated soils management plan.</p> <p>» 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.</p> <p>» levels to reduce instream blockage to fish passage.</p> <p>» 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</p>	During construction	<p>This SWMSP Flora and Fauna Management Sub-plan (FFMSP)</p> <p>Contaminated Land Management Sub-plan (CLMSP)</p> <p>SWMP section 1.7.4 and Appendix</p> <p>CEMP Appendix A6 ECMS</p>	<p>This SWMSP addressed the mitigation and management measures HY-7, SG-3, SG-4 and CM-3. Refer to each REMMM in this table to see how they have been addressed.</p>

Ref #	Commitment	Timing	SWMP Reference	How Addressed
	<p>to fish movements and the Policy and guidelines for fish habitat conservation and management (Department of Primary Industries, 2013).</p> <ul style="list-style-type: none"> » Construction compounds would where feasible be located within previously disturbed areas, away from riparian vegetation (to the extent possible). » Use of platforms/temporary wharfs in preference to weirs for instream construction works. » Use of floating booms around work zones. » Use of silt curtains around new piers during piling to restrict turbidity. » Bund integrity of equipment wash -downs would be maintained for all works on/near river banks. » Prohibition dumping of excavated materials or untreated runoff water in the river. » 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). <p>The relevant mitigation and management measures would be shown on Environmental</p>			

Ref #	Commitment	Timing	SWMP Reference	How Addressed
	Control Maps in accordance with Transport for NSW's Guide to Environmental Control Map.			
HY-2	<p>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:</p> <p><i>Water Sensitive Urban Design Guideline. Applying water sensitive urban design to NSW Transport projects</i> (Transport for NSW, 2017)</p> <p><i>Managing Urban Stormwater, Environmental Targets Consultation Draft</i> (DECCW, 2007)</p> <p><i>Managing Urban Stormwater: Council Handbook</i> (EPA, 1997).</p> <p>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, 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.</p>	Prior to construction	<p>This SWMSP.</p> <p>SWMP section 1.7.4 and Appendix A</p> <p>CEMP Appendix A6 ECMs</p>	<p>Erosion and sediment controls will be in place to manage the risk of sedimentation, littering and chemical pollution. These will include:</p> <ul style="list-style-type: none"> • Sediment barriers/fences • Kerbside gravel bags • Internal pit protections • Sheeting to cover stockpiles. <p>Additional measures are detailed in Table 6.1.</p>

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 reaching of the Parramatta River, Clay Cliff Creek, Vineyard Creek and other nearby waterways within the study area during construction.	Pre-Construction	This document. [Note: The rivers and creeks below the weir will not be impacted by the SaMF construction because of their distance from the SaMF site]	Erosion and sediment controls will be in place as per the blue book to manage the risk of sedimentation, littering and chemical pollution. These will include: <ul style="list-style-type: none"> • Sediment barriers/fences • Kerbside gravel bags • Internal pit protections • Sheeting to cover stockpiles. Additional measures are detailed in Table 6.1.
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 plan would include the following: <ul style="list-style-type: none"> • 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). • Develop and implement adequate water quality control measures prior to the carrying out of 	Pre-Construction	This document: Table 6-1: SW6, SW7, SW11, SW12, SW13, SW21, SW22, SW23, SW24, SW25, SW21, SW22, SW23, SW24, SW25, SW26, SW27	This SWMP details the specific measures that will be undertaken to minimise impacts to soil and water as a result of the works. These have been prepared in accordance with the Managing Urban Stormwater: Soils and Construction, and in consultation with the relevant government authorities.

Ref #	Commitment	Timing	SWMP Reference	How Addressed
	<p>significant earthwork or bridge construction activities.</p> <ul style="list-style-type: none"> Minimise and manage impacts on water quality and downstream receiving environments during instream activities. 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). Where possible, reuse excavated materials as fill on other parts of the Project in preference to disposing off-site in accordance with OEH's <i>Waste Classification Guidelines (2016)</i>. Areas of potential contamination concern would be identified and works in these areas managed to minimise disturbance. 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. 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. <p>Develop procedures for the assessment, handling and stockpiling of potentially contaminated</p>			

Ref #	Commitment	Timing	SWMP Reference	How Addressed
	materials, in accordance with OEH's Waste Classification Guidelines (2016).			
HY-7	<p>During construction, any water collected from the worksite would be treated and discharged in accordance with current guidelines to avoid any potential contamination or local stormwater system impacts. These guidelines include:</p> <ul style="list-style-type: none"> • 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. <p>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.</p>	Construction	Section 7.4.1	Section 7.4.1. sets out the water quality criteria that must be met prior to discharge of any treated water. This will be managed in accordance with <i>TfNSW Water Discharge and Reuse Guideline: 7TP-SD-024/3.0</i> , and controlled and recorded using the <i>TfNSW: Discharge or Reuse Water Approval 9TP-FT-207</i> form.
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	Table 6-1: SW-13	SW13 commits that compound areas will be located away from any surface runoff flow paths and above the 10% AEP flood levels.

Ref #	Commitment	Timing	SWMP Reference	How Addressed
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 would be implemented during construction, including (but not limited to):			
	<ul style="list-style-type: none"> 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. 	Construction	Table 6.1: SW4	Appropriate erosion and sediment controls are discussed in Table 6.1. As per SW4, Progressive Erosion and Sediment Control Plans will be implemented and regularly maintained to prevent impacts to geology and soils, as per Volume 2D of Managing Urban Stormwater: Soils and Construction (Landcom, 2004).
	<ul style="list-style-type: none"> Stabilised surfaces would be reinstated as quickly as practicable after construction. 	Construction	Table 6.1: SW4	<p>As per SW4, progressive Erosion and Sediment Control Plans (PESCPs) will be prepared prior to construction and implemented to manage soil and water impacts prior to commencing high risk activities.</p> <p>The measures will be left in place until the works are complete and areas are stabilised.</p>

Ref #	Commitment	Timing	SWMP Reference	How Addressed
	<ul style="list-style-type: none"> • All stockpiled materials would be stored in bunded areas and kept away from waterways to avoid sediment entering the waterways. 	Construction	Table 6.1: SW13	SW13 addresses this REMMM
	<ul style="list-style-type: none"> • Sediment would be prevented from moving off-site and sediment laden water prevented from entering any watercourse, drainage line or drainage inlet. 	Construction	Table 6.1: SW11, SW12, SW13	<p>The ECMS identified in Table 6.1 include measures to prevent the movement of sediment off-site and to prevent it entering watercourses or drainage lines.</p> <p>Erosion and sediment control measures will be implemented as per Volume 1 and 2 of Managing Urban Stormwater: Soils and Construction (Landcom, 2004).</p>
	<ul style="list-style-type: none"> • Clean water would be diverted around the work site in accordance with Managing Urban Stormwater: Soils and Construction (Landcom, 2004). 	Construction	Table 6.1: SW11, SW12, SW13	<p>The ECMS identified in Table 6.1 include measures to prevent the movement of sediment off-site and to prevent it entering watercourses or drainage lines.</p> <p>Erosion and sediment control measures will be implemented as per Volume 2D of Managing Urban Stormwater: Soils and Construction (Landcom, 2004).</p>
	<ul style="list-style-type: none"> • Erosion and sediment control measures would be regularly inspected (particularly following 	Construction	Table 6.1: SW11, SW12, SW13	The ECMS identified in Table 6.1 include measures to prevent the movement of sediment off-site and to

Ref #	Commitment	Timing	SWMP Reference	How Addressed
	rainfall events) to ensure their ongoing functionality.			<p>prevent it entering watercourses or drainage lines.</p> <p>Erosion and sediment control measures will be implemented as per Volume 2D of Managing Urban Stormwater: Soils and Construction (Landcom, 2004).</p>
	<ul style="list-style-type: none"> Erosion and sediment control measures would be left in place until the works are complete and areas are stabilised 	Construction	Table 6.1: SW11, SW12, SW13	<p>The ECMs identified in Table 6.1 include measures to prevent the movement of sediment off-site and to prevent it entering watercourses or drainage lines.</p> <p>Erosion and sediment control measures will be implemented as per Volume 2D of Managing Urban Stormwater: Soils and Construction (Landcom, 2004).</p>
SG-4	<p>The presence of ASS along PLR alignment extent 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.</p> <p>The ASS management plan should outline procedures for the safe handling, treatment and transport of potential/actual ASS excavated during</p>	Construction	<p>Section 4.1.3</p> <p>Table 6.1: SW28</p> <p>Also refer to the SOM Contaminated Land Management Plan (CLMP)</p>	<p>Section 4.1.3 confirms that the proposed depth of likely excavations associated with the SaMF works is limited to approximately 1 metre or less. These excavations will not penetrate the capping layer on the SaMF site and will not interact with ASS material. Notwithstanding the risk, the PLR Projects ECM SW28 sets out procedures for any identified ASS</p>

Ref #	Commitment	Timing	SWMP Reference	How Addressed
	<p>construction or maintenance works and identify management measures, including:</p> <ul style="list-style-type: none"> • 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. <p>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.</p>			<p>during intrusive investigations has been prepared.</p>
HR5	<p>Environmental management measures relating to hazards and risk would be developed and implemented as part of the CEMP. These would include:</p> <ul style="list-style-type: none"> • Potential environmental hazards and risks associated with construction activities would be identified prior to construction. • 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. 	Pre-Construction and Construction	Table 6.1: SW 21, SW22, SW23, SW24, SW25, SW21, SW22, SW23, SW24, SW25, SW26, SW27	<p>Table 6.1 includes ECMs that ensure hazardous materials will be correctly stored and includes a commitment that they will not be stored below the 10% AEP flood level.</p> <p>ECM SW2 details training procedures for the use of spill kits in the event of a chemical spill.</p>

Ref #	Commitment	Timing	SWMP Reference	How Addressed
	<ul style="list-style-type: none"> • Hazardous materials would not be stored below the ten percent AEP flood level. • 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. • Employees would be trained in the correct use of spill kits. 			
AQ1	<p>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:</p> <ul style="list-style-type: none"> » 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 6 Table 6.1	Wheel-wash or rumble grid facilities will be placed at the Grand Avenue entrance.
	» Clean loose materials and debris from the tailgate of vehicles unloading materials to stockpiles prior to departure from site.	Construction	Table 6-1	Control measure SW9

Ref #	Commitment	Timing	SWMP Reference	How Addressed
	» Ensure that all loads are covered when materials are being hauled to and from site.	Construction	Table 6-1	Control measure SW9

3.4 Environmental Performance Outcomes

Relevant EPOs are listed in Table 3-4 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 3-4: 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).	Pre-Construction, reviewed during Construction	Table 6.1: SW4	<p>This EPO requirement is addressed in the SWMP has been prepared together with the CEMP and submitted separately.</p> <p>This plan provides mitigation measures to minimise impacts on soil and water from the construction of the SaMF and is consistent with the principles and practices detailed in <i>Managing Urban Stormwater: Soils and Construction Volume 1</i> (Landcom, 2004) and <i>Managing Urban Stormwater: Soils and Construction Volume 2</i></p>

ID Ref#	Environmental Performance Outcome	Timing	SWMP reference	How Addressed
				(Department of Environment and Climate Change, 2008a).
EPO-SG-2	There would be no impacts on aquatic environments associated with the disturbance of ASS during construction.	Pre-Construction, reviewed during Construction	Section 4.1.3 Table 6.1: SW28 Also refer to the SOM Contaminated Land Management Plan (CLMP)	Section 4.1.3 confirms that the proposed depth of likely excavations associated with the SaMF works is limited to approximately 1 metre or less. These excavations are unlikely to interact with ASS material. Notwithstanding ECM SW28 sets out procedures for any identified ASS during intrusive investigations has been prepared.

4 Existing environment

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

The key reference documents are:

- PLR Environmental Impact Statement (WSP & Jacobs 2017)
- 6 Grand Avenue, Camellia Site Remediation Review of Environmental Factors (October 2017)
- PLR Supply Operate and Maintain - Site Establishment Management Plan (December 2019)
- PLR Construction Environmental Management Plan (March 2020)
- PLR Water Quality Working Paper (Jacobs, 2017)
- PLR Flooding Technical Paper (Arup, 2017)
- Managing Urban Stormwater: Soils and Construction. Landcom, (4th Edition) March 2004 (reprinted 2006) (the “Blue Book”). Volume 1 and Volume 2
- Best Practice Erosion and Sediment Control – for building and construction sites (IECA Australasia 2008).

4.1 Topography and soil characteristics

The existing ground levels across the site vary from around 6.3mAHD near Grand Avenue to about 6.9mAHD. The proposed site levels, post remediation works, will be at 7.6mAHD near Grand Avenue, raising to 8.3mAHD. This is above the existing probable maximum flood (PMF) level at the site which is 6.7m (PLR1 SOM R17 Flood Study Report, November 2019).

Camelia and the SaMF site is relatively flat, resulting from re- grading and fill since development commenced in the 1900’s resulting in the urban / industrial /commercial area that it is today. Disturbed terrain has been identified across the Parramatta CBD and along the edge of the Parramatta River including the SaMF site.

The Soil Landscape Series Sheets indicate SaMF site footprint is generally characterised by the residual (includes Blacktown and Lucas Heights landscapes). The Blacktown landscape is prominent between Westmead and Camellia and is characterised by gently undulating topography underlain by Wianamatta shales, rock outcrops absent, and moderately deep soils (up to 1.5 metres deep). The Lucas Heights landscape is very similar to Blacktown but occurs where the area is underlain by the Mittagong Formation (upper part of the Hawkesbury Sandstone).

4.1.1 Geology

The PLR alignment corridor (including the SaMF site) is located towards the boundary of the Cumberland Plain, a large low-lying and gently undulating region of the western Sydney Basin.

The northern portion of the PLR alignment corridor is underlain by late Triassic shales of the Wianamatta Group. This geology is associated with the Blacktown Soil Landscape (see 4.1.2 following). Further south the underlying Geology is dominated by silt and clay size alluvial materials derived from the Wianamatta Group shales.

4.1.2 Soil landscapes

The Parramatta Light Rail Contaminated Land Technical Paper (Coffey 2017) identified the SaMF site as an area of environmental interest (AEI 27). The SaMF is currently notified under the CLM

Act. Soils and groundwater at the site are known to contain hexavalent chromium, volatile chlorinated hydrocarbons (VCHs) and asbestos due to historical industrial activities.

The SaMF is currently being remediated to a level to allow commercial/industrial land use under NSW EPA audit scheme prior to the commencement of construction. The site will eventually have a capping layer to encase the soil and groundwater contamination below. This capping material will meet the requirements of the Remediation Action Plan. The Remediation Contractor will provide GRCLR with a LTEMP for the SaMF, the LTEMP will include all operation, management, maintenance and monitoring requirements to protect and maintain the performance of the remediation infrastructure at for the SaMF.

The SaMF site is underlain by black to dark grey shale laminate geology. The soil landscapes within the site boundary are currently a mix of alluvial, residual and disturbed terrain. Residual soil is characterised by Wianamatta shales, an absence of rock outcrops and moderately deep soils.

Historically, the Soil Landscape Series Sheets indicate SaMF site is generally characterised by the residual surficial soil landscapes (includes Blacktown and Lucas Heights landscapes). The Blacktown landscape is prominent between Westmead and Camellia and is characterised by gently undulating topography underlain by Wianamatta shales, rock outcrops absent, and moderately deep soils (up to 1.5 metres deep). The Lucas Heights landscape is very similar to Blacktown but occurs where the area is underlain by the Mittagong Formation (upper part of the Hawkesbury Sandstone).

Review of the Soil Landscape information indicates that for the Blacktown Soil Landscape, the erosion hazard for non-concentrated flows ranges from generally moderate to very high.

Soil Erodibility Factors (K) for is given in Table 4-1.

Table 4-1 Soil Erodibility Factor

Soil landscape	K-factor
Blacktown	0.038

From: Managing Urban Stormwater – Soils and Construction Volume 2 (Landcom 2004).

A K-factor of 0.05 is to be adopted as a default for assessment of erosion of risk as this will accommodate the highest value identified in the soil landscape information plus serve as a conservative default for imported fill which may be encountered as part of the capped material (fill) added to remediate the site prior to construction commencing.

Erosion hazard for Parramatta has been calculated using the predicted annual average soil loss using the Revised Universal Soil Loss Equation (RUSLE):

$$A = R \times K \times LS \times P \times C$$

Table 4-2 details the values adopted within the equation.

Table 4-2 RUSLE Values

Factor	Definition	Value Adopted
A	Total calculated soil loss (t/ha/yr)	74 t/ha/yr
R	Rainfall erosivity factor	2750

Factor	Definition	Value Adopted
K	Soil erodibility factor	0.05
LS	Slope length and gradient factor	0.41 (80m at 2%)
P	Conservation practice factor	1.3 (default Max)
C	Ground cover factor	1.0 (default max)

Managing Urban Stormwater Volume 1 (Landcom 2004) assigns soil loss of less than 150 tonne/ha/year as Very Low Erosion Hazard, therefore the SaMF site is considered to have a very low erosion hazard.

4.1.3 Acid sulfate soils

Acid sulfate soils (ASS) are soils and sediments that contain iron sulphides that when exposed to oxygen, generate sulphuric acid, potentially toxic quantities of aluminium and other heavy metals.

The sulphuric acid and metals are produced in forms that can be readily released into the environment with potential adverse effects on the natural and built environment, as well as human health. The majority of ASS are formed by natural processes under specific environmental conditions, which generally limits its occurrence to low lying sections of coastal floodplains, rivers and creeks where surface elevations generally less than five metres above sea level.

The EIS identified a number of high risk areas for acid sulfate soils along the PLR alignment.

High risk acid sulfate soils are present at the following locations:

- Parramatta River crossing at Lennox Bridge, Parramatta (Class 1 ASS)
- Parramatta River, Rydalmer (Class 1 ASS).

A review of the acid sulphate soil mapping, obtained from Australian Soils Resource Information System and NSW Department of Land Water and Conservation, concluded that the SaMF site lies in zones designated as extremely low probability/class 5 (Parramatta North Precinct) or low probability/class 4 (Parramatta CBD Precinct).

4.2 Surface water

The SaMF site lies within the Parramatta River catchment, 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 catchment terrain varies throughout within the catchment area and is generally mildly sloping through the Parramatta North precinct, becoming flatter through the Parramatta CBD precinct.

The Upper Parramatta River refers to the freshwater section of the river. This is controlled by a series of weirs including Kiosk Weir and Upstream Weir in Parramatta Park and Charles Street Weir in the Parramatta CBD which defines the tidal boundary with the lower Parramatta River.

The Lower Parramatta River refers to the salt water river downstream of Charles Street Weir which is tidally influenced and drains to Sydney Harbour approximately 30 kilometres downstream of

Charles Street. Significant tributaries of the Parramatta River downstream of the weir include Duck River, Vineyard Creek, Ponds/Subiaco Creek, Haslams Creek and Archers Creek.

The Parramatta River catchment has undergone significant development and today the catchment a highly urbanised area. A number of areas within the catchment have historic industrial uses, which are known to contain contaminated sediments, with high concentrations typically associated with point sources.

Water quality in the catchment, particularly upstream of the Charles Street Weir is dominated by catchment inputs including stormwater and waste water overflows. Human activities have resulted in elevated levels of nutrients and gross pollutants. Sediment contamination, due to urbanisation and industrialisation of the catchment, has also had an impact on water quality throughout the catchment.

The Parramatta River has been monitored at a number of locations by the City of Parramatta Council and Sydney Water. The available data collected from 2012 to 2016 shows that turbidity and conductivity are within acceptable limits for protection of aquatic ecosystems. The pH and dissolved oxygen levels are generally compliant with acceptable levels with the exception of elevated pH levels within the vicinity of the Elizabeth Street footbridge and dissolved oxygen below the lower limit of 85 per cent upstream of the Parramatta ferry wharf.

The SaMF site is approximately 250m south of the Parramatta River at the eastern extent of the PLR alignment corridor on Grand Avenue, Camellia. Grand Avenue extends in parallel to the Parramatta River between James Ruse Drive and Durham Street.

4.2.1 Surface water quality monitoring

The SaMF works consists primarily of:

- Site establishment
- Earthworks and subsurface works
- Civil works
- Rail systems
- Structures.

The potential for release from the SaMF site would be limited to sediment-laden surface flows from exposed surfaces resulting from earthworks and from stockpiles within the site if appropriate controls are not in place. Calculations within Section 4.5 Erosion Risk indicate that the rate of soil loss would be very low.

In addition, the site has undergone subsurface remediation works to render the site suitable for its proposed land use as a SaMF. These works have removed all vegetation from the site, resulting in GRCLR receiving the site cleared of vegetation and with a capping layer. The compacted capping layer will limit any exposed natural surfaces that would ordinarily contribute to the sediment-laden surface flows at the SaMF site. Conversely the capping layer will require controls put in place to minimise lengths of flows to limit surface water volume and velocity during rainfall events.

As a result, the scope of the SaMF would unlikely have measurable impacts on the Parramatta River. Furthermore, any measured changes within the river would be difficult to directly attribute to the works at the SAMF site in isolation from other contributors to the catchment flow. Therefore, monitoring of surface water is not proposed as part of delivery of the SaMF. As part of the review of this SWMP the City of Parramatta Council, Department of Primary Industries (Water) and the

Environment Protection Authority will be consulted on this approach in accordance with CoA C9 and REMMM HY-1. Details of this consultation is provided in Appendix C.

The potential for water quality impacts will be minimised through application of best practice erosion and sediment control measures at each construction area.

As an alternative to the water quality monitoring program nominated within CoA C9 – C17 and REMMMs it is proposed that construction activities will be subject to ongoing review, as set out in Section 7.3 to confirm application of Best Practice and the avoidance of an impact. Surface water and groundwater collected during construction of the SaMF site will be tested and if required shall be adequately treated prior to discharge either in-situ or in a dedicated water treatment area in accordance with the TfNSW Water Discharge and Reuse Guideline.

Progressive Erosion and Sediment Control Plans will be implemented and regularly checked as part of the inspection process.

4.3 Ground water

The EIS indicates that two major aquifer systems are known to exist within the vicinity of the SaMF site alignment including:

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

The average depth to groundwater in the shallow aquifer has been identified as being about five metres below ground level. Given the underlying geology contains areas of shale units which have a moderate potential for salinity, it is expected the groundwater in the shallow aquifer may be moderately saline.

The depth of groundwater in the deeper aquifer was identified in two bores at greater than 60 metres below ground level. There was no information available on groundwater salinity however from a review of known bores; the groundwater quality in this aquifer is generally fresh water. The groundwater yield in the deeper aquifer indicates a range between about one litre per second and three litres per second.

As the proposed depth of likely excavation associated with construction of the SaMF is anticipated to be limited to approximately one meter or less, it is unlikely that interception with this aquifer would occur.

A search of groundwater works (NSW Pinneena database) indicates that there are approximately 50 groundwater works (bores) located within a two-kilometre radius of the PLR alignment corridor (including the SaMF site). No groundwater works (bores) are located on the SaMF site.

The EIS concluded that PLR alignment corridor (including the SaMF site) is unlikely to significantly impact on groundwater dependent ecosystems.

Remediation at the SaMF involves installing hydraulic barrier to stop contaminated groundwater migrating from the site. These barriers may impact the groundwater levels and flows with the SaMF.

4.4 Rainfall

The annual rainfall and monthly distribution has been sourced from the Bureau of Meteorology and is given in Table 4-3. January through April are the wettest months.

Table 4-3 Monthly rainfall distribution

Mean rainfall – Parramatta														
	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Yr	
mm	103.1	121.2	110.4	91	67.2	92.8	44.5	56.2	51.5	66.3	84.6	73.1	972	
%	11%	12%	11%	9%	7%	10%	5%	6%	5%	7%	9%	8%	100%	

Managing Urban Stormwater V1. (Landcom 2004) gives the 80th percentile rainfall depth for Parramatta North as 25.8mm. That is, 80 per cent of all 5-day rainfall periods will be of 25.8mm or less.

4.5 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 SaMF site has a Rainfall Erosivity Factor of 2750 SI. The monthly per cent distribution for R-Factor for Greater Sydney is given in the table below; (IECA 2008 Best Practice Erosion and Sediment Control International Erosion Control Association, Appendix E) and is provided in Table 4-4 below.

Table 4-4: Monthly % and annual rainfall erosivity (R - factor) values

Monthly % and annual rainfall erosivity (R – factor) values														
	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Year	
%	11	13	13	11	9	8	6	5	4	6	7	7	100%	
R - Value	302.5	357.5	357.5	302.5	247.5	220	165	137.5	110	165	192.5	192.5	2750	

4.6 Flooding

The EIS indicates that the PLR alignment corridor passes through a number of flood-prone areas. A flood map showing the areas in proximity to the SaMF site at risk from flooding is provided in Figures 5-5 and 5-6 of the Flood Management Plan. Flooding can usually be classified as mainstream (riverine) flooding or localised overland flow 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. In these locations when the capacity of the drainage pipes is exceeded, the existing roads act as overland flow paths.

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. 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 located east of PLR alignment corridor area. Should riverine flooding occur it will not impact the SaMF site.

Mapping the existing Probable Maximum Flood (PMF), provided in the EIS, shows a significant portion of the SaMF site would be inundated, particularly through the Parramatta CBD, including some existing bridges. In these low laying areas, drainage is influenced by the river tides and high-water levels during flood conditions.

Flooding is a known problem throughout much of the Parramatta CBD precinct, particularly when the water level in the Parramatta River is high, preventing stormwater from being effectively discharged. Overland flow flooding is also a problem in several locations in proximity to the SaMF site, primarily due to insufficient capacity in the stormwater network.

Overland flow flooding is predicted to occur due to localised low points and insufficient capacity of the existing drainage network at several locations along Macquarie Street and Church Streets south of the Parramatta River due to insufficient capacity of the existing drainage network and inverse grading of footpaths. This overland flow prediction occurs approximately 3 km west of the SaMF site.

A Flood Management Design Report (FMDP) for the PLR (SOM) in accordance with CoA E113 is in preparation.

5 Environmental aspects and impacts

5.1 Construction activities

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

- Shallow earthworks (less than 1 metre) for utility installation
- Shallow earthworks (less than 1 metre) for site access roads, landscaping, footpaths and entrance and exit installation
- Shallow earthworks (less than 1 metre) for site security fence with hoarding around the site perimeter
- Installation and operation of site sheds and facilities (offices, lunchrooms and amenities)
- Earthworks for SaMF building foundations
- Hazardous goods and chemical storage.

5.2 Impacts

The potential for impacts on soil and water will depend on a number of factors. Primarily impacts will be dependent on the nature, extent and magnitude of construction activities and their interaction with the natural environment. Potential impacts attributable to construction might include:

- Exposure of soils during vegetation clearing and earthworks, creating the potential for mobilisation and off-site movement of eroded sediments and pollutants
- Decline in water quality and visual amenity, and generation of turbidity
- Damage to ancillary facilities (including flood damage) that could result in an export of pollutants to receiving waters
- Contamination of soils, and surface and groundwater from accidental spills or oil leaks that could pollute receiving waterbodies.
- Soil loss from the stockpiling of spoil and topsoil due to the effects of wind or water in the absence of suitable stabilisation and management measures.

Section 6 provides a suite of control measures that will be implemented to avoid or minimise soil and water impacts.

Some impacts on soil and water attributable to SaMF are anticipated. Relevant aspects and the potential for related impacts have been considered in a risk assessment in Appendix A2 of the CEMP and Appendix B of the SOM Site Establishment Plan.

6 Environmental control measures

The SaMF site will be established with the following environmental control measures:

- Site security fence with hoarding around the site perimeter
- ECMs will reflect the outcomes of risk assessments, ECMs depict environmental risks and controls on site-specific maps and are included in the CEMP
- ESCPs are Site specific plans prepared in accordance with Managing Urban Stormwater: Soils and Construction (Landcom, 2004) Volume 1 and Volume 2 and the procedure provided in Appendix A
- Cattle grid and wheel wash facilities at the exit point on Grand Avenue
- The boundary of the site will be enclosed by an erosion sediment control fence to prevent any offsite flow, ensuring all surface flows are directed to the site's stormwater basin
- Low-lying stormwater basin in the south-eastern corner to capture stormwater runoff. The basin will be connected to a groundwater treatment plant (GPT) already installed and operating on site for the treatment of the existing contaminated groundwater. The GPT will discharge to the local stormwater grid in accordance with the discharge agreement, otherwise the treated water would be used for dust suppression
- Laydown area, including concrete washout area and hazardous material storage
- Concrete washout area will be a lined and bunded area where washout will be allowed to solidify before it is disposed of offsite
- Hazardous materials will be stored in the laydown area in self-bunded shipping containers in accordance with the relevant Australian Standards
- No fuel will be stored at the site. Fuel will be supplied to site equipment from a mobile fuel tanker. This tanker may park within the laydown area when it is not required
- General construction waste bins will be located in the laydown area. General construction waste will be removed offsite by a licenced contractor. No general waste segregation will occur onsite
- Hazardous waste bins will be located in the laydown area. Hazardous waste will be removed offsite by a licenced contractor
- The integrity of the SaMF capping layer will be maintained at all times.

In addition:

- Inspections of the environmental controls will occur on a weekly basis or following a weather event (e.g. rain or high wind). This will be undertaken by the Design and Construct Environment Manager or delegate.
- For stockpile sites, weekly inspections of environmental controls will take place by the , Design and Construct Environment Manager or delegate. This will also occur prior and following to predicted inclement weather. Weather forecasts will be monitored daily.

Specific measures and requirements to meet the objectives of this SWMP are documented in Table 6-1.

Table 6-1: Soil and Water management and mitigation measures

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
GENERAL SITE MANAGEMENT					
SW1	<p>General site housekeeping will form part of compulsory site inductions for all personnel.</p> <p>Waste bins will be located at all work site.</p> <p>The Civil Construction Team will be responsible for ensuring the site is free from litter at the end of each shift.</p> <p>Site tidiness will be checked during weekly inspections by the D&C Environment and Sustainability Manager or delegate.</p>	<p>Bins Brooms Inspection records</p>	Construction	<p>Senior Construction and Staging Manager</p>	REMM HY-6
SW2	Training will be provided to relevant project personnel, including relevant sub-contractors on sound erosion and sediment control practices and the requirements from this plan through inductions, toolboxes and targeted training.	Staff training /Inductions	Pre-Construction & Construction	<p>GRCLR Environment and Sustainability Manager, or delegate</p>	Best Practice
SW3	<p>Surface water and groundwater generated during construction of the SaMF will be tested and if required shall be adequately treated prior to discharge either in-situ or in a dedicated water treatment area in accordance with the TfNSW Water Discharge and Reuse Guideline.</p> <p>Clean and dirty water separation will be implemented across the SaMF</p>	<p>Water treatment area. Progressive Erosion and Sediment Control Plans (PESCPs)</p>	Construction	<p>Design and Construct Environment and Sustainability Manager</p> <p>Senior Construction</p>	REMM HY-7 TfNSW: Discharge or Reuse Water Approval 9TP-FT-207

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
				and Staging Manager	TfNSW: Water Discharge and Reuse Guideline 7TP-SD-024 SW-15
SW4	<p>Progressive Erosion and Sediment Control Plans (PESCPs) will be prepared for each work site prior to construction and implemented to manage soil and water impacts prior to commencing high risk activities. The PESCPs will be developed in accordance with this Plan and Best Practice.</p> <p>The measures will be left in place until the works are complete and areas are stabilised.</p> <p>Note: PESCPs will be reviewed by Parramatta City Council as developed.</p>	Progressive Erosion and Sediment Control Plans (PESCPs)	Construction	Construction and Staging Manager Civil Construction Team	REMM SG-3
SW5	<p>Work method statements (WMS) or procedures will be prepared and implemented to manage soil and water impacts prior to commencing high risk activities, which are considered to be the following:</p> <ul style="list-style-type: none"> • Dewatering. • Working in environmentally Sensitive Areas • Refuelling or maintenance and cleaning of plant and equipment. 	WMS	Pre-Construction & Construction	Construction and Staging Manager Civil Construction Team	Best practice

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
MANAGING IMPACTS ON SOIL IN GENERAL & SEDIMENTATION OF SURROUNDING WATERCOURSES AND DRAINAGE LINES					
SW6	<p>A Soil and Water Management Plan will be prepared in accordance with the principles and guidelines set out Soils and Construction – Managing Urban Stormwater series, comprising Volume 1 (Landcom, 2004) and Volume 2D – Main Roads (DECC, 2008).</p> <p>Environmental controls to remain in place until handover (in accordance with bluebook)</p>	<p>This SWMSP</p> <p>Progressive Erosion and Sediment Control Plans (PESCPs)</p>	Pre-Construction	<p>Design and Construct Environment Manager</p> <p>Construction and Staging Manager</p>	<p>CoA 4</p> <p>REMMs: GEN-1, HY-5HY-6</p>
SW7	Erosion and sediment controls to be installed prior to the commencement of works and shall remain installed and maintained until sufficient stabilisation is achieved as per Managing Urban Stormwater series, comprising Volume 1 (Landcom, 2004) and Volume 2D – Main Roads (DECC, 2008).	<p>Progressive Erosion and Sediment Control Plans (PESCPs)</p> <p>Staff training /Inductions</p>	Construction	Construction and Staging Manager	REMM: SG-3
SW8	Works will be programmed and planned to minimise the extent and duration of exposed surfaces.	<p>NIL</p> <p>ECM</p>	Pre-Construction & Construction	Construction and Staging Manager	Best practice
SW9	Measures will be implemented to minimise dust, soil or mud from being deposited by vehicles on public roads. This will be achieved by implementing mitigation measures such as: stable access points using cattle grid and wheel wash facilities at the exit point on Grand Avenue. Loose materials will be cleaned from vehicles prior to leaving the site. All loads will be covered when being hauled to and from site.	Progressive Erosion and Sediment Control Plans (PESCPs)	Construction	Construction and Staging Manager	<p>REMM: SG-3</p> <p>Best practice</p>

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW10	Hardstand areas and surrounding public roads will be cleaned as required, using methods which may include brooms, bobcat attachments or street sweepers.	Plant and equipment ECM	Construction	Construction and Staging Manager	REMM: SG-3 Best practice
SW11	Where appropriate and in order to effectively manage loose sediment, the typical controls that will be utilised include: <ul style="list-style-type: none"> • Sediment barriers/fences • Kerbside gravel bags • Internal pit protections • Sheeting to cover stockpiles. 	Progressive Erosion and Sediment Control Plans (PESCPs)	Construction	Construction and Staging Manager Civil Construction Team	REMM: SG-3 Best practice
SW12	Works will be staged to ensure that disturbed areas and lengths of flows are limited to reduce generation of sediment: <ul style="list-style-type: none"> • Progressive clearing and revegetation • Application of temporary surface treatments or covers • Gravel bags to break up slopes • Stabilised drains. 	Progressive Erosion and Sediment Control Plans (PESCPs)	Construction	Construction and Staging Manager Civil Construction Team	REMM: SG-3 Best practice
STOCKPILING AND STOCKPILE MANAGEMENT					
SW13	Large areas of disturbance such as compound areas and stockpile sites would, where feasible and reasonable, be	Progressive Erosion and	Construction	Construction and Staging Manager	Best Practice REMM HY-08

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
	<p>located away from any surface runoff flow paths and above the 10% AEP flood levels.</p> <p>All stockpiled materials would be stored in bunded areas and kept away from waterways to avoid sediment entering the waterways.</p>	Sediment Control Plans (PESCPs) ECM		Civil Construction Team	
SW14	Stockpile sites (over 20 Days) will be selected by the Senior Construction and Staging Manager in consultation with the GRCLR Environment and Sustainability Manager and planned with consideration to REMM HY-8. These sites will have site specific ESCPs prepared.	ECM	Construction	Design and Construct Environment Manager Construction and Staging Manager	REMM HY-08
LOCALISED FLOODING					
SW15	Information within the project Flood Management Plan will be used when preparing Erosion and Sediment Control Plans (ESCP) and strategies.	Flood Management Plan	Construction	Design and Construct Environment Manager Construction and Staging Manager	Best Practice
MANAGEMENT OF CONTAMINATED OR POTENTIALLY CONTAMINATED LAND					
SW16	Unanticipated discovery of contaminated material will be managed in accordance with the CLMP and Unexpected Finds Procedure (Appendix A of the CLMP).	Appendix A of the CLMP	Construction	Design and Construct	CLMP CoA 125 & 126

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
				Environment Manager Construction and Staging Manager	
DISPOSAL OF EXCAVATED MATERIAL					
SW17	Excavated material that is not suitable for on-site reuse or recycling will be transported to a site that is legally entitled to accept that material for reuse or disposal.	Construction Waste and Resource Management Plan (CWRMP)	Construction	Construction and Staging Manager	CoA E129 CWRMP
SW18	Excavated material leaving the site will be classified in accordance with the Waste Classification Guidelines so that correct resource recovery and or off-site disposal occur.	Construction Waste and Resource Management Plan (CWRMP)	Construction	Construction and Staging Manager	CoAE130 CWRMP Section 5.4
ACCIDENTAL SPILLS DURING CONSTRUCTION					
SW19	In the event of an environmental incident or emergency, the environmental incident and emergency response procedures will be implemented in accordance with Section 7 of the CEMP: Environmental Incident and Emergency Response.	Environmental Incident Emergency Response Procedure	Construction	Construction and Staging Manager	Best practice REMMs: GW4

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
		Spill kits Training			
SW20	Spill kits will be maintained at all work sites and at site compounds. Spill kits will be maintained on specific construction vehicles.	Spill kits ECM	Construction	Construction and Staging Manager	Best practice REMMS: GW4, HR5
SW21	Hazardous materials spills and leaks would be reported to site managers and actions would be immediately taken to remedy spills and leaks.	Spill Kits Reporting procedures Staff training /Inductions MSDS	Construction	Civil Construction Team	REMMS: GW4, HR5
SW22	Employees would be trained in the correct use of spill kits and reporting procedures	Staff training /Inductions	Construction	GRCLR Environment and Sustainability Manager or delegate Construction and Staging Manager	REMMS: GW4, HR5

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
SW23	Hazardous materials will be stored only in a sealed storage facility with inbuilt containment. Storage areas would be impervious and adequately bunded. Where possible these will not be located within 50m of a water way	Storage Bunds, Inspection records, MSDS	Construction	Construction and Staging Manager Civil Construction Team	Best practice REMMs: GW4
SW24	Hazardous Materials will not be stored below the 10 per cent AEP flood level	Inspection records	Construction	Design and Construct Environment Manager Construction and Staging Manager	Best practice
SW25	The refuelling of plant and maintenance of machinery will be undertaken where possible in clearly marked impervious bunded areas in accordance with Australian Standards and DECCW guidelines. Refuelling will be attended at all times using appropriate equipment.	Refuelling bunds, refuelling areas, spill kits, EWMS	Construction	Construction and Staging Manager Civil Construction Team	Best practice REMM: GW4
SW26	Concrete wash out areas will be lined with impervious material, they will be adequately sized, regularly maintained and located in a position where wastewater will not enter any drainage lines or waterways, in accordance with TfNSW's Concrete Washout Guideline.	Concrete wash out trays EWMS	Construction	Construction and Staging Manager Civil Construction Team	Best practice REMM: GW4 Environmental Risk Assessment

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
					(Appendix A2, CEMP)
SW27	Plant will be checked regularly to ensure that there are no oil, fuel or other liquids leaks.	Plant inspection lists	Construction	Construction and Staging Manager Civil Construction Team	Best practice REMM: GW4
ACID SULFATE SOILS					
SW28	Acid sulfate soils are not expected as part of this project. If found will be managed in accordance with the procedures within the CLMP.	CLMSP	Construction	Construction and Staging Manager Civil Construction Team	REMM: SG-4
MONITORING					
SW29	Rainfall forecasts will be monitored daily and the site managed to avoid erosion and sedimentation, and to minimise the impact of heavy rainfall and flood events.	www.bom.gov.au	Construction	Design and Construct Environment Manager, or delegate Construction and Staging Manager	Best practice

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
RECORD KEEPING					
SW30	Records of all dewatering activities will be maintained.	Discharge or Reuse Water Approval 9TP-FT-207	Construction	Design and Construct Environment Manager	REMMs: HY-7 TfNSW: Discharge or Reuse Water Approval 9TP-FT-207 TfNSW: Water Discharge and Reuse Guideline 7TP-SD-024 SWMP Appendix B
SW31	A register of ESCPs / Progressive ESCPs will be maintained	Progressive Erosion and Sediment Control Plans (PESCPs)	Construction	Design and Construct Environment Manager, or delegate	Best Practice

7 Compliance management

7.1 Roles and responsibilities

The Great River City Light Rail (GRCLR) Project Team's organisational structure and overall roles and responsibilities are outlined in Appendix A7 and Section 4.2 of the CEMP. Specific responsibilities for the implementation of environmental controls are detailed in Section 6 of this Plan.

7.2 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:

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:

- existence and requirements of this plan
- relevant legislation
- roles and responsibilities for soil and water management
- requirement of ESCPs for each work site
- the location of ASS or PASS
- procedure to be implemented in the event of an unexpected discovery of contaminated land/PASS
- water quality management and protection measures
- groundwater issues
- erosion and sediment control maintenance.

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. This will include:

- erosion and sediment control installation methodology
- dewatering procedures and considerations
- preparedness for high rainfall events
- emergency response measures in high rainfall events
- lessons learnt from incidents and other event e.g. high rainfall / flooding
- spill-kit use and response
- spill incident response and reporting
- hazardous material storage requirements
- identification of potentially contaminated spoil and fill material.

Further details regarding staff induction and training are outlined in Section 5 of the CEMP.

7.3 Monitoring and inspection

In accordance with the CEMP, the D&C Environment Manager and/or delegate will undertake pre-work inspections, weekly, and pre and post-rainfall inspections at the SaMF site to evaluate the effectiveness of environmental controls, and to ensure controls are in place in accordance with the ECMs and CEMP plans.

The environmental inspection checklist in Appendix A6 of the CEMP will be used to ensure that all environmental aspects are reviewed during inspection. Positive compliance and actions arising from the inspections will be recorded on the actions register and each action will be allocated to the supervisor for the work area for close-out. The environmental inspection checklist is a live document and will focus on high risk activities and processes, works in environmentally sensitive areas and site preparedness for adverse weather conditions. It will be updated regularly based on the progress of the SaMF construction and the outcomes of the quarterly risk assessment review.

Table 7-1 details the various inspections which will occur, their frequency and who will attend or arrange.

Records of monitoring and inspection will be documented and will be used to:

- Evaluate performance against legal, regulatory, contract, permit, licence and other commitments
- Identify required corrective actions
- Provide input into the process of review and improvement of environmental
- Track and trend progress against objective and targets
- Inform compliance requirements for environmental reporting.

Table 7-1 Environmental inspections

Activity	Type of Inspection	Frequency	Responsibility
Site inspection (quality, safety & environment)	Visual	Daily.	Site Supervisor.
Environmental inspection	Visual	Weekly or prior to and following significant rainfall events.	D&C Environment and Sustainability Manager or delegate.
Environmental Representative / TfNSW representative inspection	Visual	Fortnightly or as determined by the nature of activities being undertaken and their associated environmental risks	GRCLR Environment and Sustainability Manager to accompany third party.

Activity	Type of Inspection	Frequency	Responsibility
EPA or stakeholder inspection	Visual	On request.	GRCLR Environment and Sustainability Manager (or delegate) to accompany third party.

7.4 Licences and permits

There is no Environment Protection Licence for the construction of the SaMF.

7.4.1 Dewatering

If required, dewatering and water discharges will be managed in accordance with *TfNSW Water Discharge and Reuse Guideline: 7TP-SD-024/3.0* and controlled and recorded using the *TfNSW: Discharge or Reuse Water Approval 9TP-FT-207* form provided as Appendix B.

The water quality criteria for discharges will be in accordance with Table 7-2 below.

Table 7-2 Water Quality Criteria

Parameter	Criteria	Method
pH	6.5-8.5	Meter
Total Suspended Solids (TSS)	50 mg/L	Laboratory Analysis
Turbidity	TBA following correlation with TSS results	Meter or laboratory Analysis
Oil and Grease	None Visible	Visual

In-situ treatment of water collected on site would be carried out to ensure any discharged water meets water quality standards.

7.5 Weather monitoring

Rain and other weather forecast will be monitored by the D&C Environmental Manager or delegate using an appropriate website such as www.bom.gov.au.

An Australian Bureau of Meteorology Station (number 66124) is located at Masons Drive North Parramatta which is 3.5kms away from the Parramatta CBD and approximately 5 km from the SaMF site.

Daily rainfall and other climate data is available from:

http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=136&p_display_type=dailyDataFile&p_startYear=&p_c=&p_stn_num=066124

7.6 Auditing

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

Audit requirements are detailed in Section 8.3 of the CEMP.

7.7 Reporting

Environmental Inspections will be undertaken in accordance with Section 8.1 of the CEMP. These will be undertaken weekly as well as prior to and following rainfall. Action lists generated in these inspections will be distributed to relevant site personnel.

Additional reporting requirements identified in the CEMP are included in **Table 7-3**.

Table 7-3: Additional reporting requirements

Report	Details	Frequency	Responsibility	Recipient
Environment report	To be incorporated into the Project monthly report – to address environmental statistics (e.g. incidents, regulatory action, complaints on environmental issues), monitoring program performance, and key environmental issues	Monthly	GRCLR Environment and Sustainability Manager	TfNSW
Environmental Representative (ER) monthly report	Report on the ER's actions and decisions on matters specified in the ER Protocol for the preceding month of site environmental performance following routine inspections any non-conformances with the CEMP and corrective/management actions required.	Monthly	Environmental Representative (ER) GRCLR to provide input	DPIE and other relevant regulatory agencies

8 Review and improvement

8.1 Continuous improvement

Continuous improvement of this Plan will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of 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.

8.2 SWMP update and amendment

The processes described in Section 8 and 9 of the CEMP may result in the need to update or revise this Plan. This will occur as needed and will include the assessment of risks associated with soil and water management for the project.

Only the GRCLR 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 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 the Environment and Sustainability Manager.

ESCPs will be reviewed and revised quarterly by the D&C Environment Manager

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.

Key principle	Control Measure	Evidence of compliance
Minimise Extent and Duration of Disturbance	<ul style="list-style-type: none"> 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 and Installation of stabilised aggregate on working platforms. 	ESCPs Site inspection records
Control Stormwater Flows onto, through and from the Site	<p>The separation of 'clean' run-on water from 'dirty' or construction run-off (e.g. turbid).</p> <ul style="list-style-type: none"> Early construction of permanent drainage structures including: <ul style="list-style-type: none"> 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 controls. 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 length 	ESCPs Site inspection records

Erosion Control Measures	<ul style="list-style-type: none"> • Protection of disturbed areas as soon as practical. Short to medium term protection (0-3 months) may include: <ul style="list-style-type: none"> ◦ Geotextile or plastic linings / covers ◦ Soil polymer application Longer term protection may include: ◦ Geotextile linings or o 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	<ul style="list-style-type: none"> • Utilisation of cleared/mulched vegetation for sediment traps and filters. • Installation of diversion bunds or sediment fences around the perimeter or work areas. • Use 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
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).

Erosion and Sediment Control Plans

Note: To be developed and implemented prior to commencing works

Appendix B – Construction site dewatering and discharge procedure



Water Discharge and Reuse Guideline

DMS-SD-024

Supporting Document – Applicable to Infrastructure & Place

Divisional Management System

Status:	Approved
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Branch:	Program Management Office
Section:	Planning, Environment and Sustainability
Business unit:	Environmental Management
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Project delivery model:	I&P Project/Alliance/Novo Rail/Not Applicable
Project type:	Not Applicable
Project lifecycle:	<input type="checkbox"/> Feasibility; <input type="checkbox"/> Scoping; <input type="checkbox"/> Definition; <input checked="" type="checkbox"/> Construction readiness; <input checked="" type="checkbox"/> Implementation; <input checked="" type="checkbox"/> Finalisation; <input type="checkbox"/> Not applicable
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Version	Date of approval	Doc. control no.	Summary of change
1.0	14 Apr 15	912093	Updated to be published to TfNSW website. Changed from a standard (ST) to a supporting document (SD). Formerly ST-146
2.0	28 Apr 16	912093_17	Re-branded document
3.0	31 Mar 17	912093_19	Note regarding discharge water quality is added to Figure 1 in the document.
3.1	23 Apr 19	912093_21	Document rebranded to Infrastructure and Place.
4.0	12 Jun 19	912093_24	Minor updates to the document to ensure that site supervisor and environmental manager must authorise the discharge by signing the Discharge or Reuse Water Approval FT-207 .
4.1	22 Aug 19	912093	DMS update

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1. Purpose and scope

The purpose of this document is to provide guidance to site personnel for managing, discharging and reusing excess water on Infrastructure and Place (IP) Infrastructure & Services construction sites. It applies to the discharge of water from all sources on site, including sediment basins, temporary and informal basins and ponds, excavations, pits, boreholes, low points, storage bins, and any other areas on a construction site that may receive and store water.

This guideline includes references to some of the relevant legislative and regulatory requirements but is not intended to replace them. It is not intended to replace any requirements for vegetation management identified as part of the environmental impact assessment process.

2. Definitions and acronyms

All terminology in this guideline is taken to mean the generally accepted or dictionary definition with the exception of the following terms which have a specifically defined meaning:

Blue Book	<i>Managing Urban Stormwater: Soils & Construction 2004</i> , Landcom
CEMP	Construction environmental management plan
Environment manager	The alliance or contractor environment manager
EPA	NSW Environment Protection Authority
EPL	Environment protection licence issued in accordance with the POEO Act by the EPA
pH	The measure of the acidity or alkalinity of a solution
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
NATA	National Association of Testing Authorities, Australia.
NTUs	Nephelometric turbidity units
TfNSW	Transport for New South Wales
TSR	TfNSW Standard Requirement
TSS	Total suspended solids
Waters	(as defined in the POEO Act) means the whole or any part of: (a) any river, stream, lake, lagoon, swamp, wetlands, unconfined surface water, natural or artificial watercourse, dam or tidal waters (including the sea), or (b) any water stored in artificial works, any water in water mains, water pipes or water channels, or any underground or artesian water.

3. Accountabilities

The Director Planning, Environment & Sustainability is accountable for this guideline. Accountability includes authorising the document, monitoring its effectiveness and performing a formal document review.

Project directors are accountable for ensuring the requirements of this guideline are implemented within their area of responsibility.

Project directors who are accountable for specific projects/programs are accountable for ensuring associated contractors follow this guideline to the extent they are required under

TfNSW Standard Requirements (TSR). Contractors are accountable for following this guideline, where this guideline forms a part of their contract.

4. Legislative requirements and due diligence

The POEO Act is the key piece of environment protection legislation in NSW, administered by the EPA. Offences under the POEO Act are classified into three tiers, with Tier 1 offences being the most serious – attracting up to \$5 million and 7 years imprisonment for wilful or negligent harm to the environment. Under section 120 of this Act, any unlicensed water pollution event, no matter how minor, is illegal.

120 Prohibition of pollution of waters

(1) A person who pollutes any waters is guilty of an offence.

(2) In this section:

pollute waters includes cause or permit any waters to be polluted.

Note: for the definition of water pollution or pollution of waters refer to the POEO Act.

Under section 122 of the POEO Act it is a defence against prosecution under section 120 if the pollution was regulated by an Environment Protection Licence (EPL) and the conditions of that EPL relating to pollution of waters were not contravened. In the absence of any specific EPL provision, however, to avoid causing pollution and breaches of section 120, any water discharged from site must be of the same quality, or better, than the quality of the receiving waters (at the time of discharge).

It is essential that the quality of the receiving waters is established through background monitoring and sampling, prior to any discharge from site, so that the potential impact of discharge water can be determined. Monitoring of the receiving waters must be undertaken prior to any land disturbance works (to establish a baseline) as well as during construction.

It is also essential that water management standards, and particularly erosion and sediment controls, are implemented to control and treat water. Landcom's Blue Book publication is considered a best practice guideline for erosion and sediment control on construction sites in NSW. If implemented, the Blue Book guidelines will help mitigate the impacts of land disturbance activities on soils, landforms and receiving waters and minimise the potential for water pollution events to occur.

Water quality criteria given in this guideline, such as that for TSS, 50mg/L, as well as testing and treatment techniques, are based on the Blue Book. However, compliance with the Blue Book does not, of itself, provide any defence to an alleged breach of section 120 of the POEO Act. Examples of situations where compliance with the Blue Book could still lead to a breach of section 120 are as follows:

- water discharged with TSS below 50mg/L may still cause pollution and breach section 120, if the receiving waters have a TSS less than 50mg/L at the time the discharge occurs
- appropriate erosion and sediment controls are in place, but a rainfall event occurs beyond the design capacity of those controls.

Should a water pollution incident occur, being able to demonstrate due diligence in the implementation of environmental controls, and particularly erosion and sediment controls, *may*

provide a defence against prosecution. Due diligence *may* be recognised if the proponent is able to demonstrate that erosion and sediment controls have been implemented in accordance with the requirements of the Blue Book. The alliance/contractor must satisfy itself that appropriate management controls have been developed, implemented, maintained and documented to establish a due diligence defence.

5. Discharging water

All water discharges undertaken in accordance with this guideline must be documented using IP's [Discharge or Reuse Water Approval DMS-FT-207](#) or project-specific equivalent. Discharge is not permitted until the alliance/contractor site supervisor and environmental manager or nominated representative have signed the discharge form.

Figure 1 illustrates the options for the treatment, testing, discharge and/or removal of water as detailed in the section below.

5.1. Requirements for discharge to waters

Water to be discharged must be tested and, if required, treated to ensure that it meets water quality criteria and that pollution of the receiving waters does not occur. Results of testing and details of any treatment undertaken must be noted on the [Discharge or Reuse Water Approval FT-207](#).

Note that an EPL may authorise discharge of water from specific locations or premises, and establish criteria that differ from those given in this guideline. In such circumstances the EPL, and any conditions and criteria of that EPL, take precedence over this guideline.

5.1.1. Criteria for discharge to waters

Before water can be discharged to any receiving waters (whether on or off site), it must as a minimum meet the following criteria:

Parameter	Criterion	Method	Time prior to discharge
Oil and grease	No visible	Visual inspection	< 1 hour
pH	6.5-8.5	Probe/meter ¹	< 1 hour
TSS	< 50mg/L ²	Meter/grab sample ³	< 1 hour/< 24 hours

¹ litmus paper and pool testing kits are not to be used

² as discussed in Section 4, a more stringent TSS criterion may need to be adopted in certain situations

³ samples must be analysed at a NATA accredited laboratory

If the criteria above are not met, the water will have to be treated and retested prior to discharge – go to **Section 5.1.2**.

If all criteria above are met then the water may be authorised for discharge by the environment manager – go to **Section 5.4**.

Salinity

Salinity is determined by measuring the electrical conductivity (EC) of the water, using a meter. Setting an acceptable criteria range for salinity of discharge water is dependent on the salinity of the receiving waters and must be determined and applied on a site-specific basis following background water quality monitoring. Measuring discharge waters for salinity shall only be undertaken if required by:

- the conditions of approval
- an environment protection licence (EPL)
- the particular conditions of the site (soil or geology) or the receiving waters.

Correlating TSS with Turbidity

Consideration may be given to establishing a site-specific relationship between TSS concentration and turbidity, measured in NTU's. This allows the TSS to be inferred from an NTU reading. The benefit of using NTU is that it can be quickly measured on site with a hand-held meter, whereas water quality meters that measure TSS are expensive and the results from samples sent for laboratory analysis will not be available immediately. However, NTU is affected by factors other than suspended solids, such as colour (e.g. tannins may alter the NTU reading).

As such, a correlation curve (i.e. across a range of readings) must be determined between TSS and NTU that is specific to the site. The correlation must be determined via laboratory analysis, by a NATA-accredited laboratory. Thorough records of the site-specific correlation must be kept, and any recommendations and/or limitations should be documented as part of the CEMP.

For further information and guidance on correlating TSS with NTU refer to Appendix E of the Blue Book.

5.1.2. Treating water prior to discharge

Prior to the use of any testing equipment on site, the appropriate calibrations must be conducted as per the manufacturer's recommendations and recorded for future referral if required.

(a) Oil and grease

- Examine surface of water immediately prior to discharge for evidence of oil and grease (e.g. sheen, discolouration).
- No action is required if there is no visual contamination.
- If there is contamination, the contaminated water must either be disposed of at a licenced disposal facility, or treated using appropriate absorbent materials, which must be spread on the surface.
- Any used absorbent materials are to be disposed of appropriately.

(b) pH levels

- If pH is outside the range 6.5–8.5 the water will need to be neutralised. This may be achieved via three methods which are dependent on site and time constraints –
 - natural – allowing the water to sit for a period of time and naturally neutralise.
 - mixing – by mixing with other site water of a higher or lower pH (i.e. other water has also been tested), to achieve pH 6.5–8.5.
 - acid/base addition – if the water is above 8.5, acid is used to lower the pH; if the water is below 6.5 a base is used to raise the pH. To treat water with acid or base, safety requirements must be followed as outlined in relevant material safety data sheet (MSDS).
- Re-test the water pH following treatment – repeat as necessary, until the acceptable pH 6.5 – 8.5 range is reached.

(c) Total suspended solids

- If TSS are greater than 50mg/L, the sediments need to settle to the bottom or be removed. This can be achieved via the following methods:
 - natural settlement – this could take a long time or not occur at all (e.g. with dispersible clay soils). Dependent on soil type and other characteristics, (refer to Blue Book Chapter 3 for further information).
 - flocculation – chemical treatment with a flocculent (e.g. gypsum). If the flocculant is being applied manually, an even application over the surface of the water is essential. Only environmentally safe flocculants are to be used, based on the environment manager's review of MSDS information.
 - filtration – pumping or gravity feeding the water through a filter medium (e.g. geofabric) to another storage area (e.g. container or sediment basin) to remove sediment.
- Re-testing of water is required once treatment has been undertaken to ensure criterion for TSS is met.

Following treatment, and retesting to ensure compliance with the criteria, the water may be authorised for discharge by the environmental manager and site supervisor – go to **Section 5.4**.

5.2. Requirements for discharge to land

The objective of discharging water to land (within the site boundary) is to allow the water to infiltrate into the ground, thus avoiding direct discharge to, or pollution of, waters. Any suspended solids in the water are deposited either on the surface or retained in underlying soil layers, so the TSS criterion does not apply. However, to avoid impacts to vegetation or soil contamination pH testing and a visual inspection for oil or grease must be undertaken (refer to 5.1.1 for criteria and testing methods).

5.2.1. Determining a suitable discharge location

Consideration should be given to the following factors when determining a suitable offsite location:

- (a) Direction of groundwater flow – recharging groundwater that will subsequently flow either back onto site, into excavations or low lying areas should be avoided.
- (b) Erosion – the receiving area should have complete groundcover (e.g. grass) and established vegetation to minimise the risk of erosion.
- (c) 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.
- (d) 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.

5.2.2. Criteria for discharge to land

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

- (a) there is no visible oil or grease (otherwise treat in accordance with 5.1.2 (a) above)
- (b) the pH levels are between 6.5 – 8.5 (otherwise treat in accordance with 5.1.2 (b) above)

- (c) 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)
- (d) no erosion is caused from the discharge and appropriate erosion and sediment control are installed in accordance with the Blue Book
- (e) all discharge water can be wholly contained within the site boundary.

If all criteria above are met then the water may be authorised for discharge to land by the environmental manager and site supervisor – go to **Section 5.4**.

5.3. Reuse on site

Water may be reused on site, for example, for dust suppression, to assist with compaction or for watering landscape/bush regeneration areas. As with discharges to land, the TSS criterion does not apply as water will not be discharged to any waters. However, pH testing and a visual inspection for oil or grease must be undertaken (refer to 5.1.1 for criteria and testing methods).

5.3.1. Criteria for reuse on site

Reuse on site shall only occur if:

- (f) there is no visible oil or grease (otherwise treat in accordance with 5.1.2 (a) above)
- (g) the pH levels are between 6.5 – 8.5 (otherwise treat in accordance with 5.1.2 (b) above)
- (h) no erosion is caused from the discharge
- (i) any runoff generated by the reuse is controlled entirely within the site boundary and appropriate sediment controls are installed and maintained in accordance with the Blue Book.

If all criteria above are met then the water may be authorised for reuse by the environmental manager and site supervisor – go to **Section 5.4**.

5.4. Discharging water

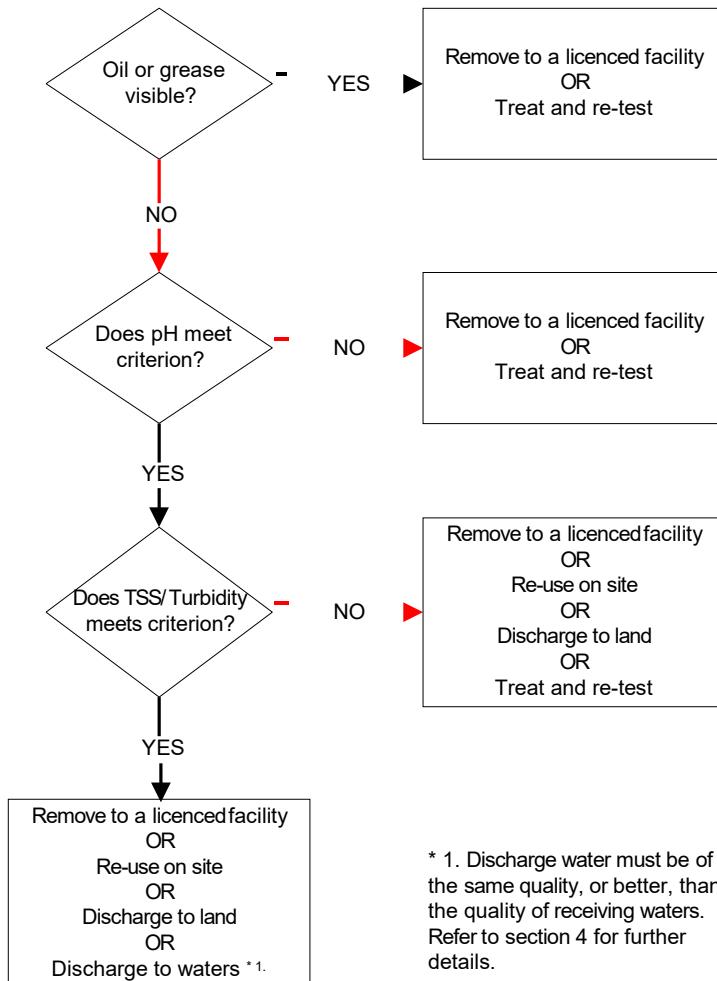
Once water has been tested and meets all the criteria for discharge to either waters or land, or for reuse on site, the site supervisor and environmental manager must authorise the discharge by signing the [Discharge or Reuse Water Approval DMS-FT-207](#).

Discharge can use a syphon system or a pump, with a priority on delivering low energy flows to downstream drainage lines, watercourses or land. The flow from the 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.

The pump inlet must be placed so that it will not disturb or take in any sediment or sediment laden water.

The person who discharges the water must sign the [Discharge or Reuse Water Approval DMS-FT-207](#) form to confirm discharge was undertaken in accordance with details as specified.

Water must never be discharged or reused onsite in a manner that exceeds the capacity of sediment controls and/or generates runoff with the potential to discharge from site.



* 1. Discharge water must be of the same quality, or better, than the quality of receiving waters. Refer to section 4 for further details.

Figure 1 Flowchart for testing water to determine options for removal, reuse, treatment or discharge.

5.5. Monitoring and maintenance

During any offsite or onsite discharge, regular monitoring must occur to ensure compliance with the requirements specified in this guideline. The person who will undertake the monitoring must be stated on the [Discharge or Reuse Water Approval DMS-FT-207](#) form and shall complete and sign the monitoring section.

The discharge must be monitored to ensure that the water being syphoned or pumped:

- complies with the discharge criteria
- does not come into contact with any soil or exposed surfaces before discharging
- does not mix with any sediment laden/untested water at either the inlet or outlet.

All sediment controls or areas that store water must be inspected to assess their integrity and capacity, as a minimum at the following times:

- weekly during dry weather
- prior to forecast rainfall events
- during rainfall events (as often as possible), and as soon as possible following a rainfall event when the site is unattended (e.g. on weekends).



All rain event data shall be recorded for the site, including rainfall quantities from each rain event.

5.6. Record keeping

Records of all water discharges undertaken in accordance with this guideline must be documented using the IP form [Discharge or Reuse Water Approval DMS-FT-207](#) or project-specific equivalent.

Records of all monitoring and maintenance measures should also be kept, on the site-specific environmental inspection checklist and other relevant document(s) (e.g. site foreman's diary).

Copies of all relevant records shall be provided to the environmental representative and/or IP environment and planning manager upon request.

6. Related documents

Related documents

[Environmental Management System Manual DMS-ST-052](#)

[Discharge or Reuse Water Approval DMS-FT-207](#)

Appendix C – Summary of Consultation evidence

Table C.1 – Summary of Consultation

Stakeholder	Consultation Dates	Response Received	Issue Raised	Where Addressed
NSW EPA	6 August to 14 September 2020	Yes – 14 September 2020	No comments. EPA deferred to DPIE for exemption from CoA C9(a).	N/A
NRAR	6 August to 7 September 2020	Yes – 7 September August 2020	No comments. NRAR deferred to EPA for exemption from CoA C9(a).	N/A.
Sydney Water	5 August to 7 September 2020	Yes – 7 September August 2020	No comments.	N/A.
City of Parramatta Council (CoPC)	7 August to 4 September 2020	Yes – 9 October 2020	Questions relating to: <ul style="list-style-type: none">• Operational monitoring;• Incident Reporting; and• Wheel wash facility.	A5 Consultation Report [PLR1SOM-GLR-ALL-EN-RPT-001006].

Appendix D – ER Endorsement



28 October 2020

Transport for NSW

Attention to: **Megan Haberley**
Senior Manager Environment
Parramatta Light Rail
130 George St, Parramatta, NSW 2150

**Review of Soil and Water Management Plan.
Supply, Operate and Maintain (SOM) Package - Parramatta Light Rail
(PLR1SOM-GLR-ALL-PM-PLN-000035 Rev F)**

Pursuant to SSI8285 Condition of Approval A23 (d) i), as the approved Environmental Representative, I confirm that I have reviewed the Soil and Water Management Plan, Supply, Operate and Maintain (SOM) Package - Parramatta Light Rail (PLR1SOM-GLR-ALL-PM-PLN-000035 Rev F), dated 21/10/2020, prepared by Great River City Light Rail, for consistency with the requirements of the Conditions of Approval.

In my opinion the aforementioned document is consistent with the requirements included in or required under the terms of the Conditions of Approval for the Parramatta Light Rail (Stage 1) development.

It is noted the scope of this management plan is for the construction works associated with the Stabling and Maintenance Facility only.

Yours sincerely,

Australian Quality Assurance & Superintendence Pty Ltd (AQUAS)

Gillian Lehn

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