



Southwest Metro – Marrickville, Canterbury and Lakemba Station Upgrades

Soil and Water Management Plan

Sydney Metro Integrated Management System (IMS)

Applicable to:	City & Southwest
Document Owner:	Southwest Metro
System Owner:	-
Status:	Final
Version:	Rev03
Date of issue:	28 January 2021
Review date:	28 January 2021
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Document Control

Title	Southwest Metro – Marrickville, Canterbury and Lakemba Station Upgrades Soil and Water Management Plan
Document No/Ref	SWM-MCL-SWMP-001

Version Control

Revision	Date	Description
00	30 October 2020	For External Consultation
01	8 December 2020	Revised in response to ER comments and external consultation feedback
02	9 December 2020	Revised for ER endorsement and issue to DPIE
03	28 January 2021	Revised in response to DPIE comments

Terms and Definitions

Terms	Definitions
AEP	Annual exceedance probability
ARI	Average Rainfall Intensity
AS	Australian Standard
ASS	Acid Sulfate Soils
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes.
CoA	Conditions of Approval (SSI-8256)
CoCB	City of Canterbury-Bankstown Council
CEMF	Construction Environmental Management Framework
CEMP	Construction Environmental Management Plan
CoA	Conditions of Approval
CoCB	City of Canterbury-Bankstown Council
CSSI	Critical Station Significant Infrastructure
DECC	NSW Department of Environment and Climate Change (now EESG)
DoI	NSW Department of Industry
DPIE	Department of Planning, Industry and Environment
ECM	Environmental Control Map
EESG	Environment, Energy and Science Group – DPIE (formerly OEH)
EIS	Environmental Impact Statement
EP&A Act	Environment Planning and Assessment Act 1979 (NSW)
EPA	NSW Environment Protection Authority
EPL	Environment Protection Licence under the POEO Act
ER	Environmental Representative
ESCP	Erosion and sediment control plan
ERSED	Erosion and sedimentation
IMS	Sydney Metro Integrated Management System
ISO	International Standardization Organisation
IWC	Inner West Council
NEPM	National Environment Protection Measures
NRAR	Natural Resources Access Regulator (formerly DoI Water)
NSW	New South Wales
OCCS	Sydney Metro Overarching Community Communication Strategy
OCP	Organochlorine Pesticides
OPP	Organophosphorous Pesticides
OEH	NSW Office of Environment and Heritage (formerly DECC, now EESG)
OOHW	Out-of-Hour Works
PASS	Potential Acid Sulfate Soils

Terms	Definitions
PCB	Polychlorinated biphenyls
POEO Act	Protection of Environment Operations Act 1997 (NSW)
PPE	Personal Protective Equipment
Proponent	The person or organisation identified as the proponent in Schedule 1 of the planning approval. In this case Transport for NSW
REMM	Revised Environmental Mitigation Measure
SDS	Safety Data Sheet
Secretary	The Secretary of the Department of Planning, Industry and Environment
SM	Sydney Metro
SMEW	Southwest Metro Early Works
SPIR	Submissions and Preferred Infrastructure Report
SSI	State Significant Infrastructure
SWMP	Soil and Water Management Plan
SWMS	Safe Works Method Statement
TRH	Total Recoverable Hydrocarbons
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
TfNSW	Transport for New South Wales.
VENM	Virgin Excavated Natural Material

1. Introduction

1.1. Context and scope of this Sub-plan

This Soil and Water Management Plan (SWMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for Southwest Metro – Marrickville, Canterbury and Lakemba Station Upgrades (the Project).

This SWMP has been prepared to address requirements of the Conditions of Approval (CoA) SSI-8256 granted 12 December 2018 (and updated on 22 October 2020 in response to Mod-1) by NSW Department of Planning, Industry and Environment (DPIE), the Revised Environmental Mitigation Measures (REMM), and the Sydney Metro Construction Environmental Management Framework (CEMF).

This SWMP describes how Sydney Metro's Principal Contractor proposes to manage soil and water during the construction of the Project. Operational management measures do not fall within the scope of this Plan and therefore are not included.

1.2. Project background

The Sydney Metro City and Southwest - Sydenham to Bankstown Upgrade Environmental Impact Statement (EIS) (GHD/AECOM September 2017) assessed the impacts of construction and operation on soil, contamination, surface and groundwater within Chapter 20 (Soils and contamination) and Chapter 21 (Hydrology, flooding and water quality). The Sydney Metro City and Southwest - Sydenham to Bankstown Upgrade Submissions and Preferred Infrastructure Report (SPIR) (GHD/AECOM June 2018) was prepared in response to the submissions received during the EIS exhibition period. The SPIR revised the scope of the Sydenham to Bankstown Upgrade project, resulting in a reduction of potential hydrology, flooding and water quality impacts during construction. However, the SPIR concluded that potential soil and contamination impacts related to construction of the preferred project would not differ substantially from those of the exhibited project that were described in the EIS.

Please refer to Section 1 of the CEMP for the Project Description.

1.3. Objectives and targets

This SWMP provides the basis for the management of soil and water in order to minimise the risk of impact during works. The objectives and targets of soil and water management and mitigation are outlined below:

Table 1: Soil and water objectives and targets

Objective	Target
Minimise pollution of surface water through appropriate erosion and sediment control.	<p>Erosion and sediment controls are to be inspected on the following basis;</p> <ul style="list-style-type: none"> Weekly during environmental inspection Prior to a rainfall of >20mm in a 24 hour period, where forecasted Following a rainfall event of >20mm in a 24 hour period Daily <p>Records of inspections will be maintained by the Principal Contractor.</p>

Objective	Target
	<p>All water will be tested (and treated if required) prior to discharge from the site in order to determine compliance with the parameters outlined in the Sydney Metro – Water Discharge or Reuse Procedure (refer to Table 10) and/or the Principal Contractor's EPL (where relevant).</p> <p>No water will be discharged from the site without written approval of the Contractor's Environment Manager (or delegate).</p> <p>No pollution incidents resulting in environmental harm or regulatory action.</p>
Maintain existing water quality of surrounding surface watercourses	<p>Water quality monitoring to be undertaken in accordance with the frequencies committed to in Section 6 and to show that the Project's works have not impacted baseline water quality (ie water quality not to worsen from baseline readings)</p> <p>No pollution incidents resulting in environmental harm or regulatory action.</p>
Source construction water from non-potable sources, where feasible and reasonable	Produce a Water Balance Study prior to Construction

These objectives conform to Sydney Metro objectives as described in the CEMF.

1.4. Consultation

CoA C3(b) requires that the SWMP be prepared in consultation with the relevant Councils, NSW Office of Environment and Heritage (OEH) (note OEH were dissolved in July 2019 and replaced by the Environment, Energy and Science Group (EESG)) and the Department of Industry (DoI), which has been replaced by the Natural Resources Access Regulator (NRAR).

CoA C8(b) requires that the Water Quality Monitoring Program, included in this SWMP, is prepared in consultation with relevant Councils. REMM FHW4 also requires the Water Quality Monitoring Program to be developed in consultation with NSW Environment Protection Authority (EPA).

As such the following stakeholders have been consulted in developing this SWMP:

- NRAR (formerly DoI);
- EESG (formerly OEH);
- NSW EPA;
- City of Canterbury Bankstown Council (CoCB); and
- Inner West Council (IWC).

A summary of the consultation is provided below and in Appendix D.

Table 2: Consultation carried out in the development of this Plan

No.	Agency Consultation	Requirements and date submitted	Key issues raised	SWMP Section Reference
Conditions of Approval				
C6	DPIE	Submitted for Approval	Various comments	
C3(b)	CoCB	Issued for consultation 31/10/20. Invited to consultation workshop held 9/11/20. Response received 6/11/20	Nil	N/A
	IWC	Issued for consultation 31/10/20. Invited to consultation workshop held 9/11/20. Response received 20/11/20	Water quality testing targets should use those from <i>Botany Bay and Catchment Water Quality Improvement Plan</i> ; Request for Bandicoot protection measures from Marrickville DCP to be put in place; Concerns around loss of topsoil and seedbank; and Other queries.	Updates to Table 9 and Section 5.1.1.
	NRAR	Issued for consultation 31/10/20. Invited to consultation workshop held 9/11/20. Response received 8/12/20 Phone conversation 12/01/21 Response received 12/01/21	Nil	N/A
	EESG	Issued for consultation 31/10/20. Invited to consultation workshop held 9/11/20. Response received 20/11/20	Nil	N/A
C8(b)	CoCB	Issued for consultation 31/10/20. Invited to consultation workshop held 9/11/20. Response received 6/11/20	Nil	N/A

No.	Agency Consultation	Requirements and date submitted	Key issues raised	SWMP Section Reference
	IWC	Issued for consultation 31/10/20. Invited to consultation workshop held 9/11/20. Response received 20/11/20	See above	N/A
Revised Environmental Mitigation Measures				
FHW4	NSW EPA	Issued for consultation 31/10/20. Invited to consultation workshop held 9/11/20. Response received 4/11/20	Nil	N/A

2. Legal and approval requirements

The SWMP addresses applicable requirements within the following documents:

- The Sydney Metro *City and Southwest - Sydenham to Bankstown Upgrade Conditions of Approval SSI-8256*, determined 12 December 2018;
- The Sydney Metro *City and Southwest - Sydenham to Bankstown Upgrade Environmental Impact Statement*, September 2017;
- The Sydney Metro *City and Southwest - Sydenham to Bankstown Upgrade Submissions and Preferred Infrastructure Report*, dated June 2018;
- The Sydney Metro *City and Southwest - Sydenham to Bankstown Upgrade Bankstown Station Modification Report* May 2020;
- The Sydney Metro *Sydenham to Bankstown Staging Report*;
- The Sydney Metro *Construction Environmental Management Framework v3*.

The Compliance Matrix in Section 2.2 provides a comprehensive list of compliance requirements, environmental documents and the contract documents.

Table 3 below details the legislation and planning instruments considered during development of this Plan.

Table 3: Legislation and Planning Instruments

Legislation	Description	Relevance to this Plan
Contaminated Land Management Act 1997	This Act provides for a process to investigate and remediate land that has been contaminated and presents a significant risk of harm to human health. Section 60 of the Act is a "Duty to Report Contamination". This duty applies to owners of land and persons who become aware their activities have contaminated the land.	This Plan defines how the Project will manage works to comply with this Act
Environmental Planning and Assessment Act 1979 (EP&A Act)	This Act establishes a system of environmental planning and assessment of development proposals for the State.	The approval conditions and obligations are incorporated into this SWMP.
Protection of the Environment Operations Act 1997 (POEO Act)	This Act includes all the controls necessary to regulate pollution and reduce degradation of the environment, provides for licensing of scheduled development work, scheduled activities and for offences and prosecution under this Act.	This Plan defines how the Project will manage works to comply with this Act.
Water Management Act 2000 Water Management (General) Regulation 2018	This Act and Regulation provide for the protection, conservation and ecologically sustainable development of water sources of the State and in particular to protect, enhance and restore water sources and their associated ecosystems.	This Act will have low relevance to the Project and will only be relevant if water is to be extracted. Projects assessed under Division 5.2 of the EP&A Act are exempt from obtaining water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91.

Legislation	Description	Relevance to this Plan
		<p>Provisions for aquifer interference approvals have yet to be enabled, as no proclamation has been made under Section 88 of the Water Management Act.</p> <p>Under the Clause 21(1) of the <i>Water Management (General) Regulation 2018</i> (NSW), Transport Authorities are exempt from the requirement to hold an access licence. Transport Authorities are also exempt under Clause 34(1) of the <i>Water Management (General) Regulation 2018</i> (NSW) from the requirement to hold a water use approval. Transport Authorities are not exempt from the requirement to hold a water supply work approval.</p>

2.1. Guidelines

Additional guidelines and standards to the management of soil and water include:

- Landcom (2004). Managing Urban Stormwater: Soils and Construction. (Volume 1 of the 'Blue Book');
- DECC (2008). Managing Urban Stormwater: Soils and Construction. Volume 2D: Main Road Construction. (Volume 2D of the 'Blue Book');
- ANZECC (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (collectively known as the 'ANZECC Guidelines');
- ANZECC (2000). Australian and New Zealand Guidelines for Water Quality Monitoring and Reporting (collectively known as the 'ANZECC Guidelines');
- ANZG (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (known as 'ANZG Guidelines');
- NSW Fisheries (2004). Guidelines for Controlled Activities, Policy and Guidelines for Fish-Friendly Waterway Crossings;
- NSW Fisheries (1999). Policy and Guidelines for Design and Construction of Bridges, Roads, Causeways, Culverts and Similar Structures;
- ASSMAC (1998). Acid Sulphate Soil Manual. Acid Sulphate Soil Management Advisory Committee, NSW;
- Sydney Metro - Water Discharge or Reuse Procedure;
- Guidelines for the Management of Acid Sulphate Materials: Acid Sulphate Soils, Acid Sulphate Rock and Monosulfidic Black Ooze, RTA;
- NSW Environmental Protection Authority - Assessing and Managing Acid Sulphate Soils;

- Environment Protection Authority, Victoria Information Publication 655 - Acid Sulphate Soil and Rock;
- Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land (Department of Urban Affairs and Planning and Environment Protection Authority, 1998);
- Acid Sulphate Soil Manual (Acid Sulfate Soil Management Advisory Committee, 1998);
- National Environment Protection (Assessment of Site Contamination) Amendment Measure (No. 1) 2013; and
- NSW EPA (2014) Waste Classification Guidelines – Part 1: Classifying Wastes.

2.2. Conditions of Approval

The CoA and REMM relevant to this SWMP are listed in Table 4 below. In accordance with CoA C4, the relevant requirements of the CEMF have also been included in Table 4. Table 4 also provides a cross reference to demonstrate where the relevant requirement is addressed in this SWMP or other management documents.

Please refer to Appendix A for all other CoA, REMM and CEMF requirements relevant to the development of this Plan.

Table 4: SWMP Compliance Matrix

No.	Requirement	Reference	How addressed?			
Conditions of Approval						
C3	<p>The CEMP Sub-plans must be prepared in consultation with the relevant government agencies identified for each CEMP Sub-plan and be consistent with the CEMF and CEMP referred to in Condition C1:</p> <table><tr><td>(b)</td><td>Soil and water</td><td>Relevant council(s), DoI, OEH</td></tr></table>	(b)	Soil and water	Relevant council(s), DoI, OEH	<p>Section 1.4 Appendix D</p> <p>This Plan has been prepared in accordance with this condition and describes how Sydney Metro's Principal Contractor proposes to manage soil and water during construction of the Project. This plan has been provided to IWC, CoCB, NRAR (formerly DoI) and EESG (formerly OEH) for consultation.</p>	
(b)	Soil and water	Relevant council(s), DoI, OEH				
C4	<p>The CEMP Sub-plans must be prepared in accordance with the CEMF</p>	<p>This Table</p>	<p>Table 4 demonstrates how this plan has been prepared in accordance with the relevant requirements of the CEMF.</p>			
C5	<p>Details of all information requested by an agency to be included in a CEMP Sub-plan as a result of consultation, including copies of all correspondence from those agencies, must be provided with the relevant CEMP Sub-Plan.</p>	<p>Section 1.4 Appendix D</p>	<p>This plan has been provided to IWC, CoCB, NRAR and EESG for consultation.</p> <p>Refer to Section 1.4 and Appendix D for a summary of consultation undertaken in the development of this Plan.</p>			
C6	<p>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 (1) month before Construction.</p>	<p>Refer to section 1.2 of the CEMP</p>	<p>This Plan will be submitted for approval to DPIE prior to the final submission of the CEMP for DPIE approval.</p>			
C7	<p>Construction must not commence until the CEMP and all CEMP Sub-plans have been approved by the Planning Secretary. The CEMP and CEMP Sub-plans, as approved by the Planning Secretary, including any minor amendments approved by the ER must be implemented for the duration of Construction. Where Construction of the CSSI is staged, Construction of a stage must not commence until the CEMP and CEMP Sub-plans for that stage have been approved by the Planning Secretary.</p>	<p>Refer to section 1.2 of the CEMP</p>	<p>Construction will not commence until the CEMP and all CEMP Sub-plans have been approved by DPIE. The CEMP and Sub-plans will be implemented for the duration of construction.</p>			
C8	<p>The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies identified for each to compare actual performance of Construction of the CSSI against the predicted performance.</p> <table><tr><td>(b)</td><td>Water Quality</td><td>Relevant council(s)</td></tr></table>	(b)	Water Quality	Relevant council(s)	<p>Section 1.4 Section 6 Appendix D</p>	<p>The Water Quality Monitoring Program has been prepared in accordance with this condition and describes how Sydney Metro's Principal Contractor proposes to monitor water quality during construction of the Project. The monitoring program has been provided to IWC and CoCB for consultation.</p>
(b)	Water Quality	Relevant council(s)				
C9	<p>Each Construction Monitoring Program must provide:</p>	<p>-</p>	<p>-</p>			

No.	Requirement	Reference	How addressed?
	(a) details of baseline data available;	Section 6.3	Details of the surface water baseline data available, as well as data to be obtained and when, during the development of the Water Quality Monitoring Program are presented in Section 6.3.
	(b) details of baseline data to be obtained and when;		
	(c) details of all monitoring of the project to be undertaken;	Section 6.4	The details of monitoring to be undertaken by the Project is described in Section 6.4 of this Plan.
	(d) the parameters of the project to be monitored;	Section 6.5	The parameters to be monitored by the Project are described in Section 6.5 of this Plan
	(e) the frequency of monitoring to be undertaken;	Section 6.6	The frequency and location of monitoring to be undertaken by the Project is described in Section 6.6 of this Plan
	(f) the location of monitoring;		
	(g) the reporting of monitoring results;	Section 6.8	Section 6.8 of this plan details the reporting of monitoring results.
	(h) procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory; and	Section 6.9	Procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory are presented in Section 6.9 of this Plan.
	(i) any consultation to be undertaken in relation to the monitoring programs.	Section 1.4 Appendix D	Section 1.4 of this Plan details the consultation undertaken during the development of the Water Quality Monitoring Program.
C10	The Construction Monitoring Programs must be developed in consultation with relevant government agencies as identified in Condition C8 of this approval and must include reasonable information requested by an agency to be included in a Construction Monitoring Programs during such consultation. Details of all information requested by an agency including copies of all correspondence from those agencies, must be provided with the relevant Construction Monitoring Program.	Section 1.4 Appendix D	The Water Quality Monitoring Program has been prepared in accordance with this condition and describes how Sydney Metro's Principal Contractor propose to monitor surface water quality during construction of the Project. The monitoring program has been provided to IWC and CoCB for consultation.
C11	The Construction Monitoring Programs must be endorsed by the ER and then submitted to the Planning Secretary for approval at least one (1) month before the commencement of Construction.	Refer to section 1.2 of the CEMP	The Water Quality Monitoring Program has been endorsed by the ER. The Water Quality Monitoring Program will be submitted to DPIE as part of this Soil and Water Management Plan, for approval no later than one month prior to the commencement of construction activities.

No.	Requirement	Reference	How addressed?
C12	Construction must not commence until the Planning Secretary has approved all of the required Construction Monitoring Programs.	Refer to section 1.2 of the CEMP	Construction will not commence until the CEMP and Sub-plans, including relevant construction monitoring programs have been approved by DPIE.
C13	The Construction Monitoring Programs, as approved by the Planning 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 Planning Secretary, whichever is the greater.	Section 6.1	The Water Quality Monitoring Program will be implemented for the duration of construction as detailed in Section 6.1 of the Water Quality Monitoring Program.
C14	The results of the Construction Monitoring Programs must be submitted to the Planning 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 6.8	Section 6.8 details the reporting requirements and the frequency required for this reporting.
C15	Where a relevant CEMP Sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP Sub-plan.	Section 6	The Water Quality Monitoring Program is incorporated in Section 6 of this this Plan.
Revised Environmental Mitigation Measures			
FHW4	A construction water quality monitoring program would be developed and would commence prior to construction, to monitor water quality at identified discharge points. The program would include relevant water quality objectives, parameters, and criteria and specific monitoring locations identified in consultation with DPI (Water) and the EPA.	Section 6	The Water Quality Monitoring Program has been prepared in accordance with this condition and describes how Sydney Metro's Principal Contractor propose to monitor surface water quality during construction of the Project. The monitoring program has been provided to IWC, CoCB, DoI Water / NRAR and EPA for consultation.
Construction Environmental Management Framework			
15.2 (a)	Principal Contractors will develop and implement a Soil and Water Management Plan for their scope of works. The Soil and Water Management Plan will include as a minimum:	This SWMP	-
	<ul style="list-style-type: none"> The surface water and flooding mitigation measures as detailed in the environmental approval documentation. 	Section 5 Appendix A	Section 5 of this Plan summarises the surface water and flooding mitigation measures as detailed in the environmental approval documentation.
	<ul style="list-style-type: none"> details of construction activities and their locations, which have the potential to impact on water courses, storage facilities, stormwater flows, and groundwater; 	Section 4	Section 4 of this Plan details the Project's construction activities and which have the potential to impact upon soil and water.

No.	Requirement	Reference	How addressed?
	<ul style="list-style-type: none"> surface water and ground water impact assessment criteria consistent with the principles of the Australian and New Zealand Environment Conservation Council (ANZECC) guidelines; 	Section 2.1 Section 5.2.2 Section 5.5	Section 2.1 includes the guidelines that have been considered in the development of this Plan, including ANZECC. Section 5.2.2 of this Plan outlines the offsite discharge criteria to be utilised on this Project Section 5.5 of this Plan outlines the management of groundwater, consistent with the ANZECC guidelines.
	<ul style="list-style-type: none"> management measures to be used to minimise surface and groundwater impacts, including identification of water treatment measures and discharge points, details of how spoil and fill material required by the SSI will be sourced, handled, stockpiled, reused and managed; erosion and sediment control measures; salinity control measures and the consideration of flood events; 	Section 5 CEMP Appendix E	Section 5 of this Plan outlines the management measures to be implemented to minimise soil and water impacts. Refer to Appendix E of the CEMP for the Waste and Spoil Management Procedure
	<ul style="list-style-type: none"> a contingency plan, consistent with the Acid Sulfate Soils Manual (EPA 1998), to deal with the unexpected discovery of actual or potential acid sulfate soils, including procedures for the investigation, handling, treatment and management of such soils and water seepage; 	Section 5.11	Section 5.11 of this Plan outlines how acid sulfate soils or potential acid sulfate soils are to be investigated, handled, treated and the management of such soils and water seepage.
	<ul style="list-style-type: none"> management measures for contaminated material (soils, water and building materials) and a contingency plan to be implemented in the case of unanticipated discovery of contaminated material, including asbestos, during construction; 	Section 5.7 Section 5.8 Section 5.9 Section 5.10 Section 5.11	Section 5.7 to 5.11 include the measures for the management of contaminated materials and the procedure to be implemented if unexpected contamination is encountered during construction.
	<ul style="list-style-type: none"> a description of how the effectiveness of these actions and measures would be monitored during the proposed works, clearly indicating how often this monitoring would be undertaken, the locations where monitoring would take place, how the results of the monitoring would be recorded and reported, and, if any exceedance of the criteria is detected how any noncompliance can be rectified; 	Section 6	The Water Quality Monitoring Program in Section 6 of this Plan details how often monitoring would be undertaken, the locations of monitoring, the recording and reporting of results and adaptive management should exceedances be identified.
	<ul style="list-style-type: none"> The requirements of any applicable EPL conditions. 	Section 2.3 Appendix A	Section 2.3 and Appendix A of this Plan outlines the requirements of any applicable EPL conditions.

No.	Requirement	Reference	How addressed?
	<ul style="list-style-type: none"> The responsibilities of key project personnel with respect to the implementation of the plan. 	Section 2.4	Section 2.4 outlines the responsibilities of key personnel with respect to the implementation of this Plan.
	<ul style="list-style-type: none"> Procedures for the development and implementation of progressive erosion and sediment control plans. 	Section 5.1.4	Section 5.1.4 outlines the development and implementation of progressive erosion and sediment control plans.
	<ul style="list-style-type: none"> Identification of locations where site specific Stormwater and Flooding Management Plans are required. 	-	Stormwater and Flooding Management Plans will be developed by the Principal Contractor prior to Construction where constructions sites are within the 100 year ARI +10% increase in rainfall flood zone.
	<ul style="list-style-type: none"> Compliance record generation and management. 	Section 8 Section 10.2	Section 8 and 10.2 of this Plan describe compliance record generation and management.

2.3. Environment Protection Licence

At this stage, Sydney Metro's Principal Contractor has not sought an Environment Protection Licence (EPL) from the NSW EPA.

If Sydney Metro's Principal Contractor applies for an EPL for the Project, then this may include different or additional soil and water management requirements to the CoA. In this case, the Project's SWMP will be updated to incorporate requirements of the EPL.

For elements of the Project's scope, the Sydney Trains EPL 12208 may apply. The works will be managed in accordance with the railway track maintenance clauses presented in the table in Appendix A.

2.4. Roles and Responsibilities

The roles and responsibility of key personnel with respect to soil and water management are as follows in Table 5.

Table 5: Roles and Responsibilities

Roles	Responsibilities
Project Director	Managing the delivery of the Project including overseeing implementation of the soil, water and groundwater management Act as Contractor's Representative
Environment Manager	Oversee the implementation of all soil, water and groundwater management initiatives Responsible for managing ongoing compliance with the CoA, REMM and environmental document requirements Monitoring and report on soil and water management during construction
Commercial Manager	Ensure that relevant soil, water and groundwater management requirements are considered in procuring materials and services
Construction Managers Site Superintendent	Manage the delivery of the construction process, in relation to soil, water and groundwater management across all sites in conjunction with the Environment Manager
Sustainability Manager	Track and report soil and water elements against sustainability targets
Environment Coordinator	Manage the on-ground application of soil and water management measures during construction (e.g. erosion and sediment control, water treatment and monitoring) Monitor and report on soil and water management during construction
Project Engineer	Implement soil and water management activities during construction works
Site Foreman (Site Superintendent)	Monitor and report on erosion and sediment controls during construction works
Independent Environmental Representative (ER)	<ul style="list-style-type: none"> Receive and respond to communication from the Planning Secretary in relation to the environmental performance of the CSSI; Consider and inform the Planning Secretary on matters specified in the terms of this approval;

Roles	Responsibilities
	<ul style="list-style-type: none"> Consider and recommend to the Proponent any improvements that may be made to work practices to avoid or minimise adverse impact to the environment and to the community; Review documents identified in Conditions C1, C3 and C8 and any other documents that are identified by the Planning Secretary, to ensure they are consistent with requirements in or under this approval and if so: <ul style="list-style-type: none"> (i) make a written statement to this effect before submission of such documents to the Planning Secretary (if those documents are required to be approved by the Planning Secretary), or (ii) make a written statement to this effect before the implementation of such documents (if those documents are required to be submitted to the Planning Secretary for information or are not required to be submitted to the Secretary); Regularly monitor the implementation of the documents listed in Conditions C1, C3 and C8 to ensure implementation is being carried out in accordance with the document and the terms of this approval; As may be requested by the Planning Secretary, assist the Department in the resolution of community complaints; Consider any minor amendments to be made to the documents listed in Conditions C1, C3 and C8 and any document that requires the approval of the Planning Secretary that comprise updating or are of an administrative or minor nature and are consistent with the terms of this approval and the documents listed in Conditions C1, C3 and C8 or other documents approved by the Planning Secretary and, if satisfied such amendment is necessary, approve the amendment. This does not include any modifications to the terms of this approval; and Prepare and submit to the Planning Secretary and other relevant regulatory agencies, for information, an Environmental Representative Monthly Report detailing the ER's actions and decisions on matters for which the ER was responsible in the preceding month. The Environmental Representative Monthly Report must be submitted within seven (7) days following the end of each month for the duration of the ER's engagement for the CSSI.

It is noted that the site team, including the Principal Contractor's Environmental Manager, Environmental Coordinator, Construction Manager and Site Foreman/Site Superintendent will attend site inspections with the ER upon request.

The ER may request information relating to soil and water management from the Principal Contractor, the primary contract being the Environmental Manager.

3. Existing Environment

The following sections summarise what is known about the factors influencing soils and water within and adjacent to the Project. The information within the section is high-level in nature and not exhaustive. Sydney Metro's Principal Contractor will be responsible for reviewing all available information and managing any environmental risks accordingly.

The key reference document is Chapters 20 and 21 of the EIS.

3.1. Topography

The area within and adjacent to the Sydenham to Bankstown rail corridor ranges in elevation from the lowest point, which is about 3.5 metres above Australian height datum near Marrickville Station, to the highest point, which is about 36 metres above Australian height datum near Wiley Park Station. Bankstown Station is located about 23 metres above Australian height datum.

Between Punchbowl and Bankstown stations, the project area is located on or near a localised ridgeline. East of Punchbowl Station, the natural topography varies through a series of ridges and gullies. Between Marrickville and Sydenham stations, the project area is located in low-lying terrain.

3.2. Geology

The Project sites traverse a number of regional geological units identified by the *Sydney 1:100,000 Geological Sheet 9130* (Herbert, 1983).

Section 20.2.2 of the EIS identifies the following regional geological units within the Project's footprint:

- Fill – located through numerous parts of the site, particularly within embankments;
- Quaternary Sediments – alluvium and estuarine deposits near Marrickville Station;
- Wianamatta Group – includes Ashfields shales near Canterbury Station;
- Mittagong Formation – between Dulwich Hill and Canterbury;
- Hawkesbury Sandstone – between Marrickville and Canterbury; and
- Dykes – Volcanic intrusions at Marrickville and Canterbury

3.2.1. Soil landscapes

The Project area traverses three soil landscape types identified by the *Sydney 1:100,000 Soil Landscape Sheet Series 9130* (Herbert, 1983). These include Birrong, GyMEA and Blacktown soil units.

These soil landscape types are described as follows:

- **Birrong:** Soils – deep (>250 cm) yellow podzolic soils and yellow solodic soils on older alluvial terraces
- **GyMEA:** Soils – shallow to moderately deep yellow earths and earthy sands on crests and on the inside of benches

- **Blacktown:** Soils – shallow to moderately deep hard setting mottled texture contrast soils, red and brown podzolic soils on crests grading to yellow podzolic soils on lower slopes and in drainage lines

It is noted that the Project area is highly disturbed and soils across the station sites likely include imported materials.

Figure 1 indicates the soil units across the Project.

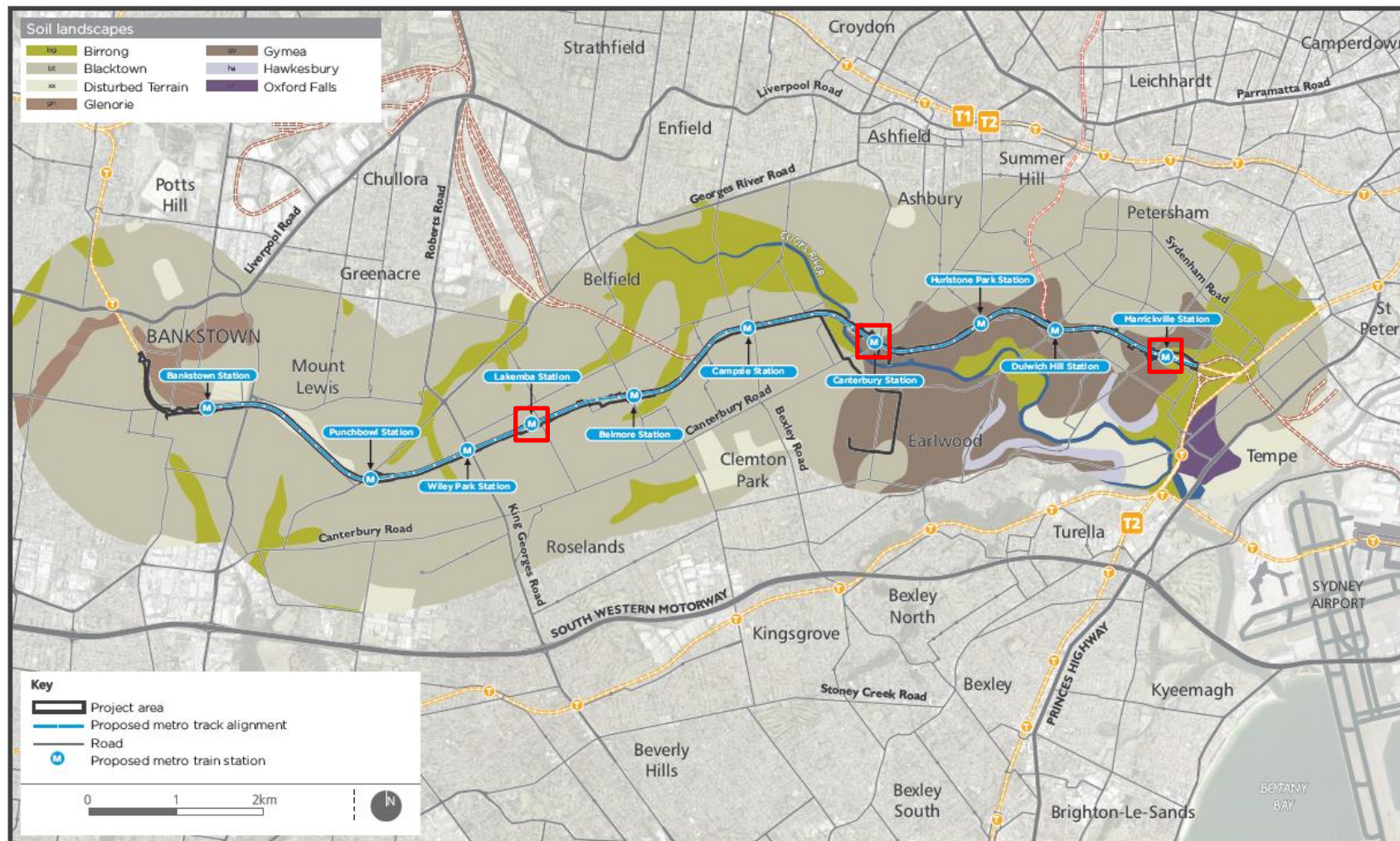


Figure 1 Soil landscapes along the project alignment. Indicative project areas shown in red.

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3.2.2. Soil salinity

Salinity in the Project area was considered within the EIS. Based on the content of the EIS there was no evidence of soil salinity within the Project area. The relevant soil salinity mapping has been extracted from the EIS, and is included in Figure 2. The EIS concluded that “... *potential saline soils are located west of Punchbowl Station. The remainder of the Project area is not mapped as having salinity potential. However, there may be areas of salinity potential in these areas.*”

As the Project sites are not located within areas with salinity potential, REMM SC3 is not relevant to the Project.

3.2.3. Acid sulfate soils

Acid sulfate soils (ASS) are the common name given to naturally occurring sediments and soils containing iron sulphides (principally iron sulphide or iron disulphide or their precursors). Exposure of the sulphide in these soils to oxygen as a result of drainage or excavation leads to the generation of sulphuric acid. Areas of acid sulphate soils can typically be found in low-lying and flat locations that are often swampy or prone to flooding.

In accordance with the Australian Soil Resource Information System (CSIRO, 2015) parts of the rail corridor between Sydenham and Bankstown has been deemed to have a high potential for the presence of Acid Sulphate Soils, particularly the area near the Cooks River. Refer to Figure 2 for mapping.

Sydney Metro City & Southwest Sydenham to Bankstown upgrade: Technical Paper – Contamination Assessment Report (GHD, 2017) has reviewed available information on Acid Sulphate Soil and states;

“Marrickville Station to Section D (country side of Hurlstone Park Station) – A review of the mapping indicates that there is unlikely to be occurrences of ASS.

Canterbury Station – The western quarter of the Canterbury Station has been mapped as ‘disturbed terrain’; and there is potential for ASS to depths varying between 2 and 4 m below ground level.

Section E (country side of Canterbury Station to city side of Campsie Station) – The eastern half of section E has been mapped as having a low risk of acid sulphate soils (at two to four metres below ground surface) and ‘disturbed terrain’ on the western and eastern sides of the Cooks River, respectively.

Campsie Station to Section K (Bankstown Station) – A review of the mapping indicates that there is unlikely to be occurrences of ASS.”

With regards to the Project Area the EIS reports:

- A Class 3 risk of encountering ASS at the Service Building location at Marrickville Station; and
- A Class 4 risk of encountering ASS at the Service Building location at Canterbury Station.

City and Southwest, Sydney Metro Sub-portion 2 – Sydenham to Bankstown Contamination Assessment (GHD, 2017) indicates that three samples from within the Project area at Marrickville are to be considered Potential Acid Sulfate Soils (PASS) following Chromium

Reducible Sulfur testing. The three samples were taken from the Marrickville area at a depth of 2-3m, as such there is a possibility that the Project works will encounter PASS in these areas.

Sydney Metro's Principal Contractor's management of ASS and PASS will occur in accordance with Section 5.11 of this Plan.

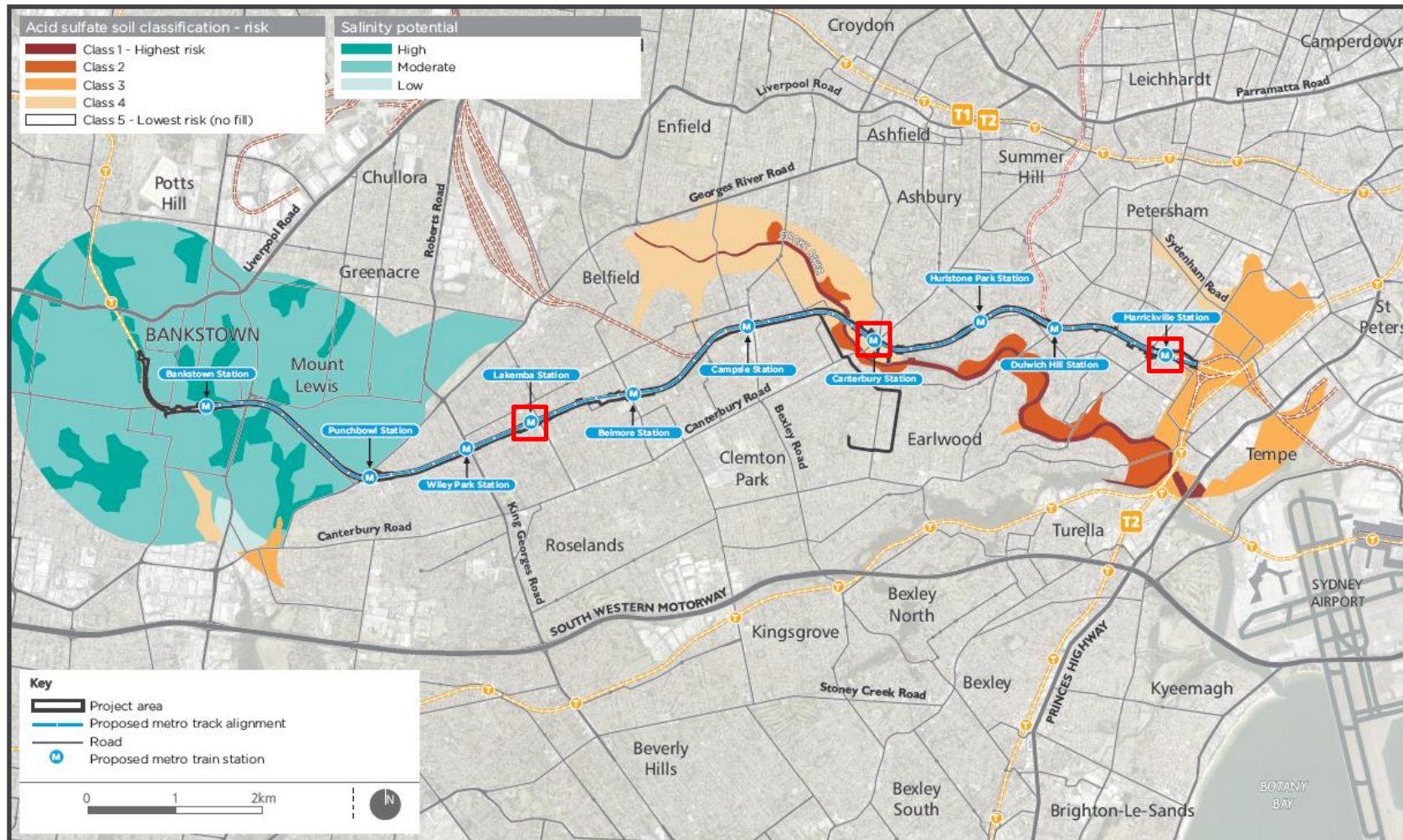


Figure 2 Salinity potential and ASS risk. Indicative project areas shown in red.

3.3. Contamination

The Sydenham to Bankstown rail corridor has been part of an operational rail corridor for more than 130 years. A Phase 1 contamination assessment for the existing rail corridor between Sydenham and Bankstown Stations was carried out by GHD as part of the development of the EIS. The Phase 1 assessment included a desktop review and site visit. Chapter 20 of the EIS references the preliminary site assessment which concluded; *“that there is a risk of contamination along the length of the project area, albeit a low to medium risk for the majority of the project area, with potential contamination sources being historical rail activities, and commercial and residential land use in surrounding areas.”* Contaminants of potential concern (COPC) associated with the use of railway include:

- Asbestos;
- Hydrocarbons;
- Heavy metals; and
- Herbicides.

Areas identified in the EIS with a medium to high contamination risk along the Sydenham to Bankstown rail corridor are detailed in Table 6 below

Table 6: Areas with a medium to high contamination risk along the rail corridor

Location	Potential contamination sources	Potential contaminants present	Location in relation to the nearest Project site
Between Sydenham and Marrickville stations	<ul style="list-style-type: none"> Previous site investigations identified asbestos in soil and petroleum aromatic hydrocarbons in groundwater north of the project area, at 361 Victoria Road 	Within the vicinity of 361 Victoria Road: <ul style="list-style-type: none"> Asbestos in soil Petroleum aromatic hydrocarbons in groundwater 	Approximately 150m east of the Marrickville Station site
Between Campsie and Belmore stations (triangular area within the rail corridor)	<ul style="list-style-type: none"> Historical rail activities Historical commercial and residential land use 	<ul style="list-style-type: none"> Arsenic in ballast Asbestos Hydrocarbons (including chlorinated hydrocarbons in fill) Heavy metals (including in groundwater) Herbicides 	> 1km east of the Lakemba Station site
Between Punchbowl and Bankstown stations (car park at North Terrace)	<ul style="list-style-type: none"> Historical rail activities Historical commercial and residential land use 	<ul style="list-style-type: none"> Asbestos Hydrocarbons (in soil and groundwater) Heavy metals Herbicides 	>3km west of the Lakemba Station site

Table 6 identifies that the nearest medium to high contamination risk site in relation to the Project is 361 Victoria Road, Marrickville, located approximately 150m from the Marrickville Station site.

Chapter 21.2.6 of the EIS states that groundwater levels at Marrickville are the shallowest, recorded at about 2.3m below ground level. As outlined in Section 3.4, there is the possibility that the Project will interact with petroleum aromatic hydrocarbon impacted groundwater. Contamination will be managed in accordance with the Unexpected Contaminated Land Procedure and Asbestos Finds Procedure; as per CoA E39 and CoA E40 and the mitigation measures outlined in Section 5 of this Plan.

Chapter 20 of the EIS states that no sites listed on the EPA's contaminated land register are located within 100 metres of the Sydenham to Bankstown rail corridor. However, three sites which have been notified to the EPA are located within 100 metres of the rail corridor. These are listed in Table 7 below.

Table 7: Registered contaminated sites

Suburb	Site name and address	Site activity	Contamination status	Location in relation to the nearest Project site
Marrickville	Way Street	XPT Maintenance Facility, other industry	Regulation under CLM Act not required	>400m east of the Marrickville Station site
Marrickville	2 Carrington Road	Unclassified	Regulation under CLM Act not required	>200m east of the Marrickville Station site
Belmore	348 Belmore Road	Rail land, unclassified	Regulation under CLM Act not required	>500m east of the Lakemba Station site

Due to the history of the rail corridor and surrounding development, Phase 2 contamination testing has been undertaken across the rail corridor and at stations. These assessments include;

- City & Southwest, Sydney Metro Sub-portion 2 - Sydenham to Bankstown Targeted Contamination Assessment (GHD 2017)
- Sydney Metro City and Southwest Sydney Metro, Sub-portion 1: Sydenham to Bankstown Station Platforms Contamination Assessment (GHD 2017)
- Southwest Corridor Conversion Enabling Works – Tranche 1B Contamination Assessment Report (AGJV 2019)

Table 8 summarises exceedances of screening criteria within 100m of the Project sites, as published in the Targeted Contamination Assessment (GHD 2017).

Table 8: Targeted Contamination Assessment exceedances in proximity to the Project

ID	Location	Summary of exceedance of screening criteria
Marrickville Station		
BH001	Within 50m of the Marrickville Station Service Building footprint	Concentration of total recoverable hydrocarbons (TRH) >C16-C34 (4,800 mg/kg) exceeded the Commercial / Industrial Management Limit (3,500 mg/kg) (depth of 0.4-0.5 m)
BH012	Within the Marrickville Station Service Building footprint	Concentration of lead (3,400 mg/kg) (depth of 1.0 to 1.1 m) exceeded the adopted screen health investigation level (1,500 mg/kg) for commercial / industrial land use
BH013	Station Street, immediately adjacent to Platform 2	Concentration of lead (3,400 mg/kg) exceeded the HIL-D (1,500 mg/kg) (depth of 1-1.1 m)
Canterbury Station		
BH064	Platform 2	Chrysotile and amosite asbestos was detected in fibre cement material at BH064
Lakemba Station		
N/A	N/A	No exceedances of screening criteria were identified in proximity of Lakemba Station.

Asbestos was encountered at a number of other test locations within the corridor, including on the city side of Livingstone Bridge, Marrickville.

The Targeted Contamination Assessment states that the conceptual site model is complete and any contaminants, including those listed above, can be *“managed by using appropriate PPE and management measures.”* These measures are included within Section 5 of this Plan.

AGJV's investigations (boreholes / test pits) between Sydenham and Campsie Stations suggested that concentrations of COPC in fill soil are below the adopted human health screening criteria for commercial / industrial land use and adopted management limits. AGJV's Tranche 1B Contamination Assessment Report Refined Conceptual Site Model identifies the inhalation of airborne (asbestos) fibres as a potential pathway to receptors and recommends that an Asbestos Management Plan with an appropriate unexpected finds procedure is developed and implemented for the works. Refer to Section 5.9 for asbestos mitigation measures.

GHD's platform contamination assessment report included the results of an intrusive soil investigation. At Marrickville Station, GHD reported concentrations of benzo(a)pyrene TEQ at MVBH01 (depths of 0.9-1.0 and 1.3-1.4 m) (4.4 and 10 mg/kg, respectively) and MVBH05 (depth of 0.1-0.2 m) (12 mg/kg) exceeded the HIL for high-density land use (4 mg/kg). No exceedances of screening criteria were reported at Canterbury and Lakemba Station platforms.

REMM SC7 states *“In the event a Remediation Action Plan is required, it would be developed in accordance with Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land (Department of Urban Affairs and Planning and Environment Protection Authority, 1998) and a NSW Environment Protection Authority Accredited site auditor would be engaged to audit the works.”* Based on the results of the contamination assessments, a Remediation Action Plan is not required.

It is noted that the construction process may lead to the disturbance and mobilisation of existing contamination, or may result in the addition of new contamination to soil, surface water or groundwater via spills or leaks of fuels, oils or other hazardous materials. The risk of contamination arising through the construction process will be mitigated by implementing the mitigation measures as described within Section 5 of this Plan.

3.3.1. Hazardous materials

A hazardous materials assessment of buildings and structures was conducted by GHD in September 2016, which focused on stations along the rail corridor - *City and Southwest Metro Asset Condition Assessment – Hazardous Materials Assessment (GHD 2016)*. The scope of this assessment was limited to a visual re-inspection of previously identified hazardous materials and an inspection, with limited sampling, for potential hazardous materials not noted on existing registers.

The assessment inspected the following locations relevant to this Project:

- Marrickville Station – Platform building, booking office, former platform building;
- Canterbury Station – Concourse, station master's office, station building, sectioning hut; and
- Lakemba Station – Concourse, concourse station building, station building

For the purposes of GHD's assessment, the hazardous materials assessed included:

- Asbestos containing materials;
- Synthetic mineral fibre;
- Polychlorinated biphenyls (PCB) capacitors within light fittings;
- PCB oils within transformers and other electrical equipment; and
- Leaded paint systems and lead contaminated dust.

The report summarised that the following materials were identified or presumed as containing asbestos:

- Flat cement sheeting;
- Corrugated cement sheeting;
- Asbestos containing cement sheeting debris;
- Asbestos containing vinyl floor tiles;
- Asbestos containing gaskets;
- Asbestos containing textile wrap;
- Asbestos containing fuse;
- Resinous board; and
- Pipe conduit.

The assessment assigns the asbestos instances a 'Very High Risk' status as refurbishment and/or demolition related activities are likely to impact on these instances.

Other hazardous materials that were identified include:

- Synthetic mineral fibres in insulation to underside of roof, acoustic ceiling tiles and insulation to ceiling cavities;
- Polychlorinated Biphenyls (PCB) capacitors within fluorescent light fittings;
- PCB oil within transformers;
- Leaded paint systems to interior and exterior surfaces; and
- Lead-contaminated dust.

The assessment assigned the above instances a 'Very High Risk' status as refurbishment and/or demolition related activities are likely to impact on these instances.

This assessment was undertaken only in nominated areas where access was readily available. In accordance with REMM SC6, the Principal Contractor will conduct hazardous materials surveys for all proposed demolition activities, and for utility adjustments as required, prior to these works commencing.

All reasonable and feasible management recommendations outlined in City and Southwest Metro Asset Condition Assessment – Hazardous Materials Assessment (GHD 2016) will be implemented by the Principal Contractor.

3.4. Groundwater

Chapter 21 of the Sydney Metro City & Southwest: Sydenham to Bankstown EIS makes the following statements in regards to groundwater;

- *"The groundwater level along most of the project area was recorded at between about 2.3 metres below ground level (to the east of the project area in Marrickville) and about 10.3 metres below ground level (near Bankstown Station)."*
- *"Groundwater has been observed discharging from open cuttings along the rail corridor. The surface groundwater system is likely to be recharged by rainfall and percolation from irrigation of residential gardens and open spaces, as well as incidental runoff from impervious surfaces, such as roads and footpaths."*
- *"Quaternary alluvium underlies the Cooks River and its tributaries and forms an aquifer. Groundwater is also present within localised alluvial deposits in some gullies. Groundwater salinity within the Quaternary alluvium and localised alluvial deposits is expected to vary from lower salinity in the upper reaches of the Cooks River, to higher salinity in the lower reaches due to mixing and tidal influences."*

An assessment of groundwater quality from previous studies is included within the City & Southwest, Sydney Metro Sub-portion 2 - Sydenham to Bankstown Targeted Contamination Assessment (GHD, 2017) has noted the following;

- Light non-aqueous phase liquids (LNAPL) were identified in one well near the site at 361 Victoria Rd, Marrickville. The Project site is down gradient to the impacted well and a well closer to the Project site reported total petroleum hydrocarbons (TPH) concentrations less than the laboratory limits of reporting.
- Slightly elevated levels of copper, zinc and chromium were identified in groundwater between Campsie and Belmore Stations.

Testing of groundwater within the City & Southwest, Sydney Metro Sub-portion 2 - Sydenham to Bankstown Targeted Contamination Assessment (GHD, 2017) found;

- Groundwater levels within and adjacent to the Marrickville Service Building location were recorded between 3.1 and 3.6m below ground level;
- *“All groundwater samples reported one or more analysed metal (copper, mercury, nickel or zine) concentrations above the groundwater investigation level (GIL) for protecting freshwater aquatic ecosystems. These elevated heavy metal concentrations are likely representing the background levels of the groundwater aquifer in the investigation area and the Sydney basin”;*
- Concentrations of TRH, BTEX, PAHs, OCP, OPP and PCB in all groundwater samples were below the adopted health screening criteria for commercial and industrial land use and the adopted GIL; and
- pH of groundwater was between pH4.4 and pH 6.7.

At Marrickville Station, four 450mm diameter bored piles are proposed for the construction of the overline crossing, located on the country side of Illawarra Road bridge. These bored piles are proposed to an approximate depth of 6.5 metres below ground level. In addition to this, underbores are proposed for the construction of four underline crossings, required to house power and signals and communication cables. These underline crossings are located to the city side of the station, approximately 75 metres to the east of the end of Marrickville Station platforms. The underbores are proposed to a depth of 3.1 to 4.6 metres below ground level.

Due to the depth of excavations associated with the Project, there is the possibility that contaminated groundwater may be encountered. Additional groundwater investigations will be carried out by Sydney Metro’s Principal Contractor in areas where there is the potential for interacting with groundwater, prior to these works commencing.

Should groundwater be encountered during works it will be managed and should that groundwater need to be dewatered, the primary approach would be to dewater the groundwater to a nearby water body, if ANZG/ANZECC Guideline criteria is met. Where groundwater cannot be stored and treated to meet ANZG/ANZECC guideline criteria, Sydney Metro’s Principal Contractor will dispose of the groundwater in accordance with the NSW Waste Classification Guidelines.

It is noted that construction processes, if not managed appropriately, could lead to contamination of groundwater via spills and leaks. Management measures outlined in Section 5 will mitigate the risk of impact to groundwater quality.

3.5. Surface water

3.5.1. Catchments and waterways

The Project sites form part of the overall Cooks River catchment with water from the area discharging into the Cooks River via local stormwater drainage or overland flow. The catchment area and waterways is highly urbanised with mixed residential, commercial and industrial properties. Waterways within this catchment are largely artificial, hard-lined (e.g. concrete channel, piped channel, brick channel) stormwater channels, with the exception of the Cooks River.

The EIS states *“The Cooks River catchment, located in the inner to middle south-western suburbs of Sydney, has an area of about 102 square kilometres. The majority of the catchment is highly developed. The Cooks River itself is about 23 kilometres long, and flows from Chullora in the west to Botany Bay in the east. The river discharges into the north of Botany*

Bay, near Sydney Airport. The river is tidally influenced as far as South Enfield. Major tributaries of the river include:

- *Coxs Creek*
- *Cup and Saucer Creek*
- *Wolli Creek*
- *Alexandra Canal*
- *Muddy Creek*
- *Eastern Channel*
- *Western Channel.”*

It is noted that in accordance with REMM FHW7, works within or near watercourses (including the Cooks River) would be undertaken with consideration given to the NSW Office of Water’s guidelines for controlled activities. Given no works are proposed within watercourses, REMM FHW7 is not relevant to the Project.

The station upgrades and service building construction at Marrickville, Canterbury and Lakemba have a footprint limited to within and adjacent to the existing station areas and the rail corridor. The Project does not propose any direct impacts or modifications to existing watercourses. The closest Project worksite to an existing watercourse is Canterbury Station services building, which is located approximately 100m from the Cooks River; separated by intervening streets, buildings and vegetated areas.

Figure 3 indicates the catchments and stream order of waterways for the area, as published in the EIS.

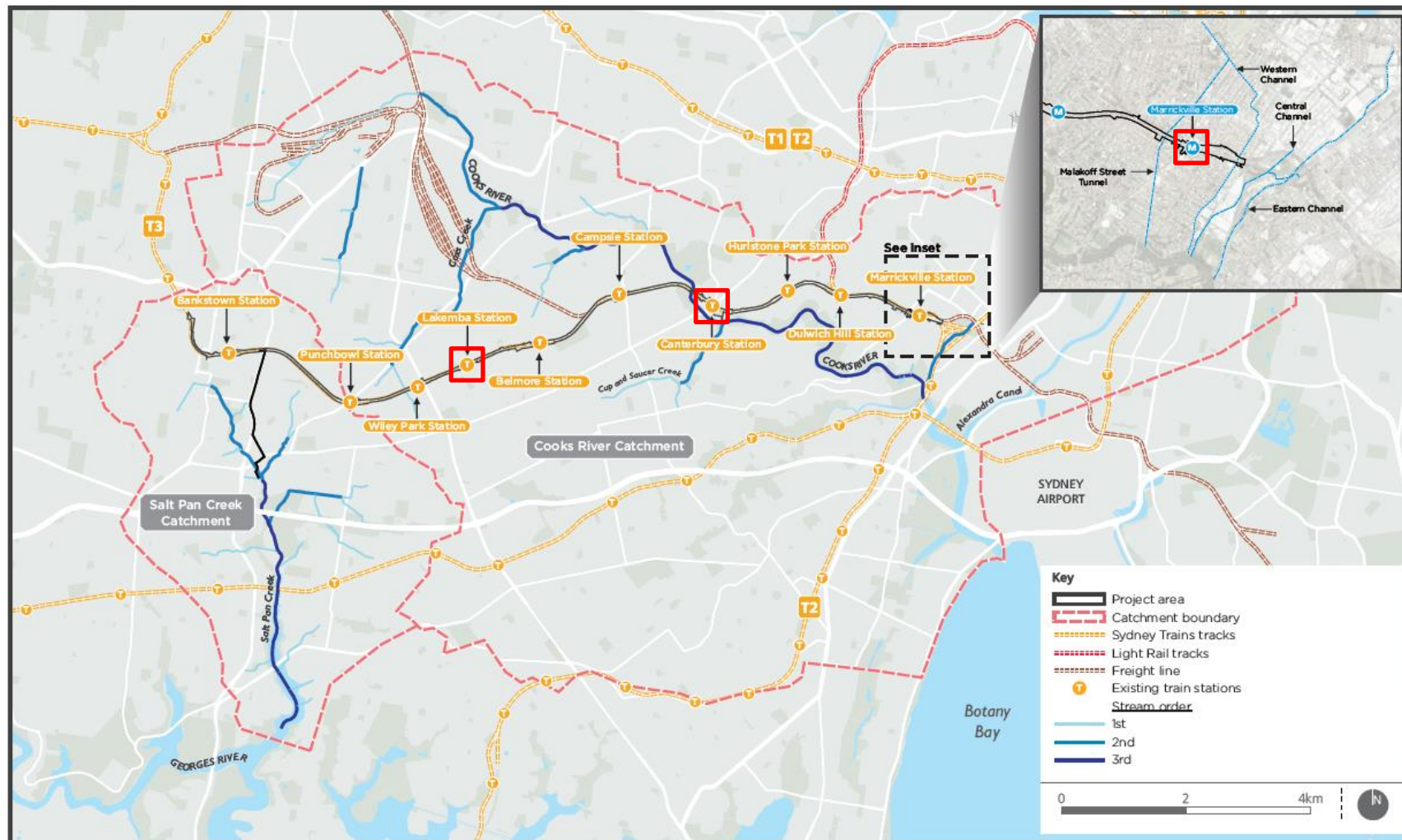


Figure 3 Catchment area and watercourse locations. Indicative project areas shown in red.

3.5.2. Surface water quality

Water courses within the catchment are heavily urbanised, with stormwater collected by developed stormwater networks and the Cooks River. Surface water quality in the project area is influenced by several factors including:

- Current and former polluting land uses within the catchment;
- Stormwater and sewage overflows and leachate from contaminated and/or reclaimed land;
- Urbanisation of the catchments and subsequent reduction in permeable area, increasing run-off and pollutant loads entering waterways; and
- Illegal dumping.

Water quality is measured on an ongoing basis for the wider Cooks River catchment by the NSW EESG as part of the Beachwatch programme. The monitoring point is at Kyeemagh Baths at the mouth of the Cooks River in Port Botany. Water quality within the Cooks River catchment is influenced by stormwater, fertilisers, industrial discharges and sewage contamination.

Limited background water quality data is available for the Cooks River through monitoring undertaken by the Cooks River Alliance. However, the most recent data available is from 2013/2014 and monitoring was not undertaken in close proximity to the Project area.

As the Project works are not within the proximity of any first, second or third order streams, minimal impacts to surface water quality are predicted. Refer to Section 5 for erosion and sediment controls measures to be implemented during construction.

3.6. Flooding

Chapter 21 of the EIS cites the *Marrickville Valley Flood Study* (Marrickville Council and NSW Government 2013) which summarises the existing flooding conditions at Marrickville, the draft *Overland Flow Study Canterbury LGA Cooks River Catchment* (Cardno 2016) for the remainder of the Cooks River Catchment and the *Salt Pan Creek Stormwater Catchment Study* (Bankstown City Council 2011).

The EIS states that the existing rail corridor and surrounds near Marrickville Station are susceptible to flooding, with flooding predicted to occur in events as frequent as the 39 per cent Annual Exceedance Probability (AEP). The EIS also summarises the flooding and drainage issues occurring in the remainder of the alignment between Sydenham and Bankstown Stations. These issues are generally considered to be more minor than at Marrickville Station. The flooding conditions relevant to this Project are summarised below.

Marrickville Station

Chapter 21 of the EIS states “*The project involves upgrading rail infrastructure in areas subject to regular existing flooding – particularly in Marrickville.*” The most flood affected parts of both the Project area and surrounding areas are located in the vicinity of Marrickville Station. Modelling of the existing flood conditions was carried out during the EIS development and the output shows:

- *“Flooding of the rail corridor with flood depths greater than one metre between Livingstone Road and Illawarra Road near Marrickville Station in a one per cent AEP event;*
- *Most of the rail corridor between Livingstone Road and Illawarra Road, and a section of corridor east of Marrickville Station, is identified as a high flood hazard area during the one per cent AEP event;*
- *In the one per cent AEP event, high flood hazard areas are also located along public roads (Sydenham Road and Carrington Road in particular) and open channels, consistent with their definition as floodways;*
- *During the PMF, these same roads and areas are more severely affected, including the rail corridor between Livingstone Road and Illawarra Road, Sydenham Road (and roads leading south), Carrington Road, Meeks Road/Fitzroy Street, and areas to the east; and*
- *Access routes around Marrickville Station, including some used for emergency access, would be flooded, including Railway Parade, Sydenham Road, Marrickville Road, Illawarra Road, Schwebel Street, and Arthur Street.”*

Canterbury Station

Overland flooding into the rail corridor occurs in some locations between Dulwich Hill and Canterbury Station, where existing cross drainage capacity is exceeded. These include:

- Substantial overland flooding ~100m east of Canterbury Station (high flood hazard area); and
- Minor overland flooding potential west of Canterbury Station (low flood hazard area).

Lakemba Station

- East of the station there is a risk of flooding in the rail corridor for events equal to and greater than the 5% AEP; and
- West of the station there is limited cross drainage capacity however the rail corridor is on fill.

Both the Marrickville and Canterbury Station services building sit within the 100 year ARI +10% increase in rainfall flood zone. In accordance with CoA E9, in order to minimise flood impacts, the services buildings have been designed as elevated buildings on footing walls with discrete openings to allow cross flows beneath the building. Flooding assessment concludes that this design does not increase the flood risk to adjacent road, rail tracks or private properties.

The Lakemba Station services building is located outside of the 100 year ARI flood zone based on the existing flood studies. The design of the building is not anticipated to impact upon the local flooding regime.

In accordance with REMM FHW1, the Marrickville, Canterbury and Lakemba services buildings have been designed to ensure there is no increase in stormwater runoff rates. As the addition of these buildings results in an increase of impervious area, on-site detention in

the form of on-site detention (OSD) tanks have been provided as part of the design to reduce flows.

Given the existing flooding risks, particularly at the Marrickville and Canterbury services building sites, the management measures outlined in Section 5.4 will be implemented by Sydney Metro's Principal Contractor during the construction planning and construction phase of the Project to minimise flooding impacts.

4. Environmental aspects and impacts

4.1. Construction activities

Key construction activities that could result in adverse impacts to soils and surface water include:

- Vegetation clearing and topsoil stripping;
- Bulk earthworks;
- Construction and use of site accesses;
- Drainage works;
- Material stockpiling including the treatment of acid sulfate soil and rock;
- Water use; and
- Operations at site compounds including fuel and chemical storage, refuelling and chemical handling.

The key aspects and potential impacts associated with the management of soil and water during the delivery of the Project are listed in Table 9.

Table 9: Aspects and potential impacts

Aspects	Potential impacts
Discharge of contaminated water from within site boundary during rainfall Concrete washout	<ul style="list-style-type: none"> • Contamination of adjacent watercourse • Contamination of soils
Dust generated by vehicles	<ul style="list-style-type: none"> • Potential pollution of waterways and air
Vegetation clearing and topsoil stripping	<ul style="list-style-type: none"> • Sediment degrading surrounding environment • Runoff entering drainage lines causing pollution and impacting aquatic life in the catchment • Potential loss of seedbank in topsoil
Earthworks / Embankment works / Platform excavation works / Service building works	<ul style="list-style-type: none"> • Potential spread of contamination into soils /surface or groundwater • Personnel exposure to contaminants • Sediment degrading surrounding environment • Change to flooding characteristics
Flooding of worksites	<ul style="list-style-type: none"> • Contamination of floodwaters by sewage, fuels and/or chemicals onsite
Leaks or spillages of fuels, oils and grease from construction plant and equipment and at compounds	<ul style="list-style-type: none"> • Contamination of soil • Contamination of watercourse, riparian environment and groundwater ecosystems • Personnel exposure to contaminants
Disturbance of Potential Acid Sulphate soils and Actual Acid Sulphate Soils during excavations.	<ul style="list-style-type: none"> • Mobilisation of metals within runoff to levels toxic to natural systems • Release of acidic runoff
Modifications to natural hydrology or water quality from excavations	<ul style="list-style-type: none"> • Localised pollution of waterways • Potential loss of surface flow from existing drainage lines

Aspects	Potential impacts
Sediment laden runoff during rainfall	<ul style="list-style-type: none"> Runoff entering drainage lines causing pollution and impacting aquatic life in Cooks River
Sediment tracking onto public roads from vehicles leaving site	<ul style="list-style-type: none"> Potential impact on traffic safety Potential for sediment laden runoff during rainfall Potential for generation of dust
Storage of hazardous chemicals and dangerous goods	<ul style="list-style-type: none"> Contamination as a result of a spill Impact to watercourses from pollution
Construction laydown spills	<ul style="list-style-type: none"> Contamination of soils Potential for pollutants to wash into drainage system Sediment laden/ contaminated runoff entering drainage system Potential for contamination of floodwaters by sewerage, fuels and/or chemicals onsite
Inappropriate management (handling, stockpiling, transport and disposal) of identified contamination or contaminated materials encountered during construction works (e.g. excavation)	<ul style="list-style-type: none"> Potential for spread of contamination (soil/water) Personnel exposure to contaminants Local media coverage Fines and prosecution from Regulatory Authorities

It is noted that groundwater impacts are not captured in Table 9 as groundwater is not anticipated to be impacted by the works. Further information regarding groundwater management is included in the Groundwater Management Procedure included in Appendix E of the CEMP.

Some impacts on soil and water attributable to the Project are anticipated. Section 5 provides a suite of mitigation measures that will be implemented to avoid or minimise those impacts. No stormwater storage structures are anticipated to be impacted by the Project works.

5. Soil and water management

5.1. Erosion and sediment control

5.1.1. General principles

Environmental protection during construction will involve the installation, use and maintenance of a number of temporary erosion and sediment control measures as required in accordance with the following principles:

- Before undertaking any construction work (including any earthmoving or vegetation removal works), implement all soil and water management works required to minimise pollution of waters;
- All erosion and sediment controls will be installed in accordance with best-practice guidelines such as NSW Blue Book Volumes 1 and 2D (Landcom, 2004 and DECC, 2008);
- Erosion and sedimentation mitigation measures would be installed and maintained for the duration of the Project's works;
- Minimise loss of topsoil where practicable;
- Maintaining ground cover for as long as possible to prevent erosion and sedimentation;
- Diversion of 'clean' run-off from offsite around or through the worksite without it contacting exposed soils or mixing with 'dirty' onsite water and maintaining existing drainage infrastructure wherever possible;
- Installation of any permanent scour protection measures required for the operational phase would occur as soon as practical;
- Minimisation of soil erosion and mobilisation of sediment during rain events;
- Use of suitable sediment retention structures and control measures to filter or retain mobilised sediment generated during rain events over surface disturbances;
- Maximum sediment capture through effective positioning of temporary erosion and sediment control structures;
- Progressive rehabilitation and/or stabilisation of completed areas to minimise erosion hazard, as soon as practicable;
- Regular inspection and maintenance of all erosion and sediment controls to ensure they are effective;
- Use of water efficient fittings and fixtures where reasonable and feasible for temporary site facilities;
- Targeted training on ERS&D principles for the Principal Contractor's key staff;
- Ensure that any road, footpath, shared path or cycleway which is open to the public is at all times kept free of mud, dirt, dust, deleterious material, debris, obstructions and trip hazards arising from the Project activities in accordance with the Project Approval;

- Utilisation and maintenance of appropriate site exit controls. This may include wheel wash facilities. These measures would be put in place to mitigate the risk of any loss of fuels, lubricants, load or other substances;
- Any spillage or build-up of such material or debris would be cleaned up as soon as practicable;
- Diversion of run-off from areas of exposed soil to appropriate sediment control devices as much as practicable; and
- Installation of erosion controls in the base of drains used to divert runoff, to minimise erosion of sediment from the drain.

5.1.2. Resources

Ultimate responsibility for erosion and sediment control will rest with the construction personnel within the construction team, led by Construction Managers, who will be responsible for the installation and maintenance of erosion and sediment controls. This would include (although is not limited to):

- Hard standing and deployment of spray-on soil stabilisers as required;
- Installation, cleaning and maintenance of controls such as sediment fences, gravel socks, inlet filters, straw bales, sandbags etc;
- Installation of temporary drain and channel liners (e.g. geofabric, jute matting etc); and
- All dewatering activities.

Relevant personnel will receive training and ongoing toolbox talks on installation and maintenance of erosion and sediment controls.

5.1.3. Sediment basins

Due to the limited earthworks proposed as part of this Project, and limited space within the rail corridor, sediment basins are not anticipated to be required during the Construction stage.

At each of the station locations there is limited space available. Erosion and sediment impacts should be sufficiently mitigated by other measures as outlined in Section 5.1.4.

Should Sydney Metro's Principal Contractor propose to use sediment basins to manage soil and water throughout their works, this SWMP will be updated to include this.

5.1.4. Erosion and Sediment Control Plans

Erosion and Sediment Control Plans (ESCP) will be developed for the Project sites in accordance with the requirements of Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004) and Managing Urban Stormwater: Soils and Construction Volume 2A (DECC 2008) (the "Blue Book"). The ESCPs will typically contain the following key management measures, as applicable to the works:

Site entry and access requirements

- Establish stabilised access points with rumble grids or wheel washes to prevent mud tracking on roads;
- Clearly delineate access points;

- Use of street sweepers;
- Longer term and/or heavily used haul roads would generally be sealed. Sealed haul roads would be regularly cleaned;
- Unsealed haul roads would be regularly damped down with fixed or mobile sprinkler systems;
- Appropriate site speed limits would be imposed and signed on haul routes; and
- Exclusion zones would be designated on construction sites to limit disturbance.

Soil stripping and stockpiling

- Stockpile areas are to be established within approved low-hazard areas clear of watercourses, stormwater drainage lines/culverts and not within the dripline of any retained trees where feasible and reasonable;
- Diversion drains/bunds are to be installed on the high side of stockpiles if run-off from upslope lands could impact on the stockpile;
- As much as is feasible, mulched vegetation, topsoil and subsoil (if applicable) are to be stockpiled separately;
- Any contaminated material stockpiles (i.e. asbestos, contaminated soil) will be covered on-site and short-term material stockpiles (>5 days not in use) with potential to generate dust will be wetted down or covered to prevent fugitive dust emissions or run-off during wet weather. Long-term stockpiles (>30 days) will be stabilised and /or covered in accordance with “Blue Book” requirements;
- Topsoil and mulch stockpiles will be constructed to no more than 2m in height where possible;
- Stockpiles will be battered down to a maximum slope of 2:1 (H:V) where space permits; and
- Material transport from site to surrounding pavement surfaces would be minimised

Dust control

- Dust suppression will be carried out whenever necessary to minimise sediments becoming air borne due to wind erosion; and
- Wherever possible, water detained onsite will be re-used for dust control.

Stabilisation

- Undertake progressive stabilisation of ground surfaces as quickly as possible as they are completed rather than at the end of the works program;
- Progressively revegetate disturbed areas utilising appropriate species in those areas to be revegetated;
- Temporary ground covers such as hydraulic soil stabilisers or geotextile fabric will be used as much as possible to stabilise batters, stockpiles and large surface areas; and
- Scour protection and energy dissipation would be used around discharge points at local points to reduce erosion where necessary.

Sediment controls

- Locations of nearest existing drainage channels and stormwater inlets to the works will be displayed on the ESCP;
- Sediment controls will be installed around stormwater inlet pits where appropriate and where they will not cause or exacerbate flooding. Traffic management and safety will need to be considered if installing such devices on or near live traffic;
- Maximise the diversion of turbid construction runoff into sediment retention devices such as sediment sumps, sediment fences and other sediment traps;
- Mulch bunds will not be used in concentrated flow areas or if they have the potential to result in tannin leachate into waterways;
- All erosion and sediment controls will be inspected by the Environmental Manager (or delegate) at least weekly, before forecast rainfall exceeding 20 mm in 24 hours, after rainfall exceeding 20 mm in 24 hours and before a site closure of two days or more. Maintenance will be carried out as required prior to the next forecast rainfall event;
- Site supervisors will undertake daily erosion and sediment control checks and record any issues within site diaries. Site supervisors will ensure controls are maintained and in working order;
- Concrete washout will be confined to designated concrete washout locations or using a Concrete Waste Separation Unit (CWSU), which allows for recycling of concrete waste;
- Clean water diversions would be constructed and stabilised around work areas; and
- No stockpiles of materials or storage of fuels or chemicals would be located adjacent to the existing culverts.

Water storage

- Although sediment basins are not required for the site, some water may be stored for treatment before discharge or re-use. In particular, water within excavations that does not meet the criteria for discharge may be pumped into storage tanks or an impermeable bund for treatment, allowing works to recommence in parallel with water treatment.

ESCPs will provide guidance on the installation of control measures, as per the Blue Book.

As the works will mainly occur under rail possessions (i.e. short term works, over a limited area) Sydney Metro's Principal Contractor will develop a series of ESCPs for the works as they progress. This series of ESCPs will focus on the erosion and sediment risks for each work front as they are established and closed out.

The Sydney Metro's Principal Contractor will engage an ERSSED Specialist Consultant to review initial site controls and where activities are deemed high risk by the Environmental Manager, ESCPs will be developed. Sydney Metro's Principal Contractor will incorporate any feasible and reasonable recommendations made by the ERSSED Specialist.

All ESCPs prepared for the Project will require sign-off by the Environmental Manager (or delegate) prior to implementation. As a minimum, the work sites that would require ESCPs to be developed are included as hold points in Section 10.1.

Sydney Metro's Principal Contractor will comply with CoA E38, which states *"All reasonable practicable erosion and sediment controls must be installed and appropriately maintained to minimise water pollution. When implementing such controls, any relevant guidance in the Managing Urban Stormwater series must be considered."*

REMM SC1 states *"Erosion and sediment control measures would be implemented in accordance with Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and Managing Urban Stormwater: Soils and Construction Volume 2A (DECC, 2008). Measures would be designed as a minimum for the 80th percentile, five day rainfall event."* Sydney Metro's Principal Contractor will comply with this REMM as it applies to the works, all measures will be installed in accordance with this documentation (e.g. sediment fence, rock check dams, batter protection etc.). It is noted that the "measures" to be designed in accordance with the 80th percentile, five day rainfall event are the different types of sediment basins described under the Managing Urban Stormwater guidelines. As stated in Section 5.1.3, it is unlikely that sediment basins would be implemented during the construction of the Project. As such, the part of REMM SC1 that states *"Measures would be designed as a minimum for the 80th percentile, five day rainfall event"* is not relevant to the Project works. Should Sydney Metro's Principal Contractor propose to use sediment basins to manage soil and water throughout their works, this SWMP will be updated to include this.

In accordance with REMM FHW8, erosion and sediment mitigation measures would be installed and maintained for the duration of the Construction period.

5.2. Surface water management

The Project site forms part of the greater Cooks River catchment. Specific Water Quality Objectives have been derived for the catchment in line with the NSW Water Quality Objectives. Catchment mapping classifies the Project site as a waterway that is *"affected by urban development"*. The water quality objectives for the catchment include the protection of:

- Aquatic ecosystems - Maintaining or improving the ecological condition of waterbodies and their riparian zones over the long term
- Visual amenity – Aesthetic qualities of waters
- Secondary contact recreation - Maintaining or improving water quality for activities such as boating and wading, where there is a low probability of water being swallowed.

5.2.1. Reuse

Where practicable, any water collected in excavations / work sites will be reused within, the Premises (e.g. dust suppression, watering retained vegetation). The Sydney Metro - Water Discharge or Reuse Procedure regulates both onsite reuse and offsite point source discharge. Prior to any discharge off the premises, or reuse within the premises, the Principal Contractor's Environment Manager or Coordinator (or delegate authorised by the Environment Manager/Coordinator) is to sign off that the water is suitable for reuse or discharge. Refer to Section 10.1 for hold points.

5.2.1.1. Onsite reuse

For onsite reuse, the following criteria will be utilised:

- pH – 6.5 to 8.5;

- No visible oil and grease;
- No potential for water to leave the premise;
- No surface runoff will be generated from the reuse (reuse includes dust suppression, watering retained vegetation etc.); and
- No potential for water to reach any watercourse.

5.2.2. Offsite discharge

No water will be discharged off site until it has been tested and a permit to discharge is approved by the Environmental Manager (or delegate). Refer to Section 10.1 for hold points. All water discharges will be documented using Sydney Metro's Water Discharge or Reuse Approval Form or site-specific equivalent.

Water quality testing will be undertaken prior to discharge offsite in accordance with the Sydney Metro – Water Discharge or Reuse Procedure for the following parameters and monitored on a daily basis. Refer to Table 10 for testing criteria for offsite discharge as published in the Sydney Metro – Water Discharge or Reuse Procedure.

Table 10: Criteria for offsite discharge

Parameter	Criterion	Method	Time prior to discharge
Oil and grease	None visible	Visual inspection	< 1 hour
pH	6.5 – 8.5	Probe/Meter	< 1 hour
Total Suspended Solids (TSS)	<50 mg/L	Meter/grab sample	< 1 hour/ <24 hours

In accordance with REMM FHW10, discharges from construction water treatment devices would be monitored to ensure compliance with the discharge criteria, as stated above.

The Water Quality Monitoring Program, as included within Section 6, will be implemented to monitor impacts on surface resources during construction.

Should offsite discharge be required, Sydney Metro's Principal Contractor will be responsible for identifying and proposing suitable discharge points. This Sub-plan will be revised to include any discharge points to be utilised by Sydney Metro's Principal Contractor. Sydney Metro's Principal Contractor will consult with the relevant Council prior to discharge in Council stormwater assets where the capacity of the stormwater system may be reduced during wet weather. It is noted that volume of stormwater captured and discharged offsite is expected to be negligible and that under most circumstances the capacity of the system would be sufficient.

Should Sydney Metro's Principal Contractor obtain an EPL which contains additional discharge criteria, this SWMP will be revised to include this.

5.3. Potable water

In-line with the CEMF the following water resource management objectives will apply to the construction of the Project:

- Minimise use of potable water; and

- Maximise opportunities for the reuse of rainwater, stormwater, wastewater and groundwater.

Sydney Metro's Principal Contractor will undertake a Water Balance Study to meet these objectives. The Water Balance Study will be completed prior to the commencement of construction and will estimate the quantities, types and potential sources of water that will be required for the Project. The study will identify the best opportunities to use non-potable water (where available) instead of potable water and minimise the quantities of both potable and non-potable water which will be consumed.

The water balance study will consider the following:

- Site facilities;
- Dust control for construction activities;
- Subgrade treatments;
- Trenching activities;
- Piling activities;
- Landscape establishment; and
- Water demand ongoing for operation and maintenance.

Measures to minimise water consumption are identified in the Sustainability Management Plan. Examples of initiatives that will be investigated and implemented where practicable include:

- Installing water efficient controls, fixtures and fittings in temporary facilities;
- Harvesting and reusing rainwater from roofs of temporary facilities and operation facilities;
- Using non-potable water sources for dust suppression during construction;
- Using water efficient construction methods and equipment;
- Specifying within supply chain contracts that offsite batching plant concrete production operation water is recycled, suitably treated and incorporated into concrete production that is supplied the Project;
- Maximise the use of stormwater in the urban design; and
- Include a drought tolerant planting schedule in the urban design.

5.4. Flooding management

As outlined in Section 3.6, the construction of the Project should have a negligible impact on flooding within the catchment, with minimal loss of flood storage and minimal changes or restrictions to existing flood regimes. However, in accordance with CoA E9, where the works will worsen flooding impacts, the Principal Contractor will be responsible for implementing measures to address those impacts.

In accordance with CoA E8, the location of the Principal Contractor's construction compounds will not worsen the existing flooding characteristics of the area. Detailed construction planning would consider flood risks for all compounds and work sites. This would include identification

of measures to not worsen existing flooding characteristics. In accordance with REMM FHW5, not worsen is defined as:

- A maximum increase in flood levels of 50mm in a one per cent AEP event;
- A maximum increase in time of inundation of one hour in a one per cent AEP event;
- No increase in the potential for soil erosion and scouring from any increase in flow velocity in a one per cent AEP flood event.

When determining potential locations for proposed compounds and worksites, Sydney Metro's Principal Contractor will review and consider existing flood information from multiples sources, including *the Sydney Metro City & Southwest Sydenham to Bankstown EIS Technical Paper 8 – Hydrology, Flooding and Water Quality Assessment*, Council Flood Studies and Local Environmental Plan Flood Maps. Sydney Metro's Principal Contractor will undertake further assessment where compounds or worksite are proposed for areas of flooding, to ensure conditions are not worsened in accordance with REMM FHW5.

In addition, Sydney Metro's Principal Contractor will implement the following measures to mitigate impacts of flooding on the Project in accordance with REMM FHW6:

- The site layout and staging of construction activities would;
 - Avoid or minimise obstruction to overland flow paths and limit the extent of flow diversion required
 - Consider how works would affect the existing stormwater network such that alternatives are in place prior to any disconnection or diversion of stormwater infrastructure;
- Stockpiling and storage of materials to occur outside potential flood areas;
- Temporary facilities and hazardous material storage to be above flood levels;
- Maintain overland flow paths;
- Monitoring of rainfall will be undertaken in accordance with Water Quality Monitoring Program;
- Construction equipment (or excess material) would be removed from prone areas where significant events are predicted;
- Site sheds and chemical stores will be constructed above the 10 year ARI level;
- Site inspections will be completed to ensure ERSR controls are place prior to the event;
- Where applicable, temporary levees or bunds would be strategically placed to contain potential flooding impacts resulting from any temporary works on the floodplain and minimise the risk to surrounding properties which might otherwise be affected;
- Stockpiles will be located away from areas subject to concentrated overland flow; and
- In the event of an emergency the requirements set out in the Emergency Response Plan will be implemented.

5.5. Groundwater management

The Project's construction activities are anticipated to have negligible impacts to the groundwater table and local groundwater hydrology. Any potential impacts on groundwater will be considered and managed through each site's ESCP.

Some groundwater seepage into excavations may occur and will be managed as detailed in the Groundwater Procedure included in Appendix E of the CEMP. Groundwater seepage will be either treated to meet ANZG/ANZECC Guidelines criteria for the nearest water body and discharged (discharge criteria detailed in Section 5.2.2); or will be removed from site as liquid waste in accordance with NSW EPA's Waste Classification Guidelines.

5.6. Refuelling, chemicals and spill management

Sydney Metro's Principal Contractor will ensure hazardous chemicals and dangerous goods will be stored and used onsite in accordance with the following protocols:

- In accordance with CoA E41, dangerous goods, as defined by the *Australian Dangerous Goods Code*, will be stored and handled strictly in accordance with:
 - All relevant Australian Standards;
 - For liquids, a minimum bund volume requirement of 110% of the volume of the largest single stored volume within the bund; and
 - The Environment Protection Manual for Authorised Officers: Bunding and Spill Management technical bulletin (EPA, 1997).
- In accordance with REMM HRS4 all hazard chemicals and dangerous goods that may be required for construction and operation would be stored and managed in accordance with the Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005) and the Hazardous and Offensive Development Application Guidelines: Applying SEPP 33 (Department of Planning, 2011);
- Hazardous chemicals and dangerous goods will be stored onsite in lockable containers, in their original receptacles;
- Emergency spill kits would be kept on-site at all times. All staff would be made aware of the location of the spill kit and be trained in its use;
- All hazardous chemicals and dangerous goods will be clearly labelled and will have Safety Data Sheets (SDS) affixed or available nearby. The SDS will be used to determine compatibility of hazardous chemicals to be stored together, i.e. no flammables with corrosives, not all corrosives compatible with each other etc;
- A bund sized to 110% of the largest stored receptacle will be established around any storage area for hazardous chemicals and dangerous goods ;
- Storage and handling of flammable or combustible liquids will be in accordance with EES Group guidelines for Bunding and Spill Management, as well as AS 1940-1993 – The Storage and Handling of Flammable and Combustible Liquids;
- An up-to-date register of hazardous chemicals and dangerous goods will be kept onsite at all times;
- Hazardous chemicals and dangerous goods will only be used onsite as required, in accordance with the manufacturer/supplier instructions;

- Any substances with the potential to impact water quality will be assessed by the Environment Manager to determine what environmental safeguards or procedures are required for that substance to minimise the risk of environmental harm;
- The use of any hazardous chemicals and dangerous goods that could result in a spill will be undertaken away from drainage or stormwater lines and, wherever possible, within defined bunds;
- All spills or leakages will be immediately contained and absorbed. Routine inspections of all construction vehicles and equipment would be undertaken for evidence of fuel/oil leaks;
- Vehicles and machinery would be properly maintained to minimise the risk of fuel/oil leaks;
- In the event of a spill, the Spill Management Procedure to be prepared by Sydney Metro's Principal Contractor will be implemented. As set out in Section 3.10 of the CEMP, the management of environmental incidents where material harm to the environment is caused or threatened will be managed in accordance with Sydney Metro's Environmental Incident and Non-compliance Reporting Procedure; and
- Construction plant, vehicles and equipment would be refuelled off-site, or in designated re-fuelling areas located at a minimum distance of 50 metres from drainage lines or waterways, where possible.

5.7. Contamination

The following mitigation measures will be implemented by Sydney Metro's Principal Contractor to mitigate risks associated with contamination across the Project sites:

- Known contamination areas will be clearly demarcated on site and within Environmental Control Maps (ECMs) – these will be updated during course of the Project if areas of potential contamination are identified;
- Known and potential contamination would be assessed, managed and/or remediated in accordance with the Unexpected Contaminated Land Procedure and Asbestos Finds Procedure (refer to Appendix B) and the Waste and Spoil Management Procedure in Appendix E of the CEMP for appropriate waste classification and removal of material off-site and in accordance with its classification status to an EPA licenced facility or facility that can lawfully accept the waste;
- Appropriate environmental controls/measures will be included on ECMs and ESCPs and implemented to manage and prevent the spread of contamination. Typical examples of controls/measures would include (although is not limited to):
 - Segregating contaminated material to minimise cross contamination (where safe to do so);
 - Establishing suitable lining prior to stockpiling;
 - Signposting;
 - Covering material; and,
 - Implementing measures outlined within Section 5.11 of this plan for ASS/PASS.

- Identifying reporting requirements, including requirements under the *Contaminated Land Management Act 1997*, when contamination is encountered;
- Providing inductions and toolbox talks detailing the correct response when contaminated material is encountered.

Where contamination is encountered, workers will apply the appropriate Personal Protective Equipment (PPE). The appropriate PPE will depend on the contaminant type and the works to be undertaken. Appropriate PPE will be decided upon in consultation with an Occupational Hygienist.

5.8. Unexpected finds

In the event of unexpected finds of contamination or asbestos the Unexpected Contaminated Land Procedure and Asbestos Finds Procedure (refer Appendix B) will be implemented. In accordance with CoA E40, the Unexpected Contaminated Land Procedure and Asbestos Finds Procedure will be implemented throughout Construction.

In brief, the following would occur:

- Cease work in the area of concern immediately;
- Isolate the area with barrier tape or any other physical barrier to prevent workers from entering the potentially contaminated location;
- Report the area of concern to the Environmental Manager and WHS Manager immediately. Nearby work groups would be notified;
- Environmental Manager will engage a suitably qualified contamination consultant inspect the site and carry out an initial assessment of the nature and extent of the contamination;
- The Contamination Consultant will advise what management is required in accordance with this plan, any Planning Approval requirements and the contamination report prepared;
- Hazardous materials surveys would be undertaken during detailed design for utility adjustments as required.

5.9. Asbestos

Identified fragments of Asbestos Containing Material (ACM) on the surface and within stockpiles on site would be managed in accordance with the measures above, the Project's Health and Safety Management Plan, Asbestos Management Plan and task specific Asbestos Removal Control Plan. The unexpected contamination finds procedure would also be implemented as per Section 5.8.

Removal of ACM would be by a licenced asbestos removal contractor who would produce the following:

- Asbestos removal licences for workers performing the removal works;
- A task specific Safe Work Method Statement (SWMS);
- Evidence of notification to the relevant authority and asbestos removal permit;

- Where there is uncertainty as to whether the exposure standard may be exceeded, or if it is likely to be exceeded, then air monitoring must be performed by a competent person who is independent of the removalist;
- At the completion of the removal works a clearance certificate must be obtained from a competent person;
- A waste disposal certificate must be provided by the removalist following the completion of the works to prove that any asbestos containing material removed from the site has gone to a licenced landfill facility;
- Unless a specific exemption exists, asbestos waste must be tracked using the NSW EPA's WasteLocate. Evidence of this is to be provided by the asbestos removalist.

Safety considerations relating to contamination and asbestos are to be included within the Principal Contractor's Health & Safety Management Plan & Occupational Health Hygiene Welfare Management Plan. Task specific Asbestos Removal Control Plans will be developed for the works if asbestos is encountered.

Where asbestos is encountered, workers will apply the appropriate PPE. Appropriate PPE will be decided upon in consultation with an Occupational Hygienist.

5.10. Salinity

In accordance with the findings of the EIS, the potential for salinity issues on the Project sites are low (refer to Section 3.2.2 and Figure 2). Should salinity be identified during the Project works further investigation is to occur, and measures would be put in place to protect building materials, vegetation and landscaping. If saline soils are encountered, they would be managed in accordance with *Site Investigations for Urban Salinity* (DLWC, 2002) as per REMM SC3.

5.11. Acid sulfate soils

As stated in the EIS and site contamination reports, ASS and PASS have been identified along the Sydenham to Bankstown rail corridor (refer to Section 3.2.3 and Figure 2). In accordance with REMM SC2, prior to ground disturbance in high probability ASS areas, testing would be carried out to determine the presence of ASS. Ongoing testing will occur as per the field and laboratory testing requirements outlined below.

If ASS are encountered, they would be managed in accordance with the *Acid Sulfate Soil Manual* and *Waste Classification Guidelines – Part 4: Acid Sulfate Soils*.

General mitigation measures for working with ASS and/or PASS include:

- Spoil to be managed in accordance with the Waste and Spoil management procedure within Appendix E of the CEMP;
- Areas of ASS and PASS should be included on ECMs and any mapping included in the permit to disturb;
- Plan works to minimise disturbance to areas of ASS and PASS;
- Excavation of ASS or PASS will not occur until an appropriate storage/treatment area is established. This includes the establishment of erosion and sediment controls in the vicinity of the storage/treatment area;

- Field testing for suspected ASS or PASS at a rate of 1 sample per 200m³ of excavated material from low, medium or high risk areas or where previous testing has indicated the presence of PASS or ASS;
- Field testing will be undertaken with the use of Hydrogen Peroxide based on Appendix I of the Acid Sulfate Soils Assessment Guidelines (Ahern et al, 1998a). Soils that record a pH of below 4, following oxidation with H₂O₂, will be managed as ASS;
- 10% of samples will be sent for laboratory analysis using the chromium reducible suite (Scr) method to confirm the peroxide screening test results and to confirm the required liming rate;
- PASS will be kept wet to prevent oxidation;
- ASS or PASS stockpiles will be located at least 50m away from drainage lines, unless a risk assessment is undertaken to prove that risks associated with the stockpile storage area are minimal;
- ASS or PASS that will be treated is to be stockpiled separately in a bunded stockpile area. Treatment will occur in accordance with the soil ASS Treatment Plan as described within Appendix C;
- Treatment rates will be determined by laboratory analysis. Estimated treatment rates are included in Section 5.11.1;
- Testing will occur to validate any treatment of ASS or PASS;
- Any surface water captured within the ASS/PASS storage bund or treatment pad area, or excavation where ASS/PASS is present will be tested in accordance with the Sydney Metro Water Discharge and Re-use Procedure to mitigate impacts on water quality and aquatic environments; and
- Inductions and toolbox talks related to the management of ASS and PASS.

A register of ASS testing will be maintained by the Principal Contractor. A register of ASS/PASS stockpiles, including liming of these stockpiles, will also be maintained.

Complete records of all testing, treatment and monitoring will be kept by Sydney Metro's Principal Contractor including:

- The lime register;
- Results of pH and verification testing;
- Waste classification reports; and
- Verification testing reports (if required).

5.11.1. Treatment and liming

Sampling undertaken within the *City & Southwest, Sydney Metro Sub-portion 2 - Sydenham to Bankstown Targeted Contamination Assessment* indicated that the liming rate for ASS or PASS soils on site would be between 1 and 8.8 kg CaCO₃/tonne. Liming rates would be confirmed by a Waste Classification Report for any material encountered.

When treating ASS / PASS onsite the following shall apply:

- Any ASS/PASS material shall be treated when there is sufficient quantity – generally in 100m³ batches;
- A bunded impervious pad (treatment pad) shall be created for the treatment of extracted ASS. The area shall be selected to ensure no impact to other environmental aspects or elements;
- A compacted bund wall of no less than 500mm shall be constructed around the entire perimeter of the ASS treatment pad. The bund should be surface limed to neutralise any runoff from stockpiled materials. The location of the bund and treatment pad will be identified on the ECM and is to be a minimum of 50m away from any waterway;
- The base of the treatment pad shall have a minimum of 300mm of clay or plastic lining and be dressed with a layer of lime or crushed limestone of at least 200mm thickness. This is to be established prior to stockpiling and/or placement of ASS materials at this location. A sump shall be constructed at the lowest point on the inside of the bund to contain runoff from the treatment. The sump shall be limed if required to neutralise runoff from stockpiled materials. If the water is to be discharged from this it must comply with the requirements outlined in Section 5.2 of this Plan;
- The treatment pad shall be graded so that all surface water flows to the sump;
- The bund will be covered at the end of each day or in the event of any rainfall.

5.11.2. Waste classification and offsite disposal

Prior to removal from the treatment area, treated materials shall be validated at 1 random test per 200m³ or each batch of soil treated (whichever is less) to ensure effectiveness of treatment.

A batch of soil is defined as soil from one location that has a different liming rate to the rest of the soil on the treatment pad. Should the treated ASS remain above the guideline requirements, further treatment shall be conducted for the balance of lime required.

Once ASS is treated, tested and validated as per the guidelines, the material will no longer be considered ASS. As such, the material can be placed as non-structural fill (where appropriate).

Excavated surfaces will be treated with lime and tested to ensure ASS does not pose a risk to the installation of services.

It is currently the intention that treated materials be reused on site, as far as is practicable, as fill material above the groundwater table. However, should this not be possible, or volumes of excavated material be in excess of that which can be reused, the treated soil will be disposed of to an appropriately licensed landfill following a waste classification by an appropriately qualified environmental consultant.

The waste classification and disposal will be undertaken in accordance with relevant standards and requirements, including the NSW EPA (2014) Waste Classification Guidelines – Part 1: Classifying Wastes. It is noted that the treated soil cannot be classified as virgin excavated natural material (VENM) as per the NSW DECC (2014) requirements.

6. Water quality monitoring program

6.1. Overview

Sydney Metro's Principal Contractor will monitor the effectiveness of measures for managing soil and water impacts during the construction of the Project. This will be achieved through implementation of a Water Quality Monitoring Program as detailed in this section, and regular inspections of control measures and their effectiveness.

The methodology below forms the Water Quality Monitoring Program to be implemented, to comply with CoA C8 and REMM FHW4. This monitoring program has been prepared to satisfy CoA C8(b) and REMM FHW4, in consultation with IWC, CoCB, NRAR and NSW EPA. See Section 1.4 for summary of consultation undertaken.

No groundwater monitoring is proposed as part of this Project as Appendix C of the Staging Report states that Section 7.2 of the CEMF is not applicable to the Project due to limited impacts.

The monitoring program will be in place and implemented prior to any on or off site discharge and for the duration of the Project works.

In accordance with CoA C14, results of this monitoring program will be submitted to the Planning Secretary, relevant regulatory agencies including the NSW EPA and IWC and CoCB in the form of a Construction Monitoring Report. The Construction Monitoring Report will be submitted on a six-monthly basis from the commencement of construction.

This monitoring program addresses the Project's construction phase monitoring until the cessation of the Project and handover to Sydney Metro. It is noted that monitoring being undertaken by follow-on contractors or works packages will be detailed in their respective management plans, and is outside the scope of this Plan.

6.2. Monitoring purpose, objectives and scope

As outlined in Section 3.5 no watercourses will be directly impacted or modified by the Project's works. Treated construction water may be discharged into existing stormwater systems during the delivery of the Project.

Sydney Metro's Principal Contractor's focus in relation to water quality management during construction is on prevention of pollution – minimising the risk of polluted, sediment-laden or contaminated water leaving the premises, by implementing a comprehensive management and monitoring regime on site.

Surface water quality monitoring of the receiving environment to define suitable standards or benchmarks for water quality discharges from the Project's works is not proposed given:

- Waterways in proximity to the Project sites are highly modified due to the urbanised nature of the surrounding area;
- Waterways detailed in Section 3.5 are typically greater than 100m away from the worksites and connected via stormwater systems;
- The stormwater system collects and transfers water from large urbanised catchment areas, as such there is the potential for contaminants to enter the stormwater systems and waterways from many different sources.

- Water quality in urban areas in proximity to the Project is highly variable and changes according to prevailing weather patterns and day-to-day during rainfall.

As outlined in Section 6.3, pre-construction monitoring data, if available will be obtained from the previous Principal Contractor where monitoring may be required.

6.3. Available baseline data

Water quality is measured on an ongoing basis for the wider Cooks River catchment by the NSW OEH as part of the Beachwatch programme. The monitoring point is at Kyeemagh Baths at the mouth of the Cooks River in Port Botany. This monitoring point is considered to be too far away from the Project sites to provide data that is useful for background information.

Limited background water quality data is available for the Cooks River through monitoring undertaken by the Cooks River Alliance. However, the most recent data available is from 2013/2014 and monitoring was not undertaken in close proximity to the Project site.

The Southwest Metro Early Works (SMEW) project conducted water quality monitoring at the Cooks River, adjacent to the rail corridor for the purpose of establishing baseline water quality data from May 2019 to September 2020 at quarterly intervals and also during a number of rainfall events. These monitoring locations (on Broughton Street, Canterbury) are located approximately 150m from the nearest works at Canterbury Station. It is noted that the data captured as part of the monitoring indicates that the water quality within the Cooks River at the monitoring location exceeds several of the ANZECC criteria regularly, including; pH and turbidity. Due to fluctuating results, they offer little in terms of interpretation or predictable trends. Baseline water quality data from the Cooks River will be sourced from the SMEW contractor. No further baseline water quality monitoring is proposed by the Project.

6.4. Construction water quality monitoring

Chapter 21.4.1 of the EIS states that “*where discharge to surface watercourses are required, a monitoring program would be implemented as part of the construction environmental management plan to assess water quality prior to discharge*”. Further, as outlined in Section 3.5 no watercourses will be directly impacted or modified by the Project’s works. Treated construction water may be discharged into existing stormwater systems during the delivery of the Project.

As such, water quality will be monitored to ensure any discharge from the Project’s construction sites is in accordance with the Sydney Metro – Water Discharge or Reuse Procedure and to identify potential non-compliances before they occur.

Water quality monitoring will be undertaken for controlled discharges offsite to ensure compliance with the discharge criteria defined in Section 5.2.2. Monitoring and analysis of data will be carried out by a competent person. Evidence of competence will be retained.

In accordance with CoA C14, results of this monitoring program will be submitted to the Planning Secretary, relevant regulatory agencies such as the NSW EPA, IWC and CoCB in the form of a Construction Monitoring Report. The Construction Monitoring Report will be submitted on a six-monthly basis from the commencement of Construction.

It is the responsibility of the Principal Contractor’s Environmental Manager to ensure all monitoring is performed according to these requirements.

6.5. Monitoring parameters

Sydney Metro's Principal Contractor will monitor site water prior to any discharge from site as outlined in Section 5.2.2. This will ensure that any water that is discharged is compliant with the requirements and would not impact the water quality within the receiving catchment. The monitoring parameters outlined in the Sydney Metro – Water Discharge or Reuse Procedure have been adopted. Table 10 details the parameters to be tested when monitoring site water for discharge.

In addition, Sydney Metro's Principal Contractor will undertake environmental condition surveys on major drainage crossings and outlets within localised catchments where works are to occur. The surveys will include a photo of the drainage outlets during dry, and where possible, wet weather. Sydney Metro's Principal Contractor will record any particular noteworthy conditions related to water quality (e.g. turbid water observed and the source of the turbid water where visible, litter, discolouration, visible oils or sheens).

Environmental condition survey information will be collected and stored on the Principal Contractor's document management system.

6.6. Monitoring frequency and locations

As described in Section 6.4, water quality monitoring will be conducted for controlled discharges offsite to ensure that discharges from the Project sites are in accordance with the water quality criteria. The frequency of offsite discharges and associated monitoring will be dependent upon rainfall events and degree of surface water inflows into excavations.

The planned monitoring locations and monitoring schedule are set out in Table 11 below. Once a Principal Contractor is engaged, they will be responsible for nominating suitable discharge locations in consultation with Sydney Metro and the ER.

Table 11: Water quality monitoring schedule

Work site	Source of offsite discharges	Monitoring schedule
Marrickville Station	Open excavations	Prior to each dewatering
Canterbury Station	Open excavations	Prior to each dewatering
Lakemba Station	Open excavations	Prior to each dewatering

6.7. Meteorological monitoring

Meteorological data will be checked to assist with managing impacts and identify potential non-compliances.

Weather data including daily weather conditions and forecasts may be obtained from the Bureau of Meteorology website (<http://www.bom.gov.au/places/nsw>). In the absence of electronic meteorological information, the Site Supervisor, Site Engineers and Environmental Coordinator will monitor rainfall events on site.

The criteria for monitoring rain events and the associated response is provided in Table 12.

Table 12: Meteorological monitoring program

Event	Criteria	Response
Rain event	>20mm in 24 hours	<ul style="list-style-type: none"> Inspect any rumble grid and wheel-wash facilities Inspect adjacent roads for signs of mud tracking Inspect site sediment and erosion controls for effectiveness/maintenance Inspect outlets to determine any change in water quality

Visual inspections as outlined in Table 12 will include the following monitoring parameters:

- Water clarity and colour;
- Odour;
- Description of flow and quantity;
- Oil and grease determination;
- Details of any foreign objects within the water; and
- Visible runoff (into the water body).

Sydney Metro's Principal Contractor will maintain a record of inspections (including photographs) on their document management system.

Where water quality issues are visibly observed, Sydney Metro's Principal Contractor will investigate further to determine if the

6.8. Reporting

CoA C14 states that *"The results of the Construction Monitoring Programs must be submitted to the Secretary for information, and relevant regulatory agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program"*.

Relevant agencies are identified within CoA C8(b). As such, a Construction Monitoring Report will be submitted on a six monthly basis to the following agencies;

- DPIE;
- IWC; and
- CoCB.

The Independent Environmental Representative will review the Construction Monitoring Report prior to submission to the DPIE, IWC and CoCB. Sydney Metro's Principal Contractor will participate in further consultation with these agencies where any relevant water quality issues are identified by the monitoring.

6.9. Adaptive management

Where water quality issues are visibly observed, or if water quality monitoring results indicate that discharge criteria are not being achieved or are otherwise unsatisfactory, then appropriate additional mitigation measures will be investigated and implemented. Work methods and management practices will be assessed and revised or adapted when necessary. These measures may include:

- Additional, more frequent or extended water quality monitoring;
- Amending monitoring locations and parameters where necessary
- Inspection of work site to identify possible sources of excess sediment or other contaminants;
- Inspection of ERSSED and other environmental controls for condition, suitability, effectiveness and compliance with the applicable ESCP;
- Repair, replace or reinstate any deficient ERSSED controls;
- Implement additional or enhanced ERSSED controls where necessary, which may include;
 - Enhanced use of soil stabilisers to minimise erosion;
 - Stabilisation of exposed ground and drainage channels by means of geofabric, crushed rock or hydroseeding;
 - Water velocity control measures such as rock check dams or earth bunds;
 - Additional sediment-trapping devices, such as double-layer barriers at drainage points;
 - Stabilisation of vehicle and pedestrian routes with crushed rock, roadbase or spray seal;
- Review construction practices and amend where necessary, such as management of stockpiles, ceasing activities during rain events, access road maintenance;
- Investigation and advice from subject-matter experts such as a soil conservationist;
- Review and update ESCP to include any additional or enhanced control measures; and
- Additional training and/or awareness for the Principal Contractor's staff and sub-contractors.

Any minor changes made to the Water Quality Monitoring Program would be subject to ER review and approval in accordance with CoA C13. Changes other than those of a minor nature would require approval from the Planning Secretary.

7. Training

All personnel working on site will undergo site induction training relating to soil and water management issues. The training will cover the following issues such as:

- Legislative requirements (POEO Act, EPL etc.) including Section 120;
- Erosion and sedimentation control planning and hold points;
- Duty to notify of environmental harm (or the potential for it) including chain of reporting;
- Spill containment and management procedure;
- Storage and use of hazardous chemicals and dangerous goods;
- Water discharge and reuse procedure;
- Maintenance of environmental controls (e.g. erosion and sediment controls);
- Contamination and Unexpected Finds.

Detailed training will be provided to key personnel regarding erosion and sediment control. This training will include:

- Legislation as it applies to erosion and sediment control;
- Basics of soil management, handling and stockpiling;
- Appropriate use, installation and maintenance of various erosion and sediment control techniques;
- Effective site rehabilitation and stabilisation;
- Use of erosion control techniques such as geotextiles, organic fibre mats, mulches and soil polymer stabilisers;
- Preparing, reading and interpreting ESCPs;
- Typical controls around existing drains and maintenance of controls;
- Relevant sampling, testing and reporting requirements;
- Toolbox talks will also be used to further reinforce awareness of Soil and Water issues.

Further details regarding staff induction and training are outlined in Section 3.5 of the CEMP.

8. Monitoring, auditing and reporting

Sydney Metro's Principal Contractor will regularly review the Project activities to ensure compliance with this Plan. A regular inspection, program for soil and water will be conducted as follows:

- Details of daily inspections undertaken by the Site Supervisor will be logged in their respective site diaries;
- Routine weekly inspections are to be conducted to monitor erosion and sediment controls in active worksites. Weekly inspections will be documented;
- Pre/Post inclement weather events will be recorded within the Inclement Weather Inspection Form; and
- Inspect the operation of soil and water management works installed on the premises and undertake any works required to repair and/or maintain these controls:
 - at least weekly during normal construction hours;
 - prior to any major rainfall event forecasted (>20mm, in 24 hours);
 - daily following a major rainfall event in any 24 hour period (>20mm), if safe to do so; and
 - prior to any site closure of greater than 24 hours.

Typical records generated and maintained would include:

- Copies of current ESCPs for all active construction sites;
- Records of soil and water inspections undertaken;
- Observations and works undertaken to repair and/or maintain soil and water management works;
- Records of testing of any water prior to discharge;
- Records of the release of the hold point to discharge water from the construction site to the receiving environment;
- Records of water quality monitoring and results;
- Unexpected finds; and
- Records for contamination management – soil classification, spoil tracking, disposal dockets, remedial action plans, occupational hygienist clearances, and Site Auditor sign-offs.

As stated in Section 6.8, the results of the Water Quality Monitoring Program will be provided to DPIE, IWC and CoCB, in the form of a Construction Monitoring Report. The Construction Monitoring Report will be produced and submitted on a six monthly basis, within 6 weeks of the end of each monitoring period. The Construction Monitoring Report will include a summary of monitoring undertaken, an overview of the results, analysis of the results and raw data from monitoring.

Complaints and enquiries relating to soil and water management will be managed in accordance with the Sydney Metro Overarching Community Communication Strategy (OCCS) and Section 3.7 of the CEMP.

Incidents, non-conformances and non-compliances that relate to soil and water management will be managed in accordance with Section 3.10 of the CEMP.

9. Review and improvement

The SWMP will be reviewed on a six-monthly basis and earlier if required taking into account below:

- The status and progress of The Project's activities;
- Changes in the design, delivery and operations processes and conditions;
- The adaptive Water Quality Monitoring Program and results;
- Lessons learnt during delivery and operations;
- Changes in other related Project Plans;
- Requirements and matters not covered by the existing Project Plans;
- Changes to Project Plans as directed by Sydney Metro's Representative under the Deed;
- Where deemed appropriate in relation to items raised within inspections or audits;
- Lessons learnt from incident, events or near misses;
- Feedback from Compliance Tracking Reports; and
- Feedback on Construction Monitoring Program results.

10. SWMP administration

10.1. Hold points

Soil and water management pre-construction and construction hold points are included within Table 13.

Table 13: SWMP hold points

Item	Process Held	Acceptance Criteria	Approval Authority
CEMP and Sub-plans	Site activities (Prior to construction commencement)	Site specific CEMP and Sub-plans (including this SWMP) have been developed, reviewed, endorsed by the ER and approved by DPIE.	ER Endorsement DPIE Approval.
Reuse or Discharge of water	Dewatering activities (During construction)	Implementation of requirements within Section 5.2 of this plan, prior to any discharge off the premises or reuse within the premises.	Environmental Manager or Coordinator
Water Quality Monitoring Program Amendments (CoA C13)	Amendments to Water Quality Monitoring Program (during construction, as per CoA C13)	Amendments have been reviewed and approved for implementation	ER Endorsement and Approval
Specific Environmental Control Maps (ECMs)/ progressive ESCPS	Marrickville Station works Canterbury Station works Lakemba Station works	ECMs/PESCPs are developed with site specific environmental controls/mitigation measures with site supervisor/engineers for work activities and are to be implemented prior to works commencing (or a new work stage as appropriate)	Environmental Manager or Coordinator

10.2. Records

Records associated with this management plan and monitoring programme will be maintained in accordance with Section 3.16 of the CEMP.

Appendix A – Other Conditions of Approval, Revised Environmental Mitigation Measures and CEMF Requirements Relevant to this Plan

Other relevant CoA relevant to the development of this Plan

CoA No.	Condition Requirement	Document Reference
E8	The location of Construction compounds must not worsen the existing flooding characteristics of the area.	Section 5.4
E9	Where the CSSI will worsen flooding impacts, the Proponent is responsible for implementing measures to address those impacts.	Section 3.6 Section 5.4
E38	All reasonably practicable erosion and sediment controls must be installed and appropriately maintained to minimise water pollution. When implementing such controls, any relevant guidance in the Managing Urban Stormwater series must be considered.	Section 5.1.4
E39	An Unexpected Contaminated Land Procedure and Asbestos Finds Procedure must be prepared and must be followed should unexpected contaminated land or asbestos be excavated or otherwise discovered during Construction.	Section 5.8 Appendix B
E40	The Unexpected Contaminated Land Procedure and Asbestos Finds Procedure must be implemented throughout Construction.	Section 5.8 Appendix B
E41	Dangerous goods, as defined by the Australian Dangerous Goods Code, must be stored and handled strictly in accordance with: (a) All relevant Australian Standards; (b) For liquids, a minimum bund volume requirement of 110% of the volume of the largest single stored volume within the bund; and (c) The Environment Protection Manual for Authorised Officers: Bunding and Spill Management technical bulletin (EPA, 1997). In the event of an inconsistency between the requirements listed from (a) to (c) above, the most stringent requirement shall prevail to the extent of the inconsistency.	Section 5.6

REMM relevant to the development of this Plan

REMM No.	REMM Requirement	Timing	Document Reference
	Soils and contamination		

REMM No.	REMM Requirement	Timing	Document Reference
SC1	Erosion and sediment control measures would be implemented in accordance with Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and Managing Urban Stormwater: Soils and Construction Volume 2A (DECC, 2008). Measures would be designed as a minimum for the 80th percentile, five day rainfall event.	Design/pre-construction	Section 5.1.4
SC2	Prior to ground disturbance in high probability acid sulfate areas, testing would be carried out to determine the presence of acid sulfate soils. If acid sulfate soils are encountered, they would be managed in accordance with the Acid Sulfate Soil Manual (Acid Sulfate Soil Management Advisory Committee, 1998) and the Waste Classification Guidelines - Part 4: Acid Sulfate Soils (EPA, 2014).	Design/pre-construction	Section 5.11
SC3	Prior to ground disturbance in areas of potential soil salinity, testing would be carried out to confirm the presence of saline soils. If saline soils are encountered, they would be managed in accordance with Site Investigations for Urban Salinity (DLWC, 2002).	Design/pre-construction	Section 5.10
SC4	WorkCover dangerous goods searches would be carried out for properties that have potential contamination near Belmore Station, to provide additional site characterisation and identify the risk of contamination in these areas	Design/pre-construction	SC4 relates to Belmore Station upgrade. As outlined in the Staging Report, this is outside the scope of this Project and is not relevant.
SC5	Prior to ground disturbance, a detailed contamination assessment would be undertaken in areas with a medium to high risk of contamination, to confirm the nature and extent of contamination, specific requirements for further investigation and remediation, and/or management requirements of any contamination.	Design/pre-construction	Phase 2 contamination assessments outlined in Section 3.3 include groundwater and soil sampling and analysis at Marrickville where the Project's service building works are proposed. The Marrickville service building is the closest Project element to 361 Victoria Road, Marrickville, an area identified as having a medium to high risk of contamination.
SC6	Hazardous materials surveys would be undertaken during detailed design for all proposed demolition activities, and for utility adjustments as required.	Design/pre-construction	Section 3.3.1
SC7	In the event a Remediation Action Plan is required, it would be developed in accordance with Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land (Department of Urban Affairs and Planning and Environment Protection Authority, 1998) and a NSW Environment Protection Authority Accredited site auditor would be engaged to audit the works.	Design/pre-construction	Section 3.3

REMM No.	REMM Requirement	Timing	Document Reference
SC8	In the event that indicators of contamination are encountered during construction (such as odours or visually contaminated materials), work in the area would cease, and the finds would be managed in accordance with the unexpected contamination finds procedure.	Construction	Section 5.8 Appendix B
Hydrology, flooding and water quality			
FHW1	Where feasible and reasonable, detailed design would result in no net increase in stormwater runoff rates in all storm events, unless it can be demonstrated that increased runoff rates as a result of the project would not increase downstream flood risk.	Design/pre-construction	Section 3.6
FHW2	Detailed design of the project would, as required at Bankstown between Stacy Street and Marion Street, take into account the impact of overland flooding for the full range of flood events up to the Probable Maximum Flood level.	Design/pre-construction	FHW2 relates to Bankstown Station upgrade. As outlined in the Staging Report, this is outside the scope of this Project and is not relevant.
FHW3	The project would be designed in accordance with water quality design criteria based on the Water Sensitive Urban Design Guideline (Roads and Maritime, 2017) to ensure there is minimal potential for water quality impacts, including incorporating water sensitive urban design elements.	Design/pre-construction	REMM FHW3 relates to the Project's design and is not relevant to the content of this SWMP.
FHW5	Detailed construction planning would consider flood risk for all compounds and work sites. This would include identification of measures to not worsen existing flooding characteristics. Not worsen is defined as: <ul style="list-style-type: none"> a maximum increase in flood levels of 50 mm in a one per cent AEP event a maximum increase in time of inundation of one hour in a one per cent AEP event no increase in the potential for soil erosion and scouring from any increase in flow velocity in a one per cent AEP flood event. 	Construction	Section 5.45.3
FHW6	The site layout and staging of construction activities would: <ul style="list-style-type: none"> avoid or minimise obstruction of overland flow paths and limit the extent of flow diversion required consider how works would affect the existing stormwater network such that alternatives are in place prior to any disconnection or diversion of stormwater infrastructure. 	Construction	Section 5.4

REMM No.	REMM Requirement	Timing	Document Reference
FHW7	Works within or near watercourses (including the Cooks River) would be undertaken with consideration given to the NSW Office of Water's guidelines for controlled activities.	Construction	No works are proposed within or near watercourses for this Project. Section 3.5.1
FHW8	Erosion and sediment mitigation measures would be installed and maintained for the duration of the construction period.	Construction	Section 5.1
FHW9	The water quality monitoring program would continue during construction, to monitor water quality at identified discharge points.	Construction	Section 6 Section 6.4
FHW10	Discharges from construction water treatment devices would be monitored to ensure compliance with the discharge criteria in the environment protection licence.	Construction	Section 5.2.2
Hazards, risks and safety			
HRS4	All hazardous substances that may be required for construction and operation would be stored and managed in accordance with the Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005) and the Hazardous and Offensive Development Application Guidelines: Applying SEPP 33 (Department of Planning, 2011).	Construction and operation	Section 5.6

CEMF requirements relevant to the development of this Plan

CEMF Section	CEMF Requirement	Document Reference
15.1 (a)	The following soil and water management objectives will apply to construction: <ul style="list-style-type: none"> Minimise pollution of surface water through appropriate erosion and sediment control. Maintain existing water quality of surrounding surface watercourses. Source construction water from non-potable sources, where feasible and reasonable. 	Section 1.3 Table 1
15.2 (b)	Principal Contractors will develop and implement progressive erosion and sediment control plans (ESCPs) for all active worksites in accordance with Managing Urban Stormwater: Soils & Construction Volume 1 (Landcom, 2004) (known as the "Blue Book"). The ESCPs will be approved by the Contractor's Environmental Manager (or delegate) prior to any works commencing (including	Section 5.1.4

CEMF Section	CEMF Requirement	Document Reference
	vegetation clearing) on a particular site. Copies of the approved ESCP will be held by the relevant Contractor personnel including the Engineer and the Site Foreman.	
15.2 (c)	ESCPs will detail all required erosion and sediment control measures for the particular site at the particular point in time and be progressively updated to reflect the current site conditions. Any amendments to the ESCP will be approved by the Contractor's Environmental Manager (or delegate).	Section 5.1.4
15.2 (d)	Principal Contractors will develop and implement Stormwater and Flooding Management Plans for the relevant construction sites. These plans will identify the appropriate design standard for flood mitigation based on the duration of construction, proposed activities and flood risks. The plan will develop procedures to ensure that threats to human safety and damage to infrastructure are not exacerbated during the construction period.	Stormwater and Flooding Management Plans will be developed by the Principal Contractor prior to Construction where constructions sites are within the 100 year ARI +10% increase in rainfall flood zone.
15.2 (e)	Principal Contractors will undertake the following soil and water monitoring as a minimum: <ul style="list-style-type: none"> Weekly inspections of the erosion and sediment control measures. Issues identified would be rectified as soon as practicable. Additional inspections will be undertaken following significant rainfall events (greater than 20 mm in 24 hours). All water will be tested (and treated if required) prior to discharge from the site in order to determine compliance with the parameters of the EPL. No water will be discharged from the site without written approval of the Contractor's Environmental Manager (or delegate). This is to form a HOLD POINT. 	Section 1.3 Section 6 Section 10.1
15.2 (f)	The following compliance records will be kept by the Principal Contractors: <ul style="list-style-type: none"> Copies of current ESCPs for all active construction sites. Records of soil and water inspections undertaken. Records of testing of any water prior to discharge. Records of the release of the hold point to discharge water from the construction site to the receiving environment. 	Section 10.2
15.2 (g)	The following water resources management objectives will apply to the construction of the project: <ul style="list-style-type: none"> Minimise demand for, and use of potable water. Maximise opportunities for water re-use from captured stormwater, wastewater and groundwater. 	Refer to Sustainability Management Plan Section 5.3

CEMF Section	CEMF Requirement	Document Reference
	<ul style="list-style-type: none"> Examples of measures to minimise potable water consumption include: <ul style="list-style-type: none"> Water efficient controls, fixtures and fittings in temporary facilities. Collecting, treating and reusing water generated in tunnelling operations, concrete batching and casting facility processes. Using recycled water or treated water from onsite sources in the formulation of concrete. Harvesting and reusing rainwater from roofs of temporary facilities. Using water from recycled water networks. Collecting, treating and reusing groundwater and stormwater. Using water efficient construction methods and equipment. Providing designated sealed areas for equipment wash down. 	
15.3 (a)	<p>Examples of surface water and flooding mitigation measures include:</p> <ul style="list-style-type: none"> Clean water will be diverted around disturbed site areas, stockpiles and contaminated areas. Control measures will be installed downstream of works, stockpiles and other disturbed areas. Exposed surfaces will be minimised, and stabilised / revegetated as soon feasible and reasonable upon completion of construction. Dangerous good and hazardous materials storage will be within bunded areas with a capacity of 110 per cent of the maximum single stored volume. Spill kits will be provided at the batch plants, storage areas and main work sites. 	Section 5

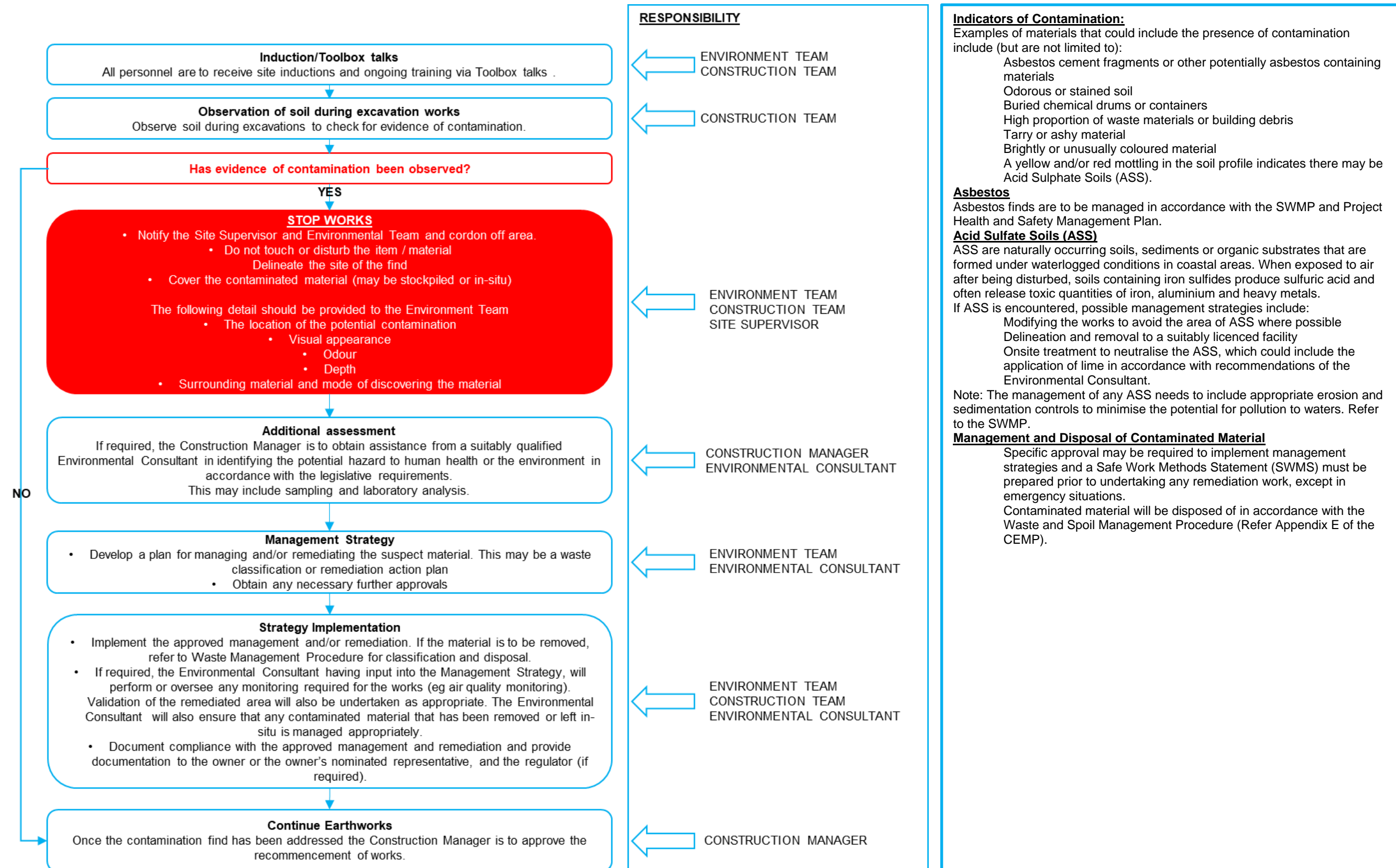
The table below presents the compliance matrix for the EPL 12208 Clauses relating to construction soil and water.

EPL Clause	Requirement / Measure	Document Reference
Pollution of waters		
L1.1	Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.	Section 2 Section 5
Erosion and sediment control		

EPL Clause	Requirement / Measure	Document Reference
O13.7	The licensee must, before and during maintenance activities, implement all feasible and reasonable erosion and sediment controls to minimise sediment leaving the Sydney Trains Network.	Section 5.1
O13.8	Erosion and sediment controls must be designed, constructed, operated and maintained in accordance with “Managing Urban Stormwater: Soil and Construction, Volume 1, 4 th Edition” (Landcom, 2004) to be read and used in conjunction with the relevant DECC Managing Urban Stormwater – Soils and Construction volume.	Section 5.1

Appendix B – Procedures

UNEXPECTED CONTAMINATED LAND AND ASBESTOS FINDS PROCEDURE



Appendix C – Acid Sulfate Soils Treatment Process

8.4.5 Soil treatment procedure

Acid sulfate soil material should be placed on the treatment pad (see Figure 8-1) or fill area in layers up to 300 mm thick. Thinner layers of soil can be more easily and thoroughly dried and mixed; 300 mm is suggested as a maximum, not only to prevent inadequate mixing but to prevent equipment from bogging and to allow compaction to improve strength, thus minimising subsidence and heave when filling. Once the ASS is dry enough to work, the appropriate amount of neutralising agent, calculated to include the safety factor, should be spread. The ASS may need reworking several times to achieve adequate mixing of the neutralising agent and/or drying of the soil.

The treated layer will require verification testing (see section 8.2 and ASS tips 13 and 14) to confirm whether enough neutralising agent has been incorporated into the soil. Treated and verified soil should be subsequently compacted before treatment of the next layer begins, or when moved to the permanent placement area if first mixed on temporary treatment pads. Compaction is not necessary if the treated soil is permitted to be disposed of or reused elsewhere.

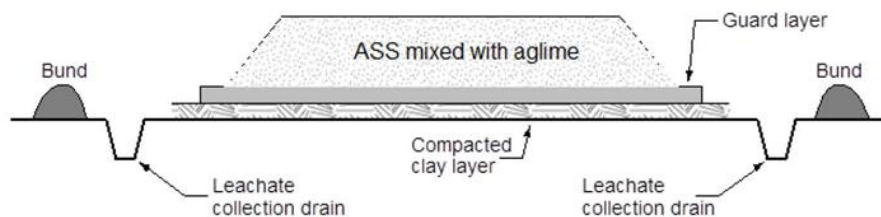


Figure 8-1: Schematic cross-section of a treatment pad, including a compacted clay layer, guard layer, leachate collection system and containment with bunding

Where soil mixing machinery (e.g. Figure 8-2) is used, soil treatment should still be carried out in a bunded and sealed area as per section 8.4.3. Treated batches should be spatially arranged in such a manner that re-treatment is easy in cases of verification test failure.

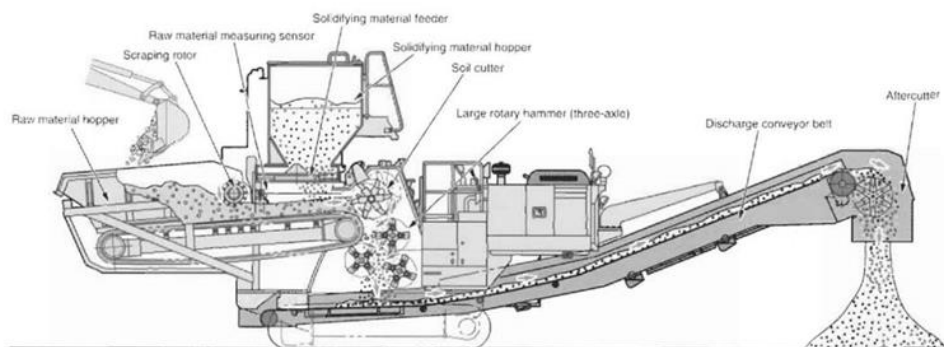


Figure 8-2: Cross-sectional view of soil mixing machinery (Komatsu, 2003). Note that soil treatment with such machinery should be carried out in an appropriately contained area, including bunding and measures to prevent leachate infiltration.

Source: Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines

Appendix D – Consultation Register

Agency	Comment	Project Response
CoCB	<p>Email received 6/11/20:</p> <p><i>“Council’s Team Leader Public Health and Environment, George Webb has reviewed the attached Soil and Water Management Plan (SWMP) and the Noise and Vibration Management Plan (NVMP).</i></p> <p><i>Both these documents are satisfactory and have addressed Council’s concerns raised from the previous draft versions and previous meetings with the Sydney Metro consultant. Council’s Environmental Health Team have no further comments to add.”</i></p>	Noted. No changes to this SWMP proposed.
IWC	<p>Email received 20/11/20:</p> <p><i>“Page 9: Need to review Water Balance Study</i></p> <p><i>Water quality testing – targets should use those from Botany Bay & Catchment Water Quality Improvement Plan</i></p> <p><i>Page 43: ‘water quality objectives for the catchment include..’: add use targets from Botany Bay & Catchment Water Quality Improvement Plan</i></p> <p><i>Page 44: Table 10: Criteria for offsite discharge – what about TP and TN? use targets from Botany Bay & Catchment Water Quality Improvement Plan”</i></p>	<p>Water Balance Study is to be prepared by the Principal Contractor, once engaged as per Section 5.3.</p> <p>The Botany Bay and Catchment Water Quality Improvement Plan sets a framework for water quality within the Cooks River (Botany Bay) and provides guidance on measures that may be implemented to achieve this. The Botany Bay and Catchment Water Quality Improvement Plan provides targets for new developments to achieve during the ‘operational phase’. These targets relate to a reduction of pollutants against a base case development (i.e with no measures implemented). These targets are not applicable to the Sydney Metro Sydenham to Bankstown Project, in accordance with the Planning Approval (SSI-8256), and as they are related to the ‘operational phase’ and design of developments rather than construction phase of this SSI and the scope of this Plan.</p> <p>Further, as outlined in Section 6, the proposed water quality monitoring of surface water is limited to monitoring discharge and carrying out environmental condition surveys as part of this SWMP due to the minimal potential for impacts</p>

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		upon receiving waters. The parameters and approach for monitoring is outlined in Section 6. The Project will implement the water discharge criteria that has been outlined within the Sydney Metro Water Discharge and Re-use Procedure, which has been utilised across many projects on Sydney Metro City and Southwest. Given the minimal potential for impacts upon receival waters, and the limited disturbance footprint of the Project, these discharge criteria are adequate.
	Page 35: Surface water quality	-
	Page 35: Flooding <ul style="list-style-type: none"> 'draft Overland Flow Study Canterbury LGA Cooks River Catchment (Cardno 2016)'. Is there a more current Flood Management Study? 	While there may be a more recent study, this is the study that was cited in the EIS and has been referenced here.
	Page 36: Flooding <ul style="list-style-type: none"> IWC prefers green infrastructure/WSUD rather than the Stormfilter cartridges proposed. 	Comment relates to the design of services buildings, outside the scope of this SWMP.
	Soil <ul style="list-style-type: none"> seedbank from remnant vegetation in soil at Dulwich Hill Station. Refer "Missing Jigsaw Pieces of the Cooks River Valley" (Ondinea, D., Benson, D. and Bear, V.) Dulwich Hill Station is in the Wildlife Corridor and Bandicoot Protection Area as per Marrickville LEP and DCP. Inner West population of Long-nosed Bandicoots is listed as threatened in the Biodiversity Conservation Act (2016). Refer Biodiversity section, Marrickville DCP. Bandicoot protection measures must be put in place. 	The Biodiversity Assessment Report within the project's EIS assessed the potential impacts to Long-nosed Bandicoots associated with the delivery of the Sydenham to Bankstown Station Upgrade Project. The outcomes of the biodiversity assessment was reflected in the project's CoA and REMM. Refer to the CEMP Appendix E Procedure 1: Biodiversity for the controls and mitigations to be applied to minimise biodiversity impacts during the Construction of the Project.
	Page 37: add potential impact of loss of seedbank in topsoil	Table 9 has been updated to add the potential impact of loss of seedbank in topsoil.

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	<p><i>Page 39: Erosion and sediment control - 5.1.1. General principles</i></p> <ul style="list-style-type: none"> <i>Add dot point: Minimise loss of topsoil and collect seed from soil before removing off site</i> <p><i>Page 41: Erosion and sediment control - 5.1.4. Erosion and Sediment Control Plans</i></p> <ul style="list-style-type: none"> <i>Soil stripping and stockpiling: Add dot point: Minimise loss of topsoil and collect seed from soil before removing off site</i> 	<p>Section 5.1.1 revised to include a dot point which states “Minimise the loss of topsoil where practicable”</p> <p>The Collection of seed from topsoil prior to removal from site is impracticable, especially given the Project occurs within the rail corridor which has been subject to over 100 years of development and operation and maintenance by Sydney Trains. There are also no areas of Endangered Ecological Communities or threatened species identified within the footprint of the Project that require preservation.</p> <p>The areas under development as part of this Project are within the existing rail corridor which has been subject to extensive disturbance over the >100 years of operation. The biodiversity assessment report prepared as part of the EIS did not identify any Endangered Ecological Communities, threatened species or plant community types within the proximity of these works. As such, collection of seed from soil prior to removal off site is impractical and is not anticipated to preserve any areas of significant biodiversity potential.</p>
Dol / NRAR	<p>Email received 8/12/20:</p> <p><i>“Thanks for your email. NRAR have no comments on the SWMP in regards to water licencing and approvals or controlled activities. If you believe a review by DPIE Water Surface Water or Groundwater team is required, e.g. groundwater monitoring plan, please let me know and I will forward to them for comment if you have not already done so.”</i></p> <p>Email received 12/01/21:</p>	<p>No changes to this SWMP proposed.</p> <p>As discussed with NRAR personnel via phone on 12/01/21, consultation with Water, Floodplains and Coast personnel from DPIE’s Environment, Energy and Science Group occurred as per below.</p>

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	<p><i>"It is NRARs understanding in 2021 Sydney Metro will start upgrades to stations between Marrickville and Bankstown, as part of the Sydney Metro City and Southwest - Sydenham to Bankstown Upgrade project. You are seeking input from NRAR as a condition of consent under SSI-8256 for the Construction Soil and Water Management Sub-plans for the three station upgrades listed below.</i></p> <p><i>NRAR have no comment on the sub-plans for the following proposed station upgrade projects:</i></p> <ol style="list-style-type: none"> <i>1. Marrickville, Canterbury and Lakemba Station upgrade project</i> <i>2. Dulwich Hill, Campsie and Punchbowl Station upgrade project</i> <i>3. Hurlstone Park, Belmore and Wiley Park Station upgrade project</i> <p><i>Kind regards,"</i></p>	
DPIE EESG	<p>Email received 20/11/20:</p> <p><i>"EES will not be providing comments on the sub-plan. Please note that this should not be considered as support for the plan."</i></p>	Noted. No changes to this SWMP proposed.
NSW EPA	<p>Email received 4/11/20:</p> <p><i>"Great to chat with you today. As discussed, the EPA's position on post approval management plans, including the CEMP, is to encourage the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and designated environmental objectives.</i></p> <p><i>However, we do not approve or endorse these documents as our role is to set environmental objectives for environmental management and not to be directly involved in the development of strategies to achieve those objectives. Therefore we will not be providing comments on the CEMP and associated sub-plans.</i></p> <p><i>The EPA may however request such documents are submitted with Environment Protection Licence applications or variations to ensure compliance with s45 of the POEO Act and to support those decisions."</i></p>	Noted. No changes to this SWMP proposed.