Appendix B4

SGWPW-JHSW-NWW-PM-PLN-000515

Soil and Water Management Sub Plan

Sydney Gateway Road Project – SSI-9737

June 2021

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Contents

Document control

Approval and authorisation

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1	Transport for New South Wales	
2	Independent Verifier	
3	Environmental Representative	
4	Project Director	
5	Environment and Sustainability Manager	
6	Quality Manager	

Glossary/ Abbreviations

Abbreviations	Expanded text
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ASS	Acid Sulfate Soil
CEMP	Construction Environmental Management Plan
CLMP	Contaminated Land Management Plan
CoA	Conditions of Approval
CSIRO	Council of Scientific and Industrial Research
CSSI	Critical State Significant Infrastructure
DPIE	NSW Department of Planning, Industry and Environment
ECM	Environmental Control Map
EEC	Endangered Ecological Community
EESG	Environment, Energy and Science Group (formerly OEH)
EIS	Environmental Impact Statement
EMM	Environmental Management Measures
EPA	NSW Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
EPL	Environmental Protection Licence
ER	Environmental Representative
ESCP	Erosion and Sediment Control Plan
EWMS	Environmental Work Method Statements

Abbreviations	Expanded text
GDE	Groundwater Dependent Ecosystems
HEPA	Heads of EPAs
JHSW JV	John Holland Seymour Whyte Joint Venture
MDP	Major Development Plan (Cth) under the *Airports Act 1996*
NEMP	National Environmental Management Plan
OEH	Office of Environment and Heritage- now EESG
PESCP	Progressive Erosion and Sediment Control Plan
PFAS	Per and Poly Fluoroalkyl Substances
PFOA	perfluorooctanoic acid substances
PFOS	perfluorooctane sulfonate substances
PIRMP	Pollution Incident Response Management Plan
POEO Act	*Protection of the Environment Operations Act 1997*
Project, the	Sydney Gateway Road Project
RAP	Remedial Action Plan
RMS	Roads and Maritime Services
RUSLE	Revised Universal Soil Loss Equation
SWMP	Soil and Water Management Sub Plan
SWTC	Scope of Works and Technical Criteria
SYD	Sydney Airport
TWP	Technical Working Paper from the EIS/MDP
TfNSW	Transport for NSW (formerly Roads and Maritime Services)
TSC Act	*Threatened Species Conservation Act 1995*
UMM	Updated Management Measure as outlined in the Project EIS/MDP documentation

1 Introduction

1.1 Context

This Soil and Water Management Sub Plan (SWMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for the Sydney Gateway Road Project (the Project).

This Plan has been prepared to address the requirements of the Minister's Conditions of Approval (CoA), the environmental management measures listed in the Sydney Gateway Road Project Environmental Impact Statement (EIS) and all applicable legislation.

Note – this Plan has been developed specifically for works occurring within NSW State owned land under approval SSI 9737, which is administered by the NSW Department of Planning, Industry and Environment (DPIE).

1.2 Environmental management systems overview

The environmental management system overview is described in Section 1.5 of the CEMP. Used together, the CEMP, issue specific environmental management plans, strategies, procedures and environmental work method statements (EWMS) form management guides that clearly identify required environmental management actions for reference by JHSWJV personnel and contractors.

1.3 Background

1.3.1 Background

Transport for NSW (TfNSW) have gained approval to deliver a high capacity road connection linking the Sydney motorway network at St Peters interchange with Sydney Airport's domestic and international terminals and the Port Botany Precinct. The Project is located on both State and Commonwealth land.

For areas on State land, the Project was declared to be critical State significant infrastructure (CSSI) under the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) and was approved by the NSW Minister for Planning and Public Spaces on 27 August 2020.

Commonwealth approval under the *Airports Act 1996* (the *Airports Act*) was granted by the Australian Minister for Infrastructure, Transport and Regional Development on 23 September 2020.

John Holland Seymour White Joint Venture (JHSWJV) have been contracted by Transport for New South Wales (TfNSW) for the Design and Construction of Sydney Gateway Stage 1 & Stage 3 (the Project).

1.3.2 Project Objectives

The objectives of the Project are to connect Sydney Airport Terminal 1 (the International Terminal) and Terminals 2/3 (the Domestic Terminals) with each other and with the Sydney motorway network via St Peters interchange. The Project aims to facilitate the movement of traffic towards Port Botany via General Holmes Drive, and will provide three main routes for traffic:

- Between the Sydney motorway network and Terminal 1, and towards the M5 motorway and the Princes Highway
- Between the Sydney motorway network and Terminals 2/3, and towards General Holmes Drive, Port Botany and Southern Cross Drive
- Between Terminal 1 and Terminals 2/3

The Project also aims to provide improved access to Sydney Airport land located on both sides of Alexandra Canal and across the Botany Rail Line.

1.3.3 Detailed Description

The Project is located about eight kilometres south of the Sydney Central Business District, in the suburbs of Tempe, St Peters and Mascot. It sits within the boundaries of the Inner West, City of Sydney and Bayside local government areas.

The key features of the Project are illustrated in Figure 1-1, which include:

- Road links to provide access between the Sydney motorway network and Sydney Airport's terminals, consisting of the following components:
    - St Peters interchange connection – a new elevated section of road extending from St Peters interchange to the Botany Rail Line, including an overpass over Canal Road
    - Terminal 1 connection – a new section of road connecting Terminal 1 with the St Peters interchange connection, including a bridge over Alexandra Canal and an overpass over the Botany Rail Line
    - Qantas Drive upgrade and extension – widening and upgrading Qantas Drive to connect Terminals 2/3 with the St Peters interchange connection, including a high-level bridge over Alexandra Canal
- Terminal links – two new sections of road connecting Terminal 1 and Terminals 2/3, including a bridge over Alexandra Canal
- Terminals 2/3 access – a new elevated viaduct and overpass connecting Terminals 2/3 with the upgraded Qantas Drive
- Road links to provide access to Sydney Airport land:
    - A new section of road and an overpass connecting Sydney Airport's northern lands on either side of the Botany Rail line (the northern lands access)
    - A new section of road, including a signalised intersection with the Terminal 1 connection and a bridge, connecting Sydney Airport's existing and proposed freight facilities on either side of Alexandra Canal (the freight terminal access)
- An active transport link, about 3 kilometres long and located along the western side of Alexandra Canal, to maintain connections between Sydney Airport, Mascot and the Sydney central business district
- Intersection upgrades and/or modifications
- Construction of operational ancillary infrastructure including maintenance bays, new and upgraded drainage infrastructure, signage and lighting, retaining walls, noise barriers, flood mitigation basin, emplacement mounds, utility works and landscaping

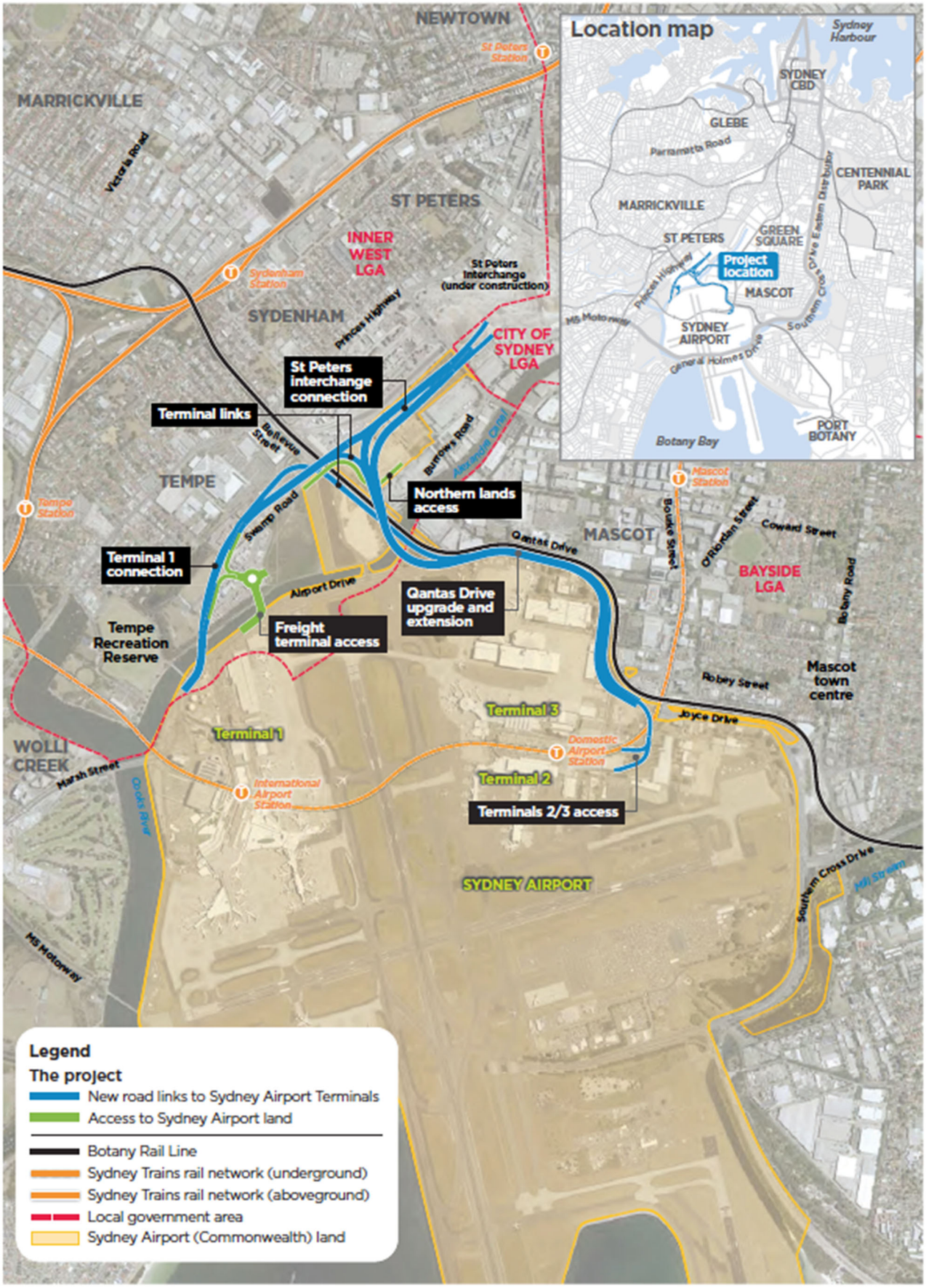


Figure 1-1 – Project overview

2 Purpose and objectives

2.1 Purpose

The purpose of this Plan is to describe how the John Holland Seymour Whyte JV (JHSW) proposes to minimise and manage potential soil and water quality during construction of the Project.

2.2 Scope

The scope of this Plan is limited to the management of soil and water quality and mitigation required for construction of the Project. The management of groundwater is detailed in the Groundwater Management Sub Plan. If Acid Sulphate Soils (ASS) are encountered these will be managed in accordance with the ASS Management Plan included in Appendix B of this Plan.

In addition any waste removal associated with the works (including liquid waste) will be managed in accordance with the Waste & Resources Management Sub Plan (WRMP).

This Plan does not include measures to manage the works within the former Tempe Landfill (including management of leachate, gas and odour). These works are managed through the Landfill Leachate, Gas and Odour Management Sub Plan (LLGOMP).

2.3 Objectives

The key objective of this Plan is to ensure all CoA, environmental management measures and licence/permit requirements, relevant to soil and water are described, scheduled and assigned responsibility as outlined in:

- The combined Environmental Impact Statement (EIS) / Major Development Plan (MDP) prepared for the Sydney Gateway Project.
- Conditions of Approval for SSI 9737 issued by the Minister for Planning and Public Spaces (NSW), on 27 August 2020.
- Updated Management Measures (UMM's) detailed in the Response to Submissions Report.
- TfNSW specifications G36, G38 and G40.
- Relevant legislation and other requirements described in Section 3.1 of this Plan.
- EPL requirements (TBC). *(Note- at the time of preparing this Sub Plan, an application for an EPL has been submitted by JHSW to the NSW EPA. Pending receipt of the EPL, any relevant requirements will be included within the Sub Plan if required.*

2.4 Targets and performance measures

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

- Ensure full compliance with the relevant legislative requirements, CoA and UMM's
- Meet EPL water quality discharge parameters for all planned pumped water discharges.
- Minimise the disturbance of Alexandra Canal aquatic sediments during pumped water discharges and installation of stormwater inlets in accordance with approved requirements (Note- the potential impacts and mitigation measures associated with aquatic sediments within the Alexandra Canal is documented in the Contaminated Aquatic Sediments in the Alexandra Canal Management Sub Plan)

- Ensure training on best practice soil and water management is provided to all construction personnel through site inductions.
- Effectively treat surface water removed as part of de-watering and discharge activities across the Project in accordance with established discharge and reuse criteria

The performance outcomes relevant to soil and water management (as identified in Chapter 27.4 Compilation of performance outcomes of the EIS/MDP) are detailed in Table 2-1.

Table 2-1 – Environmental performance targets and outcomes

No.	Performance Outcomes	Where addressed
1	The Project avoids long term impacts on surface water and groundwater hydrology.	Section 5 and 6 of this Plan detail the potential construction impacts and mitigation measures to manage the impacts. A monitoring program is included in Appendix C to validate.
2	Opportunities to reuse water resources during construction are considered during the design process.	This is covered in Section 6 of this Plan.
3	The use of water during construction is minimised.	This is covered in Section 6 of this Plan.
4	Impacts to water quality during construction and operation are minimised.	Section 5 and 6 of this Plan detail the potential construction impacts and mitigation measures to manage the impacts. A monitoring program is included in Appendix C to validate.
5	Erosion and sediment controls during construction are implemented in accordance with the Blue Book.	Compliance with this requirement is addressed throughout this Plan.
6	The Project protects or contributes to achieving the water quality objectives, during construction and operation by establishing discharge criteria that protect the environmental values of the receiving waters.	Implementation of measures in Section 6 will help achieve this requirement.
7	Site-specific soil characteristics are taken into consideration during detailed design and construction.	Section 4 provides details of the soil characteristics which are used to manage the works.
8	Soils excavated from potential acid sulfate areas are subject to the provisions of an acid sulfate soil management plan. Once acid sulfate soils have been treated, depending on the results of testing, they are either reused on site or disposed of at an appropriate facility.	An acid sulfate soils management plan has been developed and is included in this Plan (Appendix B)

No.	Performance Outcomes	Where addressed
9	Existing contamination is managed in accordance with relevant regulatory requirements.	Contamination will be managed in accordance with the Contaminated Land Management Plan and the Waste & Resources Management Sub Plan.
10	Any spoil for off-site disposal is assessed, classified, managed and disposed of in accordance with the Waste Classification Guidelines (NSW EPA, 2014a)	This requirement is addressed in the Waste & Resources Management Sub Plan.

3 Environmental requirements

3.1 Relevant legislation and guidelines

3.1.1 Legislation

The legislation relevant to this Plan is included in Table 3-1 below as well as in Appendix A1 of the CEMP.

Act	Requirement	Reference
Protection of the Environment Operations Act 1997	Do not risk harming the environment by wilfully or negligently: • disposing of waste unlawfully. • causing any substance to leak, spill or otherwise escape (whether or not from a container); or • emitting an ozone depleting substance	S115 S116 S117 S120
	Properly and efficiently maintain and operate any installed pollution control equipment (including monitoring devices).	S167 S120
	Notify the EPA immediately of pollution incidents where material harm to the environment is caused or threatened.	S148
Contaminated Land Management Act 1997	Notify the EPA if: • Contaminants exceed thresholds contained in guidelines or the regulations where contamination has entered or will foreseeably enter neighbouring land, the atmosphere, groundwater or surface water • Contaminants in soil are equal to or exceed guideline levels with respect to the current or approved use of the land. • Contamination meets other criteria that may be prescribed by the regulations.	S60

Table 3-1 Relevant legislation

3.1.2 Guidelines and standards

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

- Acid Sulfate Soil Manual (ASSMAC 1998).
- National Acid Sulfate Soils Guidance (DAWE 2018)
- Acid Sulfate Soil and Rock – Victorian EPA Publication 655.1 – July 2009.
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ 2000) (ANZG 2018).

- Department of Environment and Conservation (DEC): Bunding & Spill Management. Insert to the Environment Protection Manual for Authorised Officers - Technical section "Bu" November 1997.
- Managing Urban Stormwater: Soils and Construction. Landcom, (4th Edition) March 2004 (reprinted 2006) (the “Blue Book”). Volume 1 and Volume 2.
- Volume 2A Installation of Services (DECCW 2008).
- Volume 2B Waste Landfills (DECCW 2008).
- Volume 2C Unsealed Roads (DECCW 2008).
- Volume 2D Main Roads Construction (DECCW 2008).
- Fairfull, S. and Witheridge, G. (2003) Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings. NSW Fisheries.
- *NSW Fisheries, November 2003. Fishnote – Policy and Guidelines for Fish Friendly* Waterway Crossings (Ref: NSWF – 1181).
- Road and Maritime Dewatering Guideline (2011).
- TfNSW Specification G36 – Environmental Protection (Management System).
- TfNSW Specification G38 – Soil and Water Management
- Roads and Maritime Management of Wastes on Roads and Maritime Services Land (2014).
- Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (2004).
- RTA’s Code of Practice for Water Management – Road Development and Management (1999).
- Guidelines for the Management of Acid Sulphate materials: Acid Sulphate Soils, Acid Sulphate Rock and Monosulphidic Black Ooze (RTA 2005).
- Roads and Maritime Environment Direction Management of Tannins from Vegetation Mulch (2012).
- Roads and Maritime Stockpile Site Management Guideline (2011).
- Environmental Best Management Practice Guideline for Concreting Contractors, DEC (2004).

3.2 Minister's Conditions of Approval

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

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

CoA No.	Condition Requirements	How addressed
C5	The following **CEMP Sub-plans** must be prepared in consultation with the relevant agencies identified for each **CEMP Sub-plan.** Details of all information requested by an agency during consultation must be included in the relevant **CEMP Sub-plan,** including copies of all correspondence from those agencies. **Required CEMP Sub Plan** — **Relevant agencies to be consulted for each CEMP sub-plan** (c) Soil and Water — DPIE water, Sydney Water (if it proposed to discharge to or impact on its assets) and relevant councils	This Plan has been developed to comply with this requirement and consultation on this Plan is detailed in Section 3.5
C6	The **CEMP Sub-plans** must state how: (a) the environmental performance outcomes identified in the documents listed in **Condition A1** will be achieved; (b) the mitigation measures identified in the documents listed in **Condition A1** will be implemented; (c) the relevant terms of this approval will be complied with; and (d) issues requiring management during construction, as identified through ongoing environmental risk analysis, will be managed.	(a) The performance measures are included in Section 2.3 of this Plan. (b) The mitigation measures are detailed in Section 6 of this Plan (c) The approval conditions relevant to this Plan are included in Section 3. (d) issues requiring management are detailed in Sections 5 and 6 of this

CoA No.	Condition Requirements	How addressed
		Plan.
E43	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: Soils and Construction* series must be considered.	Details of erosion and sediment controls are detailed in Section 6, as well as the Strategy in Appendix A
E92	Groundwater generated from the dewatering of excavations and leachate from Tempe Landfill cannot be directly discharged to surface waters unless an EPL is in force in regard to the discharge which permits the discharge.	Management of leachate encountered in the former Tempe Landfill area will be managed in accordance with the Landfill Leachate, Odour and Gas Management Sub Plan (LLGOMP). A leachate treatment plant will be installed to treat leachate to the requirements outlined in the Sydney Water Trade Waste Agreement (TWA35548). Groundwater from excavations outside of the former landfill area will be sent to the WTP for treatment and discharge. Discharge from the water treatment plants (WTPs) will be in accordance with the requirements of the EPL (once received). No

CoA No.	Condition Requirements	How addressed
		discharge from WTPs will occur until the EPL is in place and discharge criteria agreed.
E93	Unless an EPL is in force in respect to the CSSI and that licence specifies alternative criteria, discharges from construction water treatment plants to surface waters must not exceed: (a) the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* 2018 (AWQG) default guideline values for toxicants at the 90 per cent species protection level; (b) for physical and chemical stressors, the guideline values set out in Tables 3,3.2 and 3.3,3 of the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC/ARMCANZ, 2000); and (c) (c) for bioaccumulative and persistent toxicants, the AQWG guidelines values at a minimum of 95 per cent species protection level. Where the AWQG (2018) does not provide a default guideline value for a particular pollutant, the approaches set out in the AWQG (2018) for deriving guideline values, using interim guideline values and/or using other lines of evidence such as international scientific literature or water quality guidelines from other countries, must be used.	Discharge from the water treatment plants (WTPs) will be in accordance with the requirements of the EPL (once received). No discharge from WTPs will occur until the EPL is in place and discharge criteria agreed.
E94	Drainage feature crossings (permanent and temporary watercourse crossings and stream diversions) and drainage swales and depressions must be carried out in accordance with relevant guidelines and designed by a suitably qualified and experienced person. Where these features are adjacent to or impact on Alexandra Canal, the works must be undertaken in consultation with the NSW Heritage Council and Sydney Water.	Design reports Non-Aboriginal Heritage Management Sub Plan
E95	Work on waterfront land must be carried out in accordance with controlled activity guidelines.	–This guideline is dealt with in the Contaminated Aquatic Sediments Management Sub Plan.

3.3 Updated Management Measures

Relevant Updated Management Measures (UMM) relevant to this plan are listed in table 3-2 below. This includes reference to required outcomes, the timing of when the commitment applies, relevant documents or sections of the environmental assessment influencing the outcome and implementation.

Table 3-3 - Updated management measures relevant to this SWMP

Ref #	Commitment	Timing/ Responsibility	How Addressed
UMM CS1	Additional soil and groundwater investigations will be undertaken to inform detailed design, construction planning, and preparation of remediation action plan(s) (RAP(s)). The investigations will include: • Further characterising the existing contamination status of the project site, including the potential for unidentified asbestos containing materials • Groundwater investigations for all assessment areas and any indirectly affected areas • Soil and groundwater testing to address data gaps for land north of the rail corridor and Sydney Airport land.	Design, Design Manager, Environment Manager	A Contamination Site Investigation Report will be undertaken to meet this requirement. Details of contamination management processes, including the development of RAPs, will be dealt with in the Contaminated Land Management Plan.
UMM CS2	Soil salinity will be considered in the design of subsurface structures.	Design, Design Manager	The durability and design of subsurface structures will deal with soil salinity and detailed in relevant drainage and bridge design reports.

Ref #	Commitment	Timing/ Responsibility	How Addressed
UMM CS5	A settlement and slope stability analysis will be undertaken to ensure that the emplacement mounds are designed to suitable engineering standards such that the long-term stability of the capping layer is maintained. The design and construction of the emplacement mounds will be described in the RAP(s) (measure CS3) and will be in accordance with Environmental Guidelines: Solid waste landfills (NSW EPA, 2016a). The design will be prepared in consultation with the NSW EPA accredited site auditor.	Design, Design Manager	Design Report A Remediation Action Plan will be developed for this location and signed off by the Site Auditor prior to commencement of bulk earthworks.
UMM CS9	A Construction Soil and Water Management Plan will be prepared as part of the CEMP and implemented during construction. The plan will detail processes, responsibilities and measures to manage potential soil and water quality impacts during construction, including potential impacts associated with the presence of existing contamination, stockpile management, saline soils and acid sulfate soils. The Construction Soil and Water Management Plan will be prepared in accordance with relevant guidelines and standards, including Managing Urban Stormwater – Soils and Construction, Volume 1 (Landcom, 2004) Volume 2B Waste landfills (DECC, 2008a) and Volume 2D (DECC, 2008b) (the Blue Book).	Pre-construction, Environment Manager	This Plan and it's Appendices
UMM CS10	An Acid Sulfate Soils Management Plan will be prepared as part of the Construction Soil and Water Management Plan in accordance with the Acid Sulfate Soils Assessment Guidelines (ASSMAC, 1998). The plan will define the process and measures to manage actual and potential acid sulfate soil and sediment disturbed during construction. The plan will include a summary of available acid sulfate soil information relevant to the project site and identify any further soil/water analysis required as a precursor to implementing the management plan. Acid sulfate soils will be disposed offsite (where required) in accordance with the Waste Classification Guidelines - Part 4: Acid sulfate soils (NSW EPA, 2014).	Pre-construction, Environment Manager	The acid sulfate soils management plan is included in Appendix B of this Plan.

Ref #	Commitment	Timing/ Responsibility	How Addressed
UMM CS17	Storage and containment systems for the stockpiling of contaminated material during construction will be designed to be impervious to the materials stored, resistant to fire (where required), covered to prevent contact with rainfall, and managed and maintained to prevent any release of liquids and contaminated run- off to stormwater drains, waters and land.	Pre-construction, Environment Manager	A Stockpile Management Procedure has been developed as detailed in Appendix F.
UMM CS18	The discovery of previously unidentified contaminated material will be managed in accordance with an unexpected contaminated finds procedure, as outlined in the Guideline for the Management of Contamination (Roads and Maritime, 2013b) and detailed in the CEMP. Awareness training will be provided for all on-site staff to assist in the identification of potentially contaminated material as per the unexpected contaminated finds procedure. In the event that unexpected indicators of contamination are encountered during construction (such as odours or visually contaminated materials), work in the area will cease, and the finds will be managed in accordance with the unexpected contaminated finds procedure.	Construction, Environment Manager	A procedure for unexpected contamination finds is included in Appendix G of this Plan.
UMM CS19	PFAS contaminated materials will be managed in accordance with the risk-based framework presented in the PFAS National Environmental Management Plan (HEPA, 2018). If soil and/or water containing PFAS is proposed for reuse, the proposed reuse must not result in an unacceptable or increased risk to human health and/or the environment. A health and environmental risk assessment and consultation with the NSW EPA (and the Airport Environment Officer where the works are on Sydney Airport land) will be required before any reuse of PFAS contaminated soil and/or water.	Construction, Environment Manager	A RAP will be developed prior to commencement of bulk excavation in areas of known contamination.

Ref #	Commitment	Timing/ Responsibility	How Addressed
UMM CS20	Validation of remediation will be undertaken during construction and a validation report prepared by a suitably qualified environmental consultant as defined in Schedule B9 of the NEPM to confirm the requirements of the RAP(s) have been met. For works on land subject to the EP&A Act, the validation report will be reviewed by an NSW EPA accredited site auditor.	Construction, Environment Manager	A Validation report will be completed following completion of excavation and provided to the Site Auditor for approval.
UMM CS21	A rehabilitation strategy will be prepared to guide the approach to rehabilitation of disturbed areas following the completion of construction.	Pre-construction, Environment Manager	The rehabilitation of work areas will be undertaken in accordance with the relevant Remediation Action Plan(s) and the Place, Design and Landscape Plan.
UMM GW4	A dewatering management strategy will be developed to confirm the approach to managing dewatering of excavations during construction. The strategy will: • Outline measures to minimise groundwater inflow • Describe likely groundwater quality based on sampling data • Estimate potential groundwater inflow rates and volumes for proposed excavations • Identify proposed methods for managing extracted water, which could include reuse, infiltration, reinjection, discharge to stormwater, disposal to the wastewater system, and collection for off-site disposal • Include a feasibility assessment of each proposed management option for extracted groundwater • Identify any groundwater treatment requirements and methods for	Pre-construction, Environment Manager	The dewatering strategy is included as part of the Groundwater Management Sub Plan.

Ref #	Commitment	Timing/ Responsibility	How Addressed
	any of the proposed management options • Describe any applicable monitoring requirements.		
UMM SW1	The potential for scour at bridge abutments will be considered for flow events up to and including the one per cent annual exceedance probability event. Scour protection will be included in the detailed design as required.	Design, Design Manager	The drainage design reports for the Project consider use of scour protection as part of the permanent works.
UMM SW2	Discharge outlets will be designed with appropriate energy dissipation and scour protection measures to minimise the potential for scour. Scour protection will be developed in consultation with relevant stakeholders, including Sydney Water.	Design, Design Manager	The drainage design reports for the Project consider use of scour protection as part of the permanent works.. Contaminated Aquatic Sediments in Alexandra Canal Management Sub Plan
UMM SW3	Appropriate treatment measures, including water sensitive urban design, will be considered in the detailed design with the aim of improving water quality within Alexandra Canal and/or achieving the targets outlined in the Botany Bay and Catchment Water Quality Improvement Plan (Sydney Metropolitan Catchment Management Authority, 2011).	Design, Design Manager, Environment Manager	Design Report, Water Quality Discharge Impact Assessments, Water Treatment Plant Specifications, EPL and Place, Design and Landscape Plan developed in accordance with CoA E76.

Ref #	Commitment	Timing/ Responsibility	How Addressed
UMM SW4	Surface water drains and associated infrastructure will be designed to prevent scour of soil, erosion and associated sedimentation impacts.	Design, Design Manager	The drainage design reports for the Project consider use of scour protection as part of the permanent works.
UMM SW5	All works within or adjacent to Alexandra Canal will be managed in accordance with the principles outlined in Guidelines for Controlled Activities on Waterfront Land – Riparian corridors (Department of Industry, 2018).	Construction, Environment Manager	This requirement is addressed in the Contaminated Aquatic Sediments in Alexandra Canal Management Sub Plan
UMM SW6	A water quality monitoring program will be developed and implemented as part of the Construction Soil and Water Management Plan to monitor potential surface water quality impacts. The program will define: • Monitoring parameters • Monitoring locations • Frequency and duration of monitoring. • The monitoring program will include ongoing baseline monitoring to determine the water quality of potential receiving waters prior to commencement of construction. • Water quality monitoring will continue for a minimum of 12 months following the completion of construction, or until affected watercourses are certified by a suitably qualified and experienced independent expert as returned to an acceptable condition (or as otherwise required by any project conditions of approval). • All surface water data related to Alexandra Canal will be provided to Sydney Water for the duration of the monitoring program.	Pre-construction, Environment Manager	A water quality monitoring program has been developed and is provided in Appendix C of this Plan. Reporting is detailed in Section 7.7 of this Plan.

Ref #	Commitment	Timing/ Responsibility	How Addressed
UMM SW7	The performance of treatment systems required to treat construction water before discharge will be verified in relation to the established discharge criteria.	Construction, Environment Manager	Details of the water treatment systems are provided in Section 6 of this Plan.
UMM SW8	The discharge criteria specified in Appendix E would be met for any extracted groundwater or surface water that has come into contact with excavated waste materials prior to discharge into Alexandra Canal and connected stormwater systems.	Construction, Environment Manager	Details of the water treatment systems are provided in Section 6 of this Plan. Monitoring of discharge water is detailed in the monitoring program contained in Appendix C.
UMM SW9	Options to reuse construction water, such as for dust suppression and irrigation of rehabilitated and landscaped areas, would be investigated and adopted where practicable to minimise the volumes requiring discharge or disposal.	Pre-construction, Environment Manager	The potential for reuse of construction water is covered in the erosion and sediment control strategy in Appendix A.
UMM SW11	The management of surface water runoff for works within the former Tempe landfill will adopt the following principles: • Isolate exposed waste from surface water runoff from other areas • Minimise contact between rainfall and surface water runoff and exposed waste • Capture and store (temporarily) surface water runoff from areas of exposed waste (leachate) • Size leachate storage(s) based on updated water balance modelling to reflect the proposed construction methodology and to minimise the risk of the capacity being exceeded.	Construction, Environment Manager	This is addressed in the Landfill Leachate, Gas and Odour Management Sub Plan .

Ref #	Commitment	Timing/ Responsibility	How Addressed
UMM HS1	A spill response procedure will be developed as part of the project's incident management protocols. The procedure and incident management protocols will detail processes, responsibilities and measures to manage hazardous substances and dangerous goods, including storage, handling and spill response, in accordance with legislative requirements.	Pre-construction, Environment Manager	A spill response procedure has been developed and is provided in Appendix D.
UMM WM5	The following measures would be implemented during works at the former Tempe landfill to avoid attracting wildlife: • Staging the excavation to minimise the amount of exposed waste at any one time • Minimising the size and area of exposed stockpiles • Ensuring material that has been disturbed, uncapped, or temporarily stockpiled is suitably covered at the end of each day.	Construction, Environment Manager	This is addressed in the Landfill Leachate, Gas and Odour Management Sub Plan .

3.4 Other Requirements Relevant to the Development of this Plan

Other requirements detailed in the relevant TfNSW Specifications (G36 and 38) are detailed in Appendix H.

3.5 Consultation

This Sub Plan has been provided to the following agencies for consultation in accordance with CoA C5(c):

- DPIE Water
- Sydney Water
- Councils (Inner West, Bayside and City of Sydney)

This Plan incorporates comments received from the consultation.

4 Existing Environment

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

4.1 Topography and soil characteristics

The Project site is located in a highly modified landscape that features industrial, commercial and transport related developments. The topography is generally flat at elevations less than 10 metres Australian height datum (AHD).

Areas of higher elevations are also present across the former Tempe Lands (approximately 12 to 15 m AHD). The Project site is relatively flat to the east of Alexandra Canal and rises towards the west of Alexandra Canal towards the Princes Highway.

The surrounding topography generally slopes gently upwards from zero metres AHD at Botany Bay in the south and Cooks River/Alexandra Canal to the west and north-west to elevations of 30 to 40 metres AHD to the northeast, east and south-east of the Project site.

A band of Ashfield Shale underlies a series of low crests running north-east to south-west, parallel to the western part of the Project site. Ashfield shale comprises black to dark grey shale and laminate. Minor occurrences of Hawkesbury Sandstone are also mapped to the west of the Cooks River. These geological units are overlain by Quaternary sediments, which infilled drowned river valleys that were incised into the bedrock. These sediments, referred to locally as the Botany Sands, are composed of predominantly unconsolidated to semi-unconsolidated permeable sands interspersed with lenses and layers of peat, peaty sands, silts and clays (low permeability).See Figure 4.1.

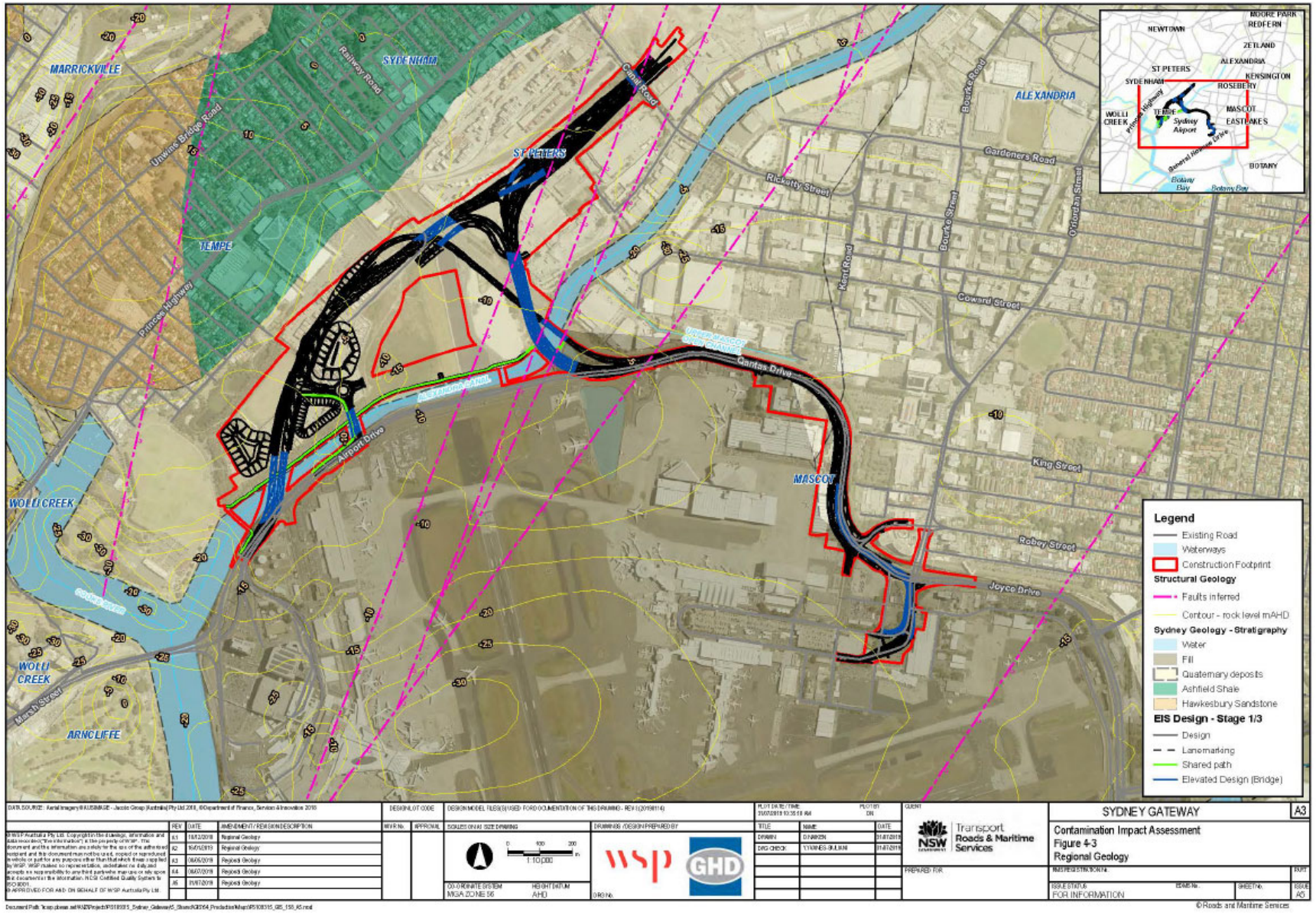


Figure 4.1 – Regional Geology

Reclamation and stabilisation of Sydney Airport land altered the original southern drainage channel networks of Alexandra Canal and Cooks River, which were diverted around the airport. Other influences on landform include drainage and reclamation of the original swamps, estuaries and wetlands that surrounded Botany Bay, landfill activities, and extensive cut/fill works.

Most of the Project site is mapped as 'disturbed terrain', which extends across Sydney Airport land, the lower reaches of the Cooks River, Alexandra Canal, Mascot, and into Tempe and St Peters.

Introduced fill, including dredged estuarine sand and mud, demolition rubble, industrial and household waste, is also found within the Project site, particularly to the west of the Alexandra Canal.

4.1.1 Soil Types

Soil landscapes within the Project site predominantly consist of disturbed terrain, with the exception of the north-western extent of the Project site, which is underlain by the residual Blacktown soil landscape and the aeolian Tuggerah soil landscape. The key characteristics of these soil landscapes are listed in Table 4.1.

Table 4-1– Soil Landscapes

Soil Landscape	Characteristics	Erosion/mass movement potential
Disturbed Terrain	Original soil materials have been removed, greatly disturbed or buried, and landfill, including soil, rock, building and waste materials, may have been added.	The erosion potential of this soil landscape depends on the nature of the disturbed soil or fill. Could result in mass movement hazard, soil impermeability and poor drainage. Potential source of sedimentation and groundwater contamination.
Blacktown (residual landscape)	Shallow to moderately deep (less than one metre deep) red and brown podzolic soils. Occurs on gently undulating rises on Wianamatta Group shales and Hawkesbury shale.	Soils are moderately reactive, highly plastic with poor drainage. No appreciable erosion occurs in this unit. The land surface above this soil landscape within the Project site is generally paved.
Tuggerah (Aeolian landscape)	Deep (greater than two metres) podzols on dunes and podzol/humus intergrades on swales. Occurs on gently rolling coastal dune fields.	Limitations include extreme wind erosion hazard, non-cohesive and highly permeable soil, very low soil fertility, localised flooding, and permanently high water tables.

4.1.2 Soil salinity

Most of the Project site is classified as having low salinity potential. The following areas (shown on Figure 4.2) are classified as having high salinity potential:

- An area in the Sydney Airport northern lands car park (assessment area 2), immediately north of Alexandra Canal
- An area north of the rail corridor (assessment area 3), to the west of the St Peters interchange.

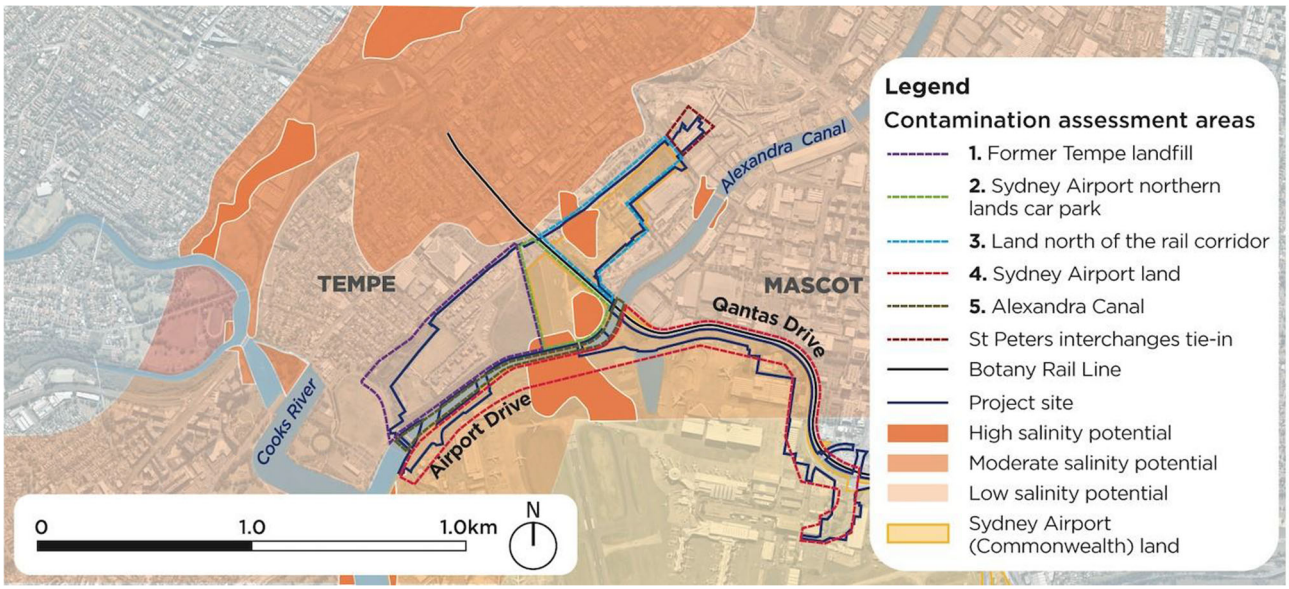


Figure 4.2 Salinity potential

4.1.3 Acid sulfate soils

The CSIRO Australian Soil Resource Information System indicates that there is a low probability of acid sulfate soils within most of the Project site, except for within Alexandra Canal and low lying areas surrounding the canal, which are mapped as potentially containing acid sulfate soils.

Table 4.2 lists acid sulfate risk classifications for land within and in the vicinity of the Project site.

The risk classifications are based on the NSW Government acid sulfate soil risk mapping. Acid sulfate soil risk mapping is shown on Figure 4.3.

Table 4-2- Acid sulfate soil classifications

Location	Acid sulfate soil class	Potential for exposure
Alexandra Canal	1	Any works below natural ground level. (Coffer dam installation, drainage inlet construction, scour protection installation, piling, ATP works, utility installation, Heritage salvage and investigation works)
Former Tempe landfill, Land north of the rail corridor, road networks around Sydney Airport.	2	Any works below natural ground level and where the water table is to be lowered, including: • Excavation for footings for reinforced soil walls, ~1.5 metres below ground surface (mBGS) • Piling for Canal Road bridges (eastern side), ~15 mBGS • Piling for piers and abutments for bridge over Qantas

		Drive (~15 mBGS) • Piling for piers and abutments for bridges over Botany Rail Line and Airport Drive (~15 mBGS) • Excavation for footings for retaining wall between bridge and the Tempe Landfill cut off wall and west of bridge (~2 mBGS) • Piling for piers and abutments for bridges over Alexandra Canal from former Tempe Landfill to Airport Drive (~15 mBGS) • Excavation for footings for retaining walls along Airport Drive and Qantas Drive (~2 mBGS) • Excavation for footing for retaining walls between Canal Road bridge (SB01) and bridges over Botany Rail Line and Alexandra Canal (~2 mBGS) • Piling for piers and abutments for bridges over Botany Rail Line and Alexandra Canal (~15 mBGS) • Excavation for footing for retaining walls between SB31 and Qantas Drive (~2 mBGS) • Piling for piers and abutments for bridge over Botany Rail Line and Alexandra Canal (~15 mBGS) • Services upgrade trenches (~1-3 mBGS)
St Peters interchange (north of Canal Road	3	Any works greater than 1.0m below natural ground level and where the water table is to be lowered by more than 1.0m, including: • Excavation for footings for reinforced soil walls between St Peters Interchange and Canal Road (eastern side,~1.5 mBGS) • Excavation for footings for reinforced soil walls under Canal Road bridges (eastern side, ~1.5 mBGS) • Piling for Canal Road bridges (eastern side, ~15 mBGS).
Joyce Drive, east of the intersection with O'Riordan Street	4	Any works greater than 2.0m below natural ground level and where the water table is to be lowered by more than 2.0m.

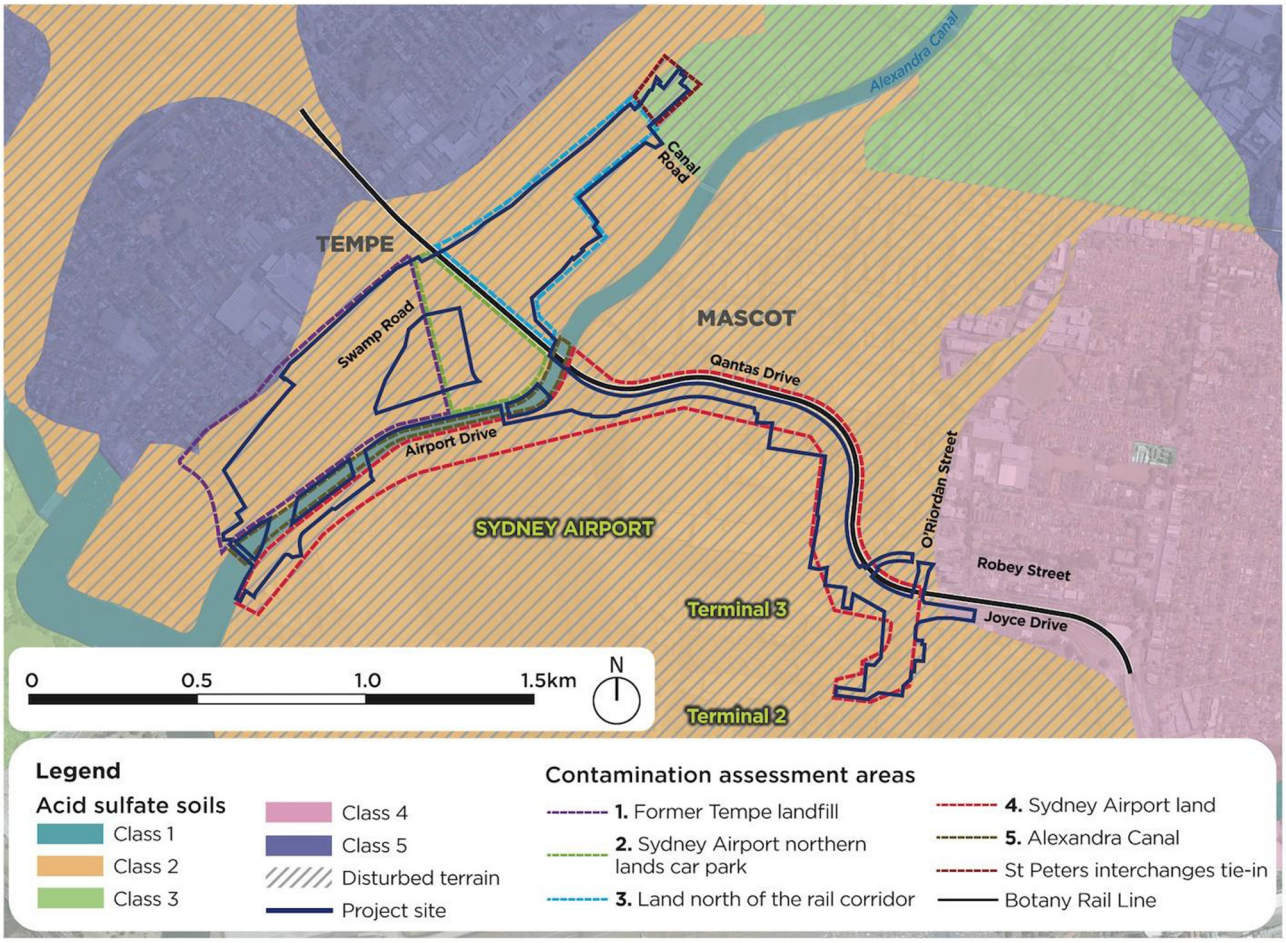


Figure 4.3 - Acid sulfate soil mapping

4.1.4 Contaminated land

Based on data contained in the EIS/MDP TWP 5 Contamination and soils, five contamination areas have been defined in the Project area. EIS/MDP TWP 5 contains detailed information on the Project's contamination history and management measures required. A summary is provided here.

The individual contamination assessment areas identified relevant for this assessment are described below:

- Former Tempe Landfill site – extending from Holbeach Avenue/Smith Street in the west and to the high intensity approach lighting (HIAL) strip of Sydney Airport in the east. The former landfill extends to Alexandra Canal in the south and towards South Street in the north. A NSW EPA approved voluntary remediation plan is in place at this site (State land).
    - Potential sources of contamination in this area are ACM, TRH, PAH, heavy metals in waste mass and biological breakdown of putrescible waste. Other sources in groundwater include PFAS, nutrients and heavy metals. Pathways including lateral mitigation of groundwater, landfill gas migration, dust inhalation and migration of leachate. The main receptors include Alexandra Canal, commercial and construction workers.
- Project Area 4 –/Robey and O'Riordan Street.
    - The main sources of contamination below the Project site are heavy metals and PAH in soil. The downgradient area is further contaminated with light non-aqueous phase liquids (LNAPL), PFAS and dissolved phase TRH. Pathways within the Project site include lateral mitigation of groundwater and dust inhalation. Additional pathways associated with the downgradient contamination include vapour migration

and accelerated migration along underground utilities. The main receptors include Cooks River, commercial and construction workers.

- Project Area 5 – Alexandra Canal – between the footbridge connecting Airport Drive to Tempe Recreation Reserve in the west and the Port Botany bridge crossing in the east. Alexandra Canal is a declared remediation site (number 21008) (State land).
    - The main sources of contamination in this area are ACM, PFAS compounds, high concentrations of metals, TPH, PAH, PCBs, Organotin compounds including tributyltin, monobutyltin and dibutyltin, pesticides and Acid sulphate soils. Pathways including lateral mitigation of groundwater and mobilisation of sediments during works in the canal and during discharge of water to the Canal. The main receptors include Alexandra Canal, Cooks River, commercial and construction workers.
- Rail Corridor – ARTC – extending from Alexandra Canal in the south and as far as the Ikea premises to the north (State land).
    - No previous contamination assessment reports were made available for this section of rail corridor but contamination is expected similar to sites on either side of the corridor. Pathways including lateral mitigation of groundwater and dust inhalation. The main receptors include Alexandra Canal, commercial and construction workers
- New M5 – Interchange tie-in - a portion of the Project site extends beyond Canal Road to the north-east, referred to as St Peters Interchange tie-in. (State land)
    - This site has been remediated under a separate approval however residual contamination may be present beneath the surface where disturbance is required. Pathways including lateral mitigation of groundwater and dust inhalation. The main receptors include Alexandra Canal, commercial and construction workers.

Project contamination areas described above are shown on Figure 4.4.

Further details are provided in the Contaminated Land Management Plan.

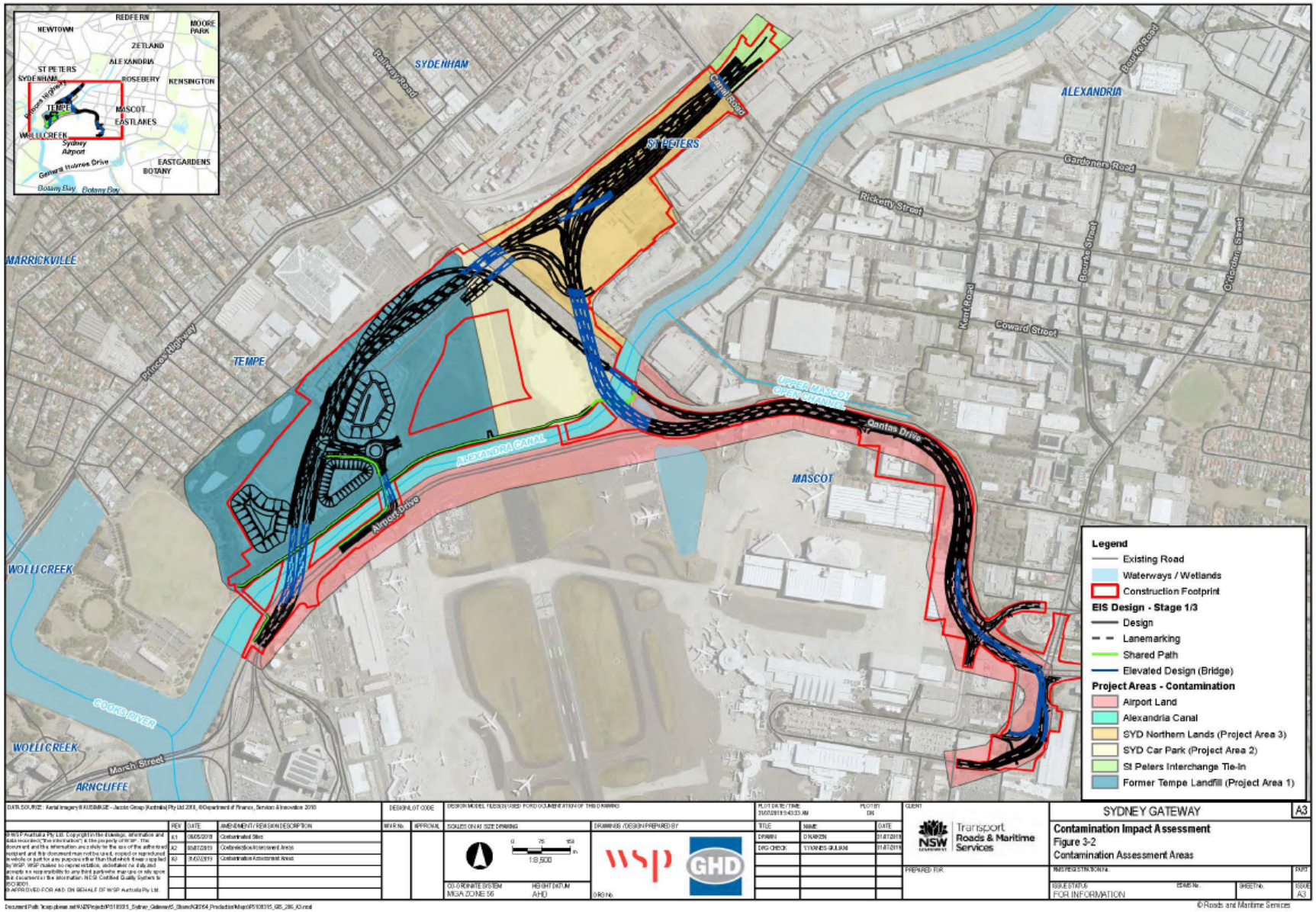


Figure 4.4 – Contamination Impact Areas

4.2 Surface water

The Project site is mainly located within the Cooks River catchment, which is a sub-catchment of the larger Botany Bay catchment which covers approximately 1,565 square kilometres. A small portion of the Project site, near the intersection of O'Riordan Street, Robey Street and Joyce Drive, drains to the lower estuarine reach of Mill Stream. Mill Stream drains to Botany Bay, which is part of the Georges River catchment.

Both the Cooks River and the Georges River catchments are highly urbanised, meaning the rainfall-runoff response of the catchments has been altered from a natural state. This has resulted in changes to the quantity and speed of runoff within the catchment.

The catchment boundaries and key watercourses within and near the Project site are shown on Figure 4.5.

A number of sensitive receiving environments including Cooks River, Mill Stream and Botany Bay occur in the vicinity of the Project. There are no registered surface water licences for water usage in the Georges River or Cooks River catchment (EIS/MDP TWP 8 2019,WaterNSW, 2019), which indicates that there is currently no water extraction for private or commercial water supply.

The current sensitivity of the surface water environment therefore relates to ecological and recreational values. Botany Bay, which is not considered to be a pristine environment, is used for a range of beneficial purposes such as recreation and fishing (despite the NSW Department of Primary Industries (DPI) prohibiting commercial fishing in Botany Bay and Cooks River under the Fisheries Management (General) Regulation 2010). Recreational fishing is prohibited in the area between the runways extending into Botany Bay, but is not prohibited in or around Mill Stream or in the broader Botany Bay area.

Cooks River and Botany Bay are both marked as key fish habitats under the Fisheries Management Act 1994. The Biodiversity Development Assessment Report (EIS/MDP Technical Working Paper 14) states that Tempe Wetland and Alexandra Canal do not provide habitat for any threatened fish species known from the locality.

The Botany Bay area provides summer habitat for a number of migratory wading birds that are listed under the EPBC Act.

The overall likelihood of threatened flora and fauna species that are known or predicted to occur within the locality actually being present in the Project area has been assessed as low, as has the likelihood of future threatened flora recruitment occurring.

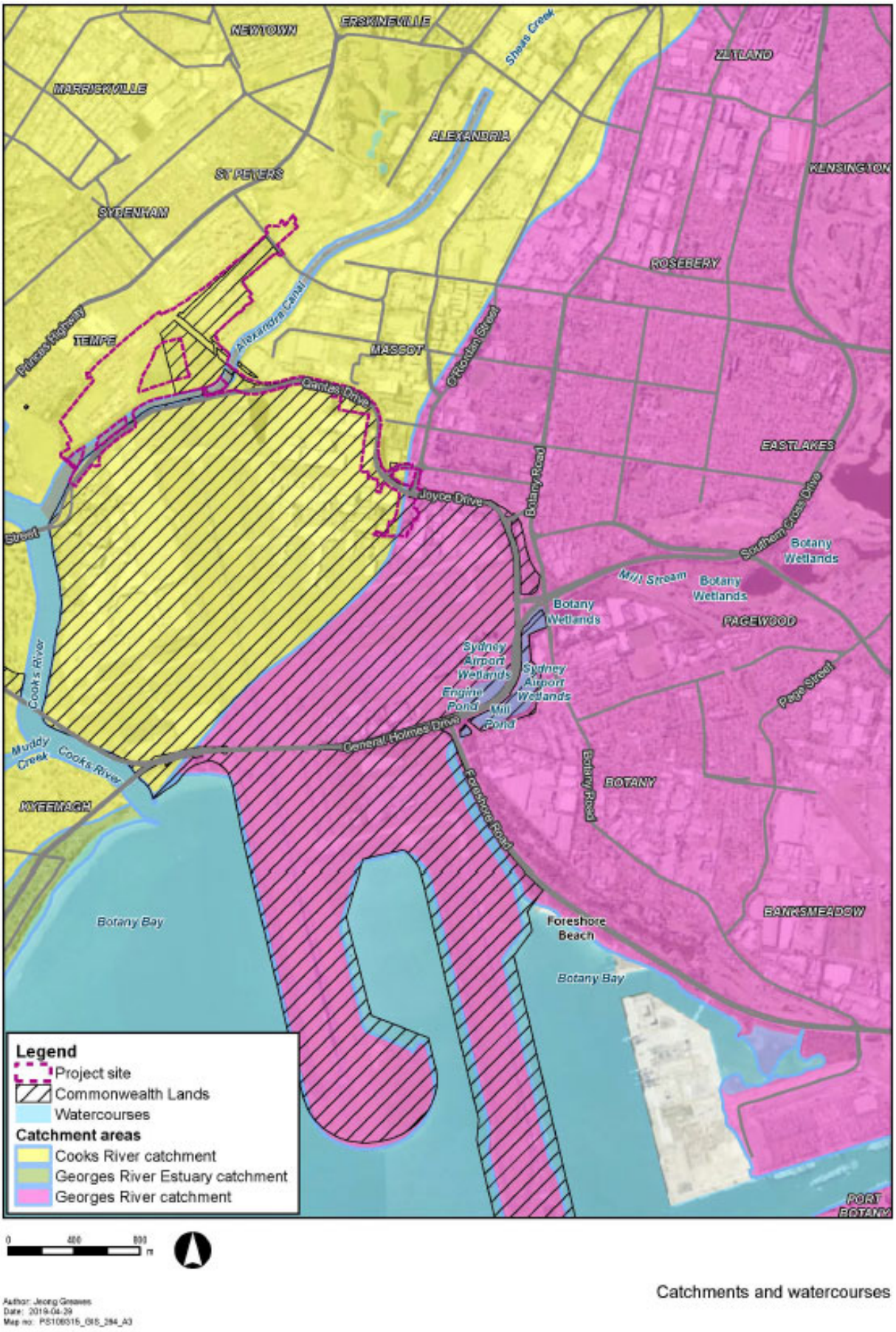


Figure 4.5 Catchments and watercourses.

4.2.1 Alexandra Canal sub-catchment

The Alexandra Canal catchment is a sub-catchment of the Cooks River catchment and has an area of about 23 square kilometres. It was artificially constructed through dredging and channelisation of the former Sheas Creek, a major tributary of the Cooks River.

Alexandra Canal is the main watercourse within the Project site, with most of the Project draining into the Canal. The canal is a four kilometre long constructed watercourse that discharges to the Cooks River to the south-west of the Project site near Tempe Recreation Reserve. Flow control in the canal is provided by water levels in the Cooks River and by its tidal-influence which extends to within the Project site. Due to these limits, the canal is generally considered to act as a sediment trap with flushing only occurring during large floods.

Within the Project site, its banks are artificial, engineered structures constructed of concrete or sandstone.

Alexandra Canal has historically been contaminated due to the surrounding industrial land uses, extensive land reclamation and industries discharging water directly to the canal. Currently contaminants entering via stormwater come from heavy industry, urban areas and road networks.

Older sediments are known to be highly contaminated, and have been overlain by more recent, less contaminated sediments. In 2004, the NSW EPA issued a remediation order (No 23004) under the CLM Act 1997. The order requires any works or activities that would disturb canal sediments to occur in accordance with a management plan approved by the NSW EPA.

The former Tempe landfill, is located in the Alexandra Canal sub-catchment. In 2001, the NSW EPA issued a remediation order (order 23003) to Marrickville Council under Section 23 of the CLM Act due to leachate migrating off site towards Alexandra Canal. Marrickville Council subsequently entered into a voluntary remediation proposal with the NSW EPA. The voluntary remediation proposal is still in place and requires that

'... the water quality of Alexandra Canal is not adversely impacted by leachate originating from the site.'

As a result of the remediation order, a barrier wall was constructed in 2004 along the southern, eastern and western boundaries of the former landfill to control leachate migrating into Alexandra Canal. Leachate levels within the landfill are maintained by a leachate collection system and treatment plant currently operated by Inner West Council where it is treated before discharged under a trade waste agreement into Sydney Water's wastewater system. The collection and treatment of leachate and gas drainage will become the responsibility of the Project during construction due to the major changes to the former landfill area that will result from construction of the Project.

4.2.2 Tempe Wetlands

Tempe Wetlands is a local artificially constructed wetland located adjacent to the Project site to the south-west of the Project area. The Tempe Lands area drains toward this wetland and then to the Cooks River further to the south-west. This area is not listed as a groundwater dependent ecosystem as it is an artificial tidal estuarine area.

4.2.3 Surface Water Baseline

Project-specific water quality monitoring was undertaken over a 26 month period between 21 December 2017 and 20 February 2020. Water samples, which were collected from 11 locations in Alexandra Canal, Mill Stream and Cooks River and were analysed to establish baseline water quality conditions in the study area. Figure 4.6 shows the locations of background sampling points.

Figure 4.6 – Surface Water sampling locations (source: EIS/MDP TWP 8 2019)

A review of this data indicated that both the Alexandra Canal and Mill Stream sub-catchments are in poor condition. The analysis indicates that:

- Samples obtained from the Cooks River and Alexandra Canal frequently exceeded ANZECC guidelines default trigger values for total nitrogen, total phosphorus, aluminium, iron, manganese, mercury, zinc and ammonia
- Samples obtained from Mill Stream frequently exceeded ANZECC guidelines default trigger values for total nitrogen, total phosphorus, aluminium, copper, iron, lead, manganese, mercury, zinc, total suspended solids, turbidity and ammonia, as well as the limits of acceptable contamination specified in Schedule 2 of the Airports (Environment Protection) Regulations 1997.

In relation to PFAS, the results indicate that:

- PFAS compounds, including perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), were detected in almost all samples obtained from the Cooks River, Alexandra Canal and Mill Stream
- Concentrations of PFAS were below the 95 per cent level of protection criteria for marine species from the PFAS National Environmental Management Plan (HEPA, 2018).

Additional information on baseline water quality is provided in the Surface Water Monitoring Program Appendix C.

4.3 Groundwater

The Project area is contained within the boundaries of the shallow unconsolidated Botany Sands Groundwater Source (EIS TWP 7 Groundwater). The Botany Sands are aeolian deposits comprising well-sorted, poorly cemented, and fine to medium-grained quartz sands. Lenses and bands of inter-dunal peat and organic clay are also present within the unit. The average thickness of the Botany Sands is 15 to 20 metres (EIS TWP 7 Groundwater).

The marine, alluvial deposits and residual soils underlying the uncontrolled fill have varying thicknesses between 15 and 30 metres, typically comprising sands, clays and clayey sands of a very loose to very dense density; and very soft to hard consistency.

Further information relating to groundwater is located in the Groundwater Management Sub Plan.

4.4 Rainfall and climate

Rainfall data have been obtained from the EIS/MDP TWP 7 for the closest Bureau of Meteorology (BOM) weather station site at Sydney Airport (BOM site number 066037). Sydney Airport has a complete rainfall record with complete data from 1898.

The data details that most rainfall occurs in the Autumn season and the highest average rainfall occurs in June. The lowest rainfall occurs in Spring. The average annual rainfall is 1083.4 millimetres.

Table 4-3– Average rainfall Sydney Airport (1939 to present)

Mth	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Avg	94.6	111.4	117.0	107.8	96.0	124.6	69.0	76.0	59.7	69.7	80.4	73.6	1083.4

Temperature and evapotranspiration data from Sydney Airport is provided in Table 4.5.

Table 4-4– Temperature and evapotranspiration (ET) Sydney Airport (1939 to present)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean Max Temp (C)	26.6	26.5	25.4	23.0	20.1	17.6	17.1	18.4	20.7	22.7	24.1	25.9	22.3
Mean Min Temp (C)	18.9	19.1	17.6	14.3	11.0	8.7	7.3	8.2	10.5	13.3	15.5	17.6	13.5
ET (mm)	146.5	120.5	110.7	82.2	62.4	47.7	55.0	74.0	96.9	122.2	134.9	150.0	1200.7

4.5 Rainfall erosivity factor

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

The Project has a Rainfall Erosivity Factor of 3000 (EI) based on mapping contained in Appendix B of Managing Urban Stormwater: Soils and Construction Volume 1 Fourth Edition (The Blue Book).

Table 4-5: Monthly % rainfall erosivity (R - factor) values for Sydney (Zone 1)

Monthly % and annual rainfall erosivity (R – factor) values												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
% EI	16	15	16	11	9	5	4	4	4	5	7	8

Table 4.6 shows that almost half of the annual rainfall is expected in the period January to March (47%). Ground disturbance works during this period will be closely monitored using pre-rainfall inspections and weather forecast monitoring to ensure controls are adequate and in place in accordance with approved plans prior to significant weather events.

4.6 Flooding

The Project site is mainly located within the lower reaches of the Cooks River catchment, a sub-catchment of the larger Botany Bay catchment. A small portion of the Project site, near the intersection of O'Riordan Street , Robey Street and Joyce Drive, discharges to Mill Stream via the stormwater system. Mill Stream drains to Botany Bay, which is part of the Georges River catchment.

Both the Cooks River and Georges River catchments have been extensively developed meaning that the rainfall-runoff response of the catchments has been altered from a natural state. This has resulted in changes to the quantity and speed of runoff within the catchments.

This means that these systems experience very low flows during dry periods and very high flows after storms, causing erosion and flooding in some areas.

4.6.1 Alexandra Canal

Flooding along Alexandra Canal is mainly confined to the channel itself for floods up to the five per cent AEP event. However, during a one per cent AEP event, flooding tops the canal banks upstream of the Botany Rail Line, causing inundation of adjacent commercial and industrial development of depths exceeding one metre at several locations. This can result in hazardous flooding conditions to persons and property. Flooding also occurs downstream of the Botany Rail Line during the one per cent AEP event, discharging over Airport Drive and inundating Sydney Airport land at a depth typically less than 0.1 metre.

During a 10 per cent AEP event, inundation of a low point along Qantas Drive, located about 300 metres to the east of Alexandra Canal, can occur to a maximum depth of one metre. This can increase to 1.2 metres during a one per cent AEP event and 2.1 metres during a PMF event. Higher ground to the north and south of this low point make it susceptible to significant depths of inundation that would be hazardous to road users.

During a 10 per cent AEP event, inundation of a low point along Airport Drive discharges in an easterly direction into a trapped depression within Sydney Airport, where depths of inundation can occur to a maximum depth of 0.7 metres. This can increase to 1.1 metres during a one per cent AEP event and 1.5 metres during a PMF event.

A significant portion of the Project site, which is located on Sydney Airport land between the Botany Rail Line and Canal Road, is affected by overland flow that discharges from the Cooks River Intermodal Terminal and the Botany Rail Line.

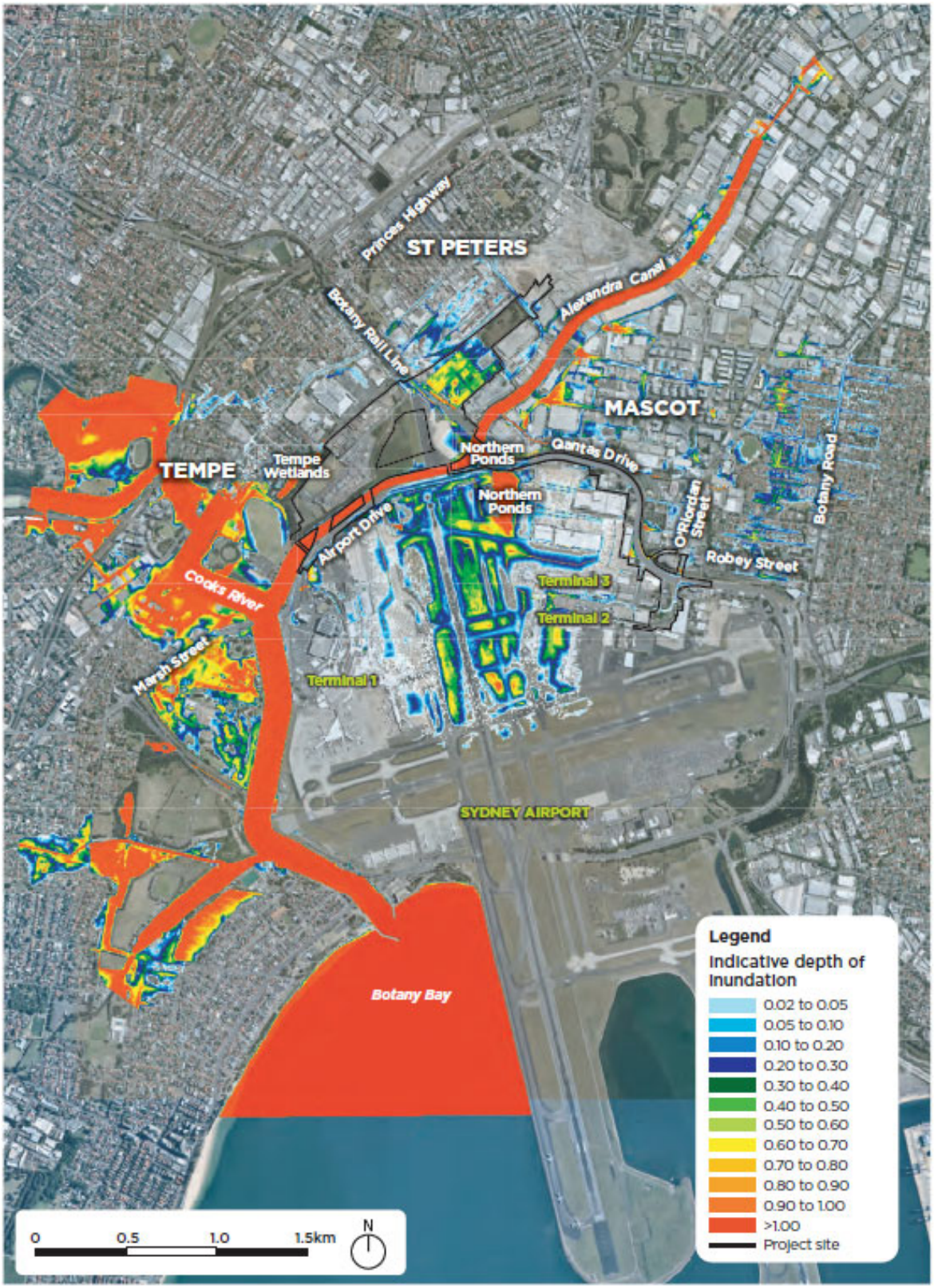
4.6.2 Tempe Wetlands

At the existing drainage system located on the Princes Highway, flooding travels overland along Station Street, Hart Street, Wentworth Street and Fanning Street in an easterly direction before discharging into Tempe Wetlands. During a one per cent AEP flood event, the depth of inundation along these streets can be up to 0.3 metres.

4.6.3 Mill Stream

The extent and depth of existing flooding for the one per cent AEP event and the PMF are shown on Figures 4.9 and 4.10. These show Alexandra Canal, Tempe Wetlands, an area between the Cooks River Intermodal Terminal and north of the Port Botany Rail Line, and parts of Sydney Airport south of Airport Drive as being flood prone and flood hazard areas. Additionally, existing low points along sections of Airport Drive (about 900 metres long) and Qantas Drive (about 200

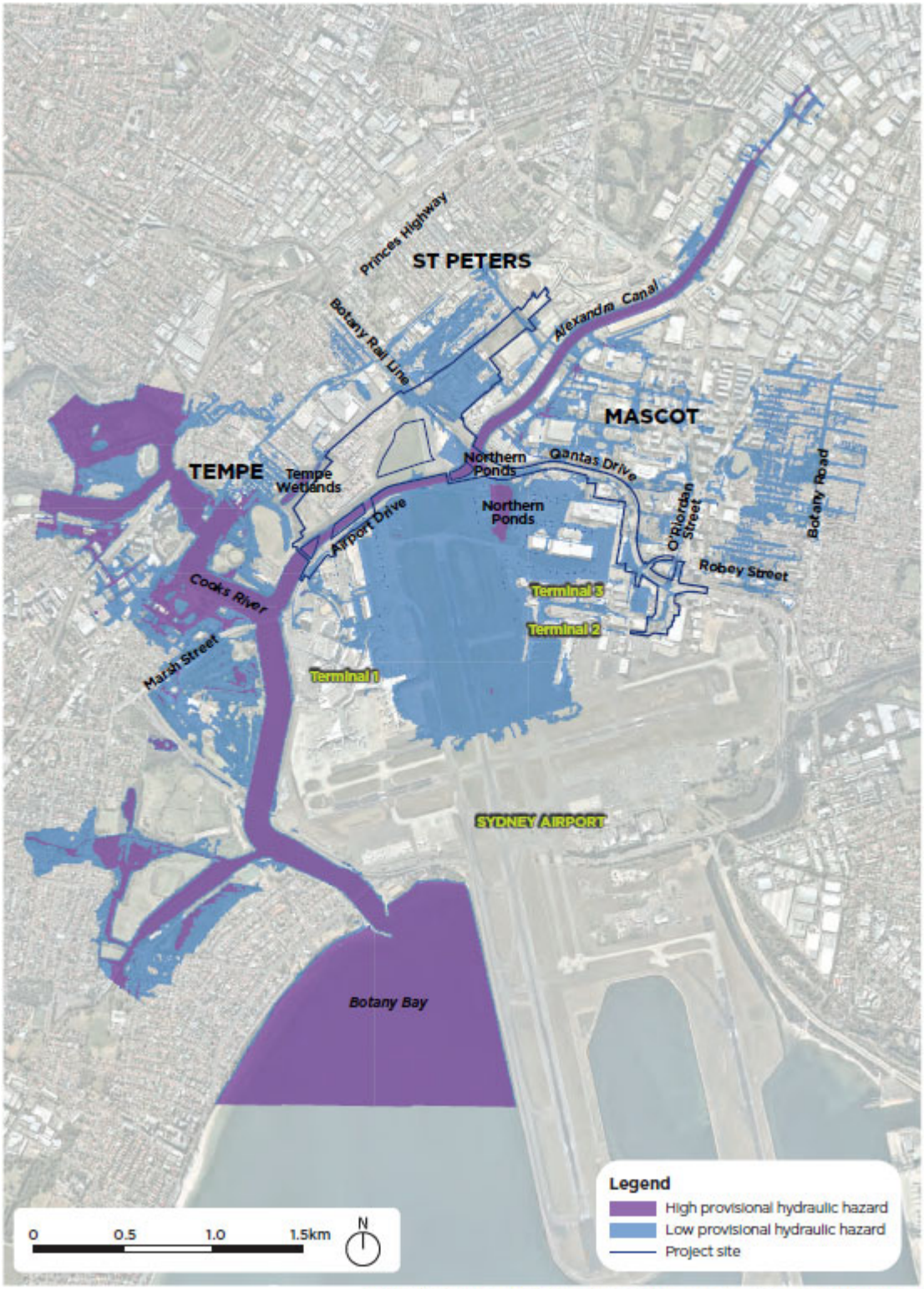
metres long) north of the Robey Street intersection are shown to be subject to substantial existing inundation.



Existing flood depth and extent – one per cent AEP event

Source EIS/MDP TWP 14

Figure 4.9 – Preliminary design 1% AEP flood mapping



Preliminary flood hazard areas during a one per cent AEP event

Source EIS/MDP TWP 14

Figure 4.10 – Preliminary design 1% AEP flood hazard areas

5 Environmental aspects and impacts

5.1 Construction activities

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

- Vegetation clearing and topsoil stripping.
- Bulk earthworks
- Landfill opening and reconstruction
- Operation of the leachate treatment plant
- Culvert and drainage works
- Works in Alexandra Canal
- Bridge construction
- Material stockpiles including the treatment of acid sulfate soil and rock
- Paving activities
- Water use / groundwater extraction and site dewatering
- Compounds operation including fuel and chemical storage, refuelling and chemical handling
- Noxious weed treatment including herbicide spraying

Refer also to the Aspects and Impacts Register included in Appendix A2 of the CEMP.

5.2 Impacts

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

- Intersection of groundwater during dewatering and excavation leading to:
  - Groundwater drawdown of adjacent areas
  - Mobilisation of contaminants from adjacent areas
- Exposure, handling and treatment of Acid Sulphate Soils
- Exposure, handling and treatment of highly saline soils
- Disturbance of contaminated materials during earthworks, piling, dewatering
- Contamination of soils and water from spills and chemical usage
- Treatment, handling and disposal of contaminated water, increasing the potential for migration of contaminants via leaching, overland flow or subsurface flow
- Mobilisation of contaminants in runoff containing sediment from disturbed areas entering local watercourses
- Potential for flooding of adjacent areas as a result of the Project

Some impacts on soil and water attributable to the Project are anticipated. Relevant aspects and the potential for related impacts have been considered in a risk assessment in Appendix A2 of the CEMP. Section 6 provides a suite of mitigation measures that will be implemented to avoid or minimise those impacts.

6 Environmental control measures

Specific measures and requirements to meet the objectives of this SWMP and to address impacts on soil and water are outlined in Table 6-3.

6.1 Water Treatment Plants

In addition to the measures in Table 6.1, where construction water needs to be treated from site areas, including groundwater encountered in excavations, water will be transferred to discrete water treatment plants (WTPs) via high-density polyethylene (HDPE) pipelines for treatment and subsequent discharge into Alexandra Canal.

The potential for appropriately sized storage tanks at various work fronts will be considered as part of the detailed construction planning for the water management within the work sites.

There are two WTPs proposed for the project as follows:

- A fixed WTP will be located in the C1 Visy Compound as indicated below in Figure 6.1. This WTP will be designed to an approximate capacity of approximately 25-30L/s. The exact capacity will be determined as part of the detailed design process.
- A mobile WTP will be located in areas of the Project where pipework to the main/fixed WTP is not feasible. This WTP will be designed to an approximate capacity of 5L/s.

Both WTPs will discharge into Alexandra Canal in accordance with the Project discharge criteria (refer to Table 6-2, noting that this criteria is to be finalised in the EPL) and at authorised discharge points (also to be finalised in the EPL), noting that the discharge point for the mobile WTP will need to be varied under the EPL from time to time.

Opportunities to reuse treated construction and groundwater to reduce discharge volumes will be implemented where appropriate.

The treatment process are likely to include:

- Pre-treatment: physical separation using baffle bins to remove heavier particulates and air strippers which will target ammonia, volatile organics, iron and manganese;
- Primary Treatment: settlement, including chemical injection (coagulation, flocculation and pH adjustment) if necessary. This stage targets organics and heavy metals;
- Secondary Treatment: media filtration using zeolite which will be utilised for physical filtration for further removal of particulates and ion exchange for metals and ammonia; and,
- Tertiary Treatment: media filtration of coal based granular activated carbon (GAC) and/or acid washed coconut catalytic GAC, which will incorporate physical adsorption targeting PFAS removal and provide a fail-safe for any remaining contaminants.

Figure 6-1 Indicative location of Water Treatment Plant (C1-Visy Compound)

6.1.1 Discharge volume

Discharge volumes will be monitored and recorded using calibrated flow metres on the WTPs. Volumes will be reported in routine (3 monthly) monitoring reports as requested by DPIE Water. These will also be reported as required by monitoring under the EPL.

6.1.2 Discharge water quality

The discharge criteria for Alexandra Canal is detailed in Table 6-1. The criteria were developed in compliance with CoA E93 (and will be updated, if required, based on the final EPL).

Table 6-1 – Discharge criteria for Alexandra Canal

Parameter	Unit	Alexandra Canal
pH	pH units	7.0 to 8.5
Turbidity	NTU	10
Aluminium	µg/L	0.5
Arsenic	µg/L	2.3
Barium	mg/L	2
Boron	µg/L	5,100
Cadmium	µg/L	5.5
Chromium (VI)	µg/L	20
Chromium (III)	µg/L	49
Copper	µg/L	3
Cobalt	µg/L	14
Iron	µg/L	300
Lead	µg/L	6.6
Manganese	µg/L	80
Mercury	µg/L	0.40
Nickel	µg/L	70
Zinc	µg/L	23
Bicarbonate alkalinity as $CaCO_3$	mg/L	124
Ammonia	ug/L	1200
Nitrate	ug/L	15
Nitrite	ug/L	15
Total Phosphorus	ug/L	30
Total Nitrogen	ug/L	300
PFOA	µg/L	220
PFOS	µg/L	0.13
TPH – C6-C9 fractions	µg/L	150
TPH – mineral oil (>C9 fractions)	µg/L	600
F2-Napthalene	mg/L	70
Ethylbenzene	µg/L	110
Total xylenes	µg/L	830
p-xylene	µg/L	200
m-xylene	µg/L	100
o-xylene	µg/L	350
Naphthalene	µg/L	70
Anthracene	µg/L	0.4
Phenanthrene	µg/L	2
Fluoranthene	µg/L	1.4

Parameter	Unit	Alexandra Canal
Benzo(a)pyrene	µg/L	0.2

Note: Criteria based on draft EPL proposed by the EPA.

6.1.3 WTP commissioning

The WTPs performance will be assessed and modified as required to meet the relevant discharge criteria within the EPL or as listed above. A minimum of two samples, testing the analytes detailed in Table 6-1, will be completed to confirm the WTPs efficacy. This will be completed once all the WTP infrastructure is in place.

A relationship between TSS and turbidity can also be developed which can serve as a proxy for the TSS threshold.

6.1.4 WTP post-commissioning

WTP discharge will be sampled fortnightly during the first 3 months of operation (the commissioning period). After the commissioning period, JHSWJV will continue to sample WTP discharge monthly throughout construction. Table 6-1 details the analytes and parameters to be sampled to ensure discharge criteria are being met.

In-line sensors, monitoring pH and turbidity (as NTU), will be installed to allow operators to observe any drift in water quality which may require investigation. If the WTP is shut down for maintenance, raw water will be recycled where appropriate, discharged as trade waste and/or disposed to a licensed waste facility. It should be noted that routine maintenance will likely be undertaken on weekend and night periods when inflows are minimal and can be temporarily placed in storage tanks until the WTP is back online. In the event of emergency maintenance, a review will be undertaken to determine if construction works need to temporarily cease to manage inflows to the WTP.

Water quality results and any WTP maintenance will be detailed in routine (3 monthly) monitoring reports.

6.2 Leachate treatment plant

JHSW will establish and operate an upgraded new Leachate Treatment Plant (LTP) for the duration of activities interact with the former Tempe Landfill. Any groundwater or construction water within the former Tempe Landfill area will be directed to the LTP for treatment and disposal.

The proposed LTP is a Sequencing Batch Reactor (SBR). This biological process involves utilising a maintained inventory of nitrifying bacteria to oxidise Ammonia within the raw leachate into Nitrate and Nitrite prior to discharge to sewer.

The LTP will use the existing leachate collection system, avoiding impacts to the bentonite wall, and will have sufficient capacity for current and future flows to ensure that the water quality of Alexandra Canal is not adversely affected by leachate originating from site. The capacity of the system will be in the order of 200m3/day unblended with a hydraulic blending capacity of 250m3/day.

Leachate will be treated to the requirements outlined in the Sydney Water Trade Waste Agreement (TWA35548).

6.3 Mitigation Measures

Table 6-2: Soil and Water management and mitigation measures

ID	Measure/Requirement	When to implement	Responsibility	Reference	Evidence
Contamination					
SWM1	Stockpiling of contaminated material during construction will be managed and maintained to prevent any release of liquids and contaminated run-off to stormwater drains, waters and land. A stockpile management plan will be prepared and implemented throughout construction.	Construction	Environment Manager	UMM CS17	Appendix F Stockpile Management Plan has been developed.
SWM2	Any previously unidentified contaminated material encountered during the works will be managed in accordance with an unexpected contaminated finds procedure, as outlined in the Guideline for the Management of Contamination (Roads and Maritime, 2013b)	Construction	Environment Manager	UMM CS18	This procedure is included in Appendix G of this Plan.
SWM3	If soil and/or water containing PFAS is proposed for reuse, the proposed reuse must not result in an unacceptable or increased risk to human health and/or the environment. A health and environmental risk assessment will be documented and consultation be undertaken with the NSW EPA before any reuse of PFAS contaminated soil and/or water.	Construction	Environment Manager	UMM CS19	Details of contamination management processes, including the development of RAPs, will be dealt with in the Contaminated Land Management Plan.

ID	Measure/Requirement	When to implement	Responsibility	Reference	Evidence
SWM4	Vehicle washdowns and/or concrete truck washouts will be undertaken within a designated area or undertaken at a suitable location off site. These areas will be detailed on the EWMS and ESCPs.	Construction	Environment Manager	Good Practice	EWMS The strategy for development of ESCPs is included in Appendix A of this Plan. Inspection Reports
SWM5	An Acid Sulfate Soils Management Plan (prepared in accordance with the Acid Sulfate Soils Assessment Guidelines (ASSMAC, 1998)) will be implemented throughout the works to manage any potential ASS that may be encountered.	Construction	Environment Manager	UMM CS10	An Acid Sulfate Soils Management Plan is included in Appendix B of this Plan.
Erosion and Sediment Control					
SWM6	Progressive Erosion and Sediment Control Plans (ESCPs) will be developed throughout the works to ensure that adequate controls are in place to manage surface water runoff and erosion potential. These plans will be developed in consultation with the Soil Conservationist.	Construction	Environment Manager, Soil Conservationist		ESCPs Inspection records

ID	Measure/Requirement	When to implement	Responsibility	Reference	Evidence
SWM7	Awareness training for all personnel involved in construction will be conducted covering: ‣ Environmental impacts; ‣ Relevant legislation; ‣ Principles of erosion and sediment control; ‣ Techniques of erosion and sediment control. The program will be conducted in detail with: ‣ Personnel with special responsibilities. ‣ Including training in flocculation and water quality ‣ management of sediment basins or preparation of Progressive Erosion and Sediment Control Plans	Pre-construction, construction	Environment Manager, Soil Conservationist	G38 3.4.3	Appendix A
SWM8	Clearing limits will be flagged with highly visible flagging/fencing and signage.	Pre-construction, construction	Environment Manager, Site Supervisor	G40	Appendix A EWMS Inspection Records
SWM9	Clearing will be staged, where possible, to reduce the potential for erosion and runoff in non-active work areas . Where clearing, including of weeds, is required ahead of works commencing, appropriate erosion and sediment controls will be implemented in accordance with the ESCP.	Construction	Environment Manager, Site Supervisor	G38 3.1.1 (ii)	EWMS The strategy for development of ESCPs is included in Appendix A of this Plan. Inspection Reports
SWM10	In order to minimise the potential for runoff adjacent to access roads and other construction sites (eg Site Compounds), vegetation removal will be minimised as much as possible	Construction	Environment Manager, Site Supervisor	UMM SW5, G38 3.7.1	ESCP

ID	Measure/Requirement	When to implement	Responsibility	Reference	Evidence
SWM11	The velocity of discharges into Alexandra Canal from water treatment plants and stormwater drains from the active construction areas will be controlled to avoid disturbance of sediment layers in the canal, including measures such as the installation of floating dissipaters to spread flow evenly over waterway surface, or similar means.	Construction	Environment Manager, Site Supervisor	UMM CS7	The strategy for development of ESCPs is included in Appendix A of this Plan.
SWM12	Separating 'clean' run-on water from 'dirty' (eg turbid) construction area run-off to suitable Water Quality Improvement infrastructure for treatment prior to discharge or reuse	Construction	Environment Manager, Site Supervisor	G38 3.1.1(vii)	The strategy for development of ESCPs is included in Appendix A of this Plan. EWMS Inspection Records
SWM13	Temporary modification of Water Quality Improvement infrastructure during the construction period will be undertaken for the additional capture of stormwater runoff to be used as construction water where deemed suitable and safe for reuse (in accordance with the Safety Management Plan)	Construction	Environment Manager, Site Supervisor	G38 3.1.1(iii)	ESCPs EWMS Inspection Records
SWM14	Clean out Water Quality Improvement Infrastructure, at minimum, whenever the accumulated sediment exceeds 60% of the sediment storage zone.	Construction	Environment Manager, Site Supervisor	G38 3.2.4	The strategy for development of ESCPs is included in Appendix A of this Plan. EWMS Inspection Records

ID	Measure/Requirement	When to implement	Responsibility	Reference	Evidence
SWM15	Apply the flocculant or coagulant (whether gypsum or another approved material) to settle suspended sediments within 24 hours of the conclusion of each rain event causing runoff.	Construction	Environment Manager, Site Supervisor	G38 3.3.1, 3.3.2, 3.3.3	The strategy for development of ESCPs is included in Appendix A of this Plan.
SWM16	Installing and lining catch drains and diversion banks before earthworks commence. Permanent surface water drains will be installed to act as diversion drains during the construction phase, where practicable.	Construction	Environment Manager, Site Supervisor	G38 3.1.1(v)	The strategy for development of ESCPs is included in Appendix A of this Plan.
SWM17	Use of geotextile, polymer sprays or similar linings to provide temporary surface protection against water and wind erosion.	Construction	Environment Manager, Site Supervisor	G38 3.5	The strategy for development of ESCPs is included in Appendix A of this Plan.
SWM18	Stockpiles of soil material will be located in low-hazard areas clear of watercourses (ie at least 50 metres). Additional protection to be afforded with temporary vegetation, upslope diversion banks and downslope sediment control measures as required	Construction	Environment Manager, Site Supervisor	G38 3.1.1(i)	A stockpile management procedure has been developed- refer Appendix F.

ID	Measure/Requirement	When to implement	Responsibility	Reference	Evidence
SWM19	Stockpile topsoil separately for potential reuse in landscaping and rehabilitation works. Protect stockpiles to prevent erosion during rainfall.	Construction	Environment Manager, Site Supervisor	G38 3.5	The strategy for development of ESCPs is included in Appendix A of this Plan.
SWM20	Ensuring the management of turbid water occurs within a suitable timeframe after rain with one or a combination of: – Pump to Water Treatment Plant (WTP) for treatment – Pump-out for construction purposes or dust control. *hierarchy of water management measures to be considered	Construction	Environment Manager, Site Supervisor	G38 3.3.4	The strategy for development of ESCPs is included in Appendix A of this Plan.
SWM21	Water is not to be discharged from site prior to achieving acceptable water quality standards.	Construction	Environment Manager, Site Supervisor	G38 3.4.1	Appendix A Attachment 12
SWM22	Where feasible utilise water for site uses prior to discharge or removal from site (eg dust suppression, filtering techniques, flocculation with approved chemical flocculant, pumping for treatment into a water treatment plant). A water movement permit system and EWMS/methodology will be implemented for site dewatering to ensure volumes moved, treated, reused and disposed of are tracked.	Construction	Environment Manager, Site Supervisor	G38 3.4.2	The strategy for development of ESCPs is included in Appendix A of this Plan.
SWM23	Implement controls such as street sweepers, wheel wash areas etc to minimise and manage deposition of mud and soil material onto local sealed roads. Maintain hardstand areas as much as practicable to minimise mud/soil generation	Construction	Environment Manager, Site Supervisor	Good Practice	inspection checklist

ID	Measure/Requirement	When to implement	Responsibility	Reference	Evidence
SWM24	Initiate and implement a water quality monitoring program in the adjacent watercourses with results analysed to determine the efficiency and effectiveness of implemented controls.	Pre-Construction /Construction	Environment Manager	UMM SW6	The program of water quality monitoring is included in Appendix C
SWM25	Arranging regular inspections by the Project Soil Conservationist and construction personnel to review and update control measures. Additional inspections will be conducted: ‣ During significant rainfall events exceeding 10mm within 24hrs and during prolonged rainfall to monitor the functioning of controls.consider safe access etc. ‣ Within 24 hours of cessation of a rainfall event causing runoff to occur on or from the Project	Construction	Environment Manager	G38 3.1.2	The strategy for development of ESCPs is included in Appendix A of this Plan.
SWM26	Monitoring weather forecasts for planning and site ‘securing’ purposes. In the event of forecast inclement weather (BOM Mascot >80% forecast of 10mm or more in a 24hr period) and before planned site shutdowns of more than 72 hours, a review of all controls will be undertaken to ensure the controls are adequate for the expected conditions (as much as reasonably practical).	Construction	Environment Manager	Good Practice	The strategy for development of ESCPs is included in Appendix A of this Plan.
SWM27	Leave temporary erosion and sediment controls in place until the disturbed catchments have over 70% vegetation cover	Construction	Environment Manager, Site Supervisor	G38 3.2.5	The strategy for development of ESCPs is included in Appendix A of this Plan.

ID	Measure/Requirement	When to implement	Responsibility	Reference	Evidence
SWM28	Stage re-vegetation of the site as work proceeds, progressively undertaking topsoiling and vegetation work as areas become completed	Construction	Environment Manager, Site Supervisor	G38 3.1.1 (viii), UMM CS22	The strategy for development of ESCPs is included in Appendix A of this Plan.
Flooding					
SWM29	A flood mitigation strategy to meet the outcomes of the EIS/MDP will be prepared as part of the design and during construction. The strategy will include undertaking additional flood modelling taking into account detailed design and proposed construction planning and methodologies, in consultation with Sydney Airport Corporation, Sydney Water, NSW State Emergency Services and relevant councils.	Design, Construction	Design Manager	UMM HF1;HF6 CoA E3, E4	Flood reports, Flood management strategies, Flood models
SWM30	Hydrologic and hydraulic assessments will be carried out for all temporary and permanent Project components (including ancillary facilities) that have the potential to affect flood levels in the vicinity of the Project.	Design, Construction	Design Manager	UMM HF2; HF7, HF8 CoA E3, E4	Flood reports, Flood management strategies, Flood models, Site Establishment Plan
SWM31	Where flood levels in the one per cent AEP event are predicted to increase at any residential, commercial and/or industrial buildings as a result of construction or operation of the Project, a floor level survey will be carried out. If the survey indicates existing buildings would experience above floor inundation during a one per cent AEP event as a result of the Project, further refinements will be made (as required) to the design of temporary and permanent Project components to minimise the potential for impacts.	Design	Design Manager	UMM HF3; CoA E3	Flood reports, Flood management strategies, Flood models

ID	Measure/Requirement	When to implement	Responsibility	Reference	Evidence
SWM32	Further modelling will be undertaken based on the detailed design to determine the ability of the receiving drainage systems to effectively convey drainage discharges from the Project once operational. The modelling will be undertaken in consultation with Sydney Airport Corporation, Inner West and Bayside Councils. It will include, but not be limited to: • Confirming the location, size and capacity of all receiving drainage systems affected by operation • Assessing the potential impacts of drainage discharges from the Project drainage systems on the receiving drainage systems • Identifying all feasible and reasonable mitigation measures to be implemented where drainage from the Project is predicted to adversely impact on the receiving drainage systems.	Design	Design Manager	UMM HF4	Flood reports, Flood management strategies, Flood models
Surface Water					
SWM33	The potential for scour at bridge abutments will be considered for flow events up to and including the one per cent annual exceedance probability event. Scour protection will be included in the detailed design as required.	Design	Design Manager	UMM SW1	The drainage design reports for the Project consider use of scour protection as part of the permanent works.

ID	Measure/Requirement	When to implement	Responsibility	Reference	Evidence
SWM34	Discharge outlets will be designed with appropriate energy dissipation and scour protection measures to minimise the potential for scour. Scour protection will be developed in consultation with relevant stakeholders, including Sydney Water.	Design	Design Manager	UMM SW2	The drainage design reports for the Project consider use of scour protection and dissipation as part of the permanent works.
SWM35	Appropriate treatment measures, including water sensitive urban design, will be considered in the detailed design with the aim of improving water quality within Alexandra Canal and/or achieving the targets outlined in the Botany Bay and Catchment Water Quality Improvement Plan (Sydney Metropolitan Catchment Management Authority, 2011) in operation.	Design	Design Manager	UMM SW3	These measures are considered as part of the Place, Design and Landscape Plan in accordance with CoA E76
SWM36	Surface water drains and associated infrastructure will be designed to prevent scour of soil, erosion and associated sedimentation impacts.	Design	Design Manager	UMM SW4	The drainage design reports for the Project consider use of scour protection as part of the permanent works.

ID	Measure/Requirement	When to implement	Responsibility	Reference	Evidence
SWM37	A surface water quality monitoring program will be developed and implemented as part of the Construction Soil and Water Management Plan to monitor potential surface water quality impacts. The program will define: • Monitoring parameters • Monitoring locations • Frequency and duration of monitoring. • The monitoring program will include ongoing baseline monitoring to determine the water quality of potential receiving waters prior to commencement of construction. • All surface water data related to Alexandra Canal will be provided to Sydney Water for the duration of the monitoring program.	Pre-construction/ Construction/ Operation	Environment Manager	UMM SW6	The program of water quality monitoring is included in Appendix C
SWM38	Discharge from the WTP will meet the established criteria before discharge can occur in accordance with the EPL	Construction	Environment Manager	UMM SW7	WTP discharge criteria in the EPL
SWM39	Where possible, dirty water from water treatment infrastructure will be reused, (where safe for workers and human health) for: construction water, dust suppression and irrigation of rehabilitated and landscaped areas to minimise the volumes requiring discharge or disposal.	Construction	Environment Manager	UMM SW9	ESCP
Emergency Response					

ID	Measure/Requirement	When to implement	Responsibility	Reference	Evidence
SWM40	An emergency response plan will be prepared and will include measures to manage emergency situations during construction, including those associated with fires, flooding or other threats to public safety. A Pollution Incident Response Management Plan (PIRMP) will also be developed as part of the EPL enforcement.	Construction	Health and Safety Manager	UMM HS4	Emergency Response Plan PIRMP (add website reference once finalised)
Waste Management					
SWM41	Suitable areas will be identified to allow for contingency management of unexpected waste materials, including contaminated materials. Areas will be hardstand or lined areas that are appropriately stabilised and bunded, with sufficient space for stockpile storage.	Construction	Environment Manager	UMM WM6	ESCP's, Stockpile Management Protocol

7 Compliance management

7.1 Roles and responsibilities

The JHSW Project Team's organisational structure and overall roles and responsibilities are outlined in Section 3.6 of the CEMP. Specific responsibilities for the implementation of environmental controls are detailed in Section 6 of this Plan.

7.2 Training

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

- Erosion and Sediment control
- Groundwater extraction and handling
- Contamination
- Surface water management
- Stockpiling
- Acid Sulfate Soils

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

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

7.3 Monitoring and inspection

7.3.1 Construction surface water quality monitoring program

A surface water quality monitoring program has been developed as detailed in Appendix C of this Plan to comply with UMM SW6. This includes baseline monitoring as well as monitoring locations upstream and downstream of the works. The trigger values for monitoring are in consistent with those detailed in the baseline surface water quality monitoring program in the EIS/MDP (TWP 8) and finalised in Appendix E of the Response to Submissions Report.

Surface water quality monitoring will continue for a minimum of 12 months following the completion of construction, or until affected watercourses are certified by a suitably qualified and experienced independent expert as returned to an acceptable condition (or as otherwise required by any project conditions of approval). This is in accordance with UMM SW6.

7.3.2 Inspections

In the event of forecast inclement weather (BOM Mascot >80% forecast of 10mm or more in a 24hr period) and before planned site shutdowns of more than 72 hours, a review of all controls will be undertaken to ensure the controls are adequate for the expected conditions (as much as reasonably practical).

A post rainfall inspection will also be completed and inspection records maintained on Sharepoint.

7.4 Licences and permits

The following licences and permits, relevant to soil and water management, will be in placed for construction of the Project:

Licence/Permit	Issuing Authority	Description
Environment Protection Licence (EPL) (# TBC)	NSW EPA	This licence will capture authorised discharge points and discharge parameters (amongst other compliance obligations, including reporting)
Trade Waste Agreement	Sydney Water	This agreement will be in place to manage leachate discharge from the Leachate Treatment Plant from the former Tempe landfill throughout the construction of the Project. Note: This licence is relevant to the Landfill Leachate, Gas and Odour Management Plan.

Once final requirements of the above licences and permits are known, this Plan will be updated (if required) to include relevant requirements.

7.5 Weather monitoring

Rainfall will be taken from the BOM Sydney Airport site (BOM site number 066037). Daily data is available from this location for all relevant parameters. This information will be downloaded on approximately a monthly basis and records maintained on SharePoint.

7.6 Auditing

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

Audit requirements are detailed in Section 3.9.3 of the CEMP.

7.7 Reporting

Reporting will be undertaken in accordance with Section 3.11.4 of the CEMP. Specific reporting required under the EPL will be captured in a future revision to this Plan once the EPL is finalised.

All surface water data related to Alexandra Canal will be provided to Sydney Water for the duration of the monitoring program. This will be provided within one month of the proceeding monitoring period.

8 Review and improvement

8.1 Continuous improvement

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

The continuous improvement process will :

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

8.2 Plan update and amendment

The processes described in Section 3.9 to Section 3.13 of the CEMP may result in the need to update or revise this Plan. This will occur as needed.

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

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to Section 3.11.2 of the CEMP.

Appendix A – Erosion and Sediment Control Strategy

Appendix A

Erosion and Sediment Control Strategy

Sydney Gateway Road Project

April 2021

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1 Introduction

1.1 Purpose of Strategy

This Erosion and Sediment Control Strategy has been prepared to provide an outline of the strategic approach to the management of Erosion and Sediment risks for the Sydney Gateway Road Project. The information in this document will guide the implementation of erosion and sedimentation management and form part of the Soil and Water Management Sub Plan.

1.2 Impacts of Erosion and Sedimentation

The construction activities to be undertaken on this project have the potential to impact on soil and water resources during bulk earthworks across areas of known contaminated areas and previously industrial landuses. Land to be disturbed will require clearing of vegetation which will expose these areas to erosion by stormwater and wind action.

Generally, soil particles eroded by stormwater runoff are transported downslope, usually settling in rivers, watercourses, lakes, dams and wetlands etc (i.e. sedimentation). This may result in many adverse environmental impacts including:

- Reduction in water quality, increased turbidity and nutrient enrichment of water bodies.
- Contamination of waterways.
- Damage to vegetation communities.
- Disturbance to aquatic flora and fauna.
- Increased potential for flooding.
- Reduction in recreational values.
- Reduction in aesthetic values.
- Increased maintenance costs.
- Promotion of weed growth.

Additionally, erosion may be caused by wind moving unprotected soil particles. This action may result in adverse impacts including:

- Loss of valuable soil (e.g. topsoil).
- Safety on and off site (e.g. traffic hazards, Airport Operations).

This strategy will form the initial ‘part of the chain’ to minimise on-site erosion and offsite sedimentation and therefore reduce adverse environmental impacts.

2 Scope of this Strategy

This document describes the intentions and fundamental principles to be used for the duration of the entire project.

The strategy will be complimented during construction by the preparation of a series of detailed Site Specific or Progressive Erosion and Sedimentation Control Plans (PESCP’s) for:

- The different stages of construction (eg; Clearing and Grubbing; Stripping and Stockpiling of Topsoil; Bulk Earthworks).
- Specific work areas (eg; Preload areas, Tempe Tip Emplacement Mound, Alexandra Canal Drainage Works, Large Stockpiles).
- The PESCP’s will identify risks and be prepared prior to the construction activity generally using drainage or general arrangement drawings and indicate (where relevant):
  - Catchment areas.
  - Construction boundaries.
  - Jurisdictional Boundaries (State/Federal)
  - Runoff capture, treatment and disposal
  - Areas of contamination
  - Exclusion zones and sensitive areas.
  - Contours and drainage paths.

- Access points and tracks (eg haulage).
- Compounds and storage areas.
- Stockpile sites.
- Temporary work areas.
- Material processing areas.
- Permanent and temporary controls (including order of implementation).

In some instances, more than one (1) PESCP may be required for an activity due to:

- Where processes are complicated and have several stages.
- Change in the construction process, scope of work or work method.
- Controls are found to be ineffective following rainfall.

PESCPs will be prepared jointly by both the Project Soil Conservationist and the environmental team and will include input from field personnel to formulate practical documents for field implementation.

Additionally, Plans will be developed in consideration of other environmental aspects (eg sensitive vegetation communities, Airport operations, contaminated areas).

Sometimes PESCPs will be developed jointly with Environmental Work Method Statements for complex construction areas (e.g. culvert works within Alexandra Canal).

The PESCPs will be entered onto a Register to maintain version history and updates (maintained on SharePoint). An example of A PESCPs is provided in Appendix A:

The purpose of the Preliminary PESCPs is to demonstrate:

- The approach to erosion and sediment control (eg runoff control, separation of 'clean' from 'dirty' flows, separation of contaminated runoff).
- Different types of controls with an emphasis on early construction of critical permanent drainage structures (eg catch drains upslope).
- Use of existing onsite materials (eg vegetation, mulch, rock) and stable ground cover.

3 Supporting Documentation

This Erosion and Sedimentation Control Strategy is based on the requirements and guidelines contained in the following manuals/documents:

- Department of Housing (1998), Managing Urban Stormwater: Soils and Construction, Vol 1, 4th Edition (i.e. Blue Book).
- Department of Environment and Climate Change (2008), Managing Urban Stormwater: Soils and Construction, Vol 2B, Waste Landfills (i.e. Blue Book).
- Department of Environment and Climate Change (2008), Managing Urban Stormwater: Soils and Construction, Vol 2D, Main Road Construction (i.e. Blue Book).
- Environmental Impact Statement/ Major Development Plan (TfNSW/SACL)
- The strategies and techniques detailed in the above documents are appropriate for the protection of the adjacent environment of this project.

4 Erosion and Sedimentation Hazard

It is expected a high erosion and sedimentation hazard will be created during the construction of this project due to a combination of factors including:

- Large scale disturbance from bulk earthworks (e.g. cut and fill sections in relation to road construction).
- Disturbance of capping layer/exposure of contaminated soils in the former Tempe Tip
- Proximity to water courses, particularly works within and in close proximity to Alexandra Canal

- Soil types present on the project as summarised in Section 4.2.
- Large preload areas using imported bulk fill materials
- Weather conditions as summarised in Section 4.5.
- Limited ability to undertake early revegetation.
- Site constraints restricting available land for controls (e.g. sediment basins).
- Sydney Airport Airspace requirements regarding reduced open water bodies to limit attracting birds and wildlife with ponding water. Ponded water will be diverted, pumped or piped to water treatment infrastructure as soon as possible after rainfall events
- Turbulence / OLS impacts due to above surface components (eg. Turkeys nests etc)

In accordance with Section 4.4.1 and 4.4.2 of the Blue Book, the erosion hazard will be calculated for each catchment area within the Project and detailed within the Progressive Erosion and Sediment Control Plans (PESCP). The PESCP's will be frequently updated to reflect changing site conditions, and the erosion hazard, within the catchment.

5 Key Management Strategies

The following list outlines principles and control measures that will be implemented on this project for minimising erosion and sedimentation. They have been identified as key issues and techniques to control erosion and sedimentation on many construction projects over the last 30 years. These points collectively fulfil the principles of sound soil conservation practice as detailed in the previously mentioned manuals/documents. This will ensure a 'preventative' rather than a 'cosmetic or remedial' approach to erosion and sediment control.

5.1 Professional Expertise

The engagement of a professional Soil Conservationist from T.R.E.E.S. P/L with extensive experience who will co-ordinate and oversee all erosion and sediment control aspects during construction.

5.2 Training

Training in key aspects of soil conservation will be implemented in the following way:

- Highlighting the importance of soil conservation issues will be included during site inductions.
- Scheduling half-day awareness seminars early in the project for all personnel involved in construction.

The program will cover:

- Environmental impacts;
- Relevant legislation;
- Principles of erosion and sediment control;
- Techniques of erosion and sediment control.

Advanced training programs may be rolled out for relevant personnel and will include:

- Flocculation techniques and water quality
- Management of water quality treatment infrastructure
- Preparation of Progressive Erosion and Sediment Control Plans.

Additionally, ongoing training will be provided to continually address relevant matters at regular 'toolbox' pre-start and other meetings. Post rainfall toolbox sessions will be carried out, as required, with construction personnel to review and assess the efficacy of existing controls and consider potential improvements.

5.3 Minimising Extent and Duration of Disturbance

Key aspects to manage the extent of disturbance are:

- Clearly define clearing limits with highly visible flagging/fencing and signage consistent with measures in the CEMP and Sub Plans
- Staging of clearing operations. - (particularly around the former Tempe Tip)
- Initially clearing and grubbing mature trees and shrubs to leave the soil surface in a reasonably rough condition with some surface vegetative groundcover.
- Minimising disturbance of vegetation along access roads and other construction sites (eg Site Compounds) with special emphasis on management of construction activities adjacent to watercourses.

5.4 Control of Stormwater Flow onto, through and from the site

Key aspects to manage stormwater flows are:

- Separating ‘clean’ run-on water from ‘dirty’ (eg turbid) construction area run-off.
- Constructing permanent drainage structures early in the project including:
    - Sediment sumps and traps;
    - Catch drains with linings upslope of works;
- Installation of floating dissipaters to spread flow evenly over waterway surface during discharges from water treatment infrastructure and minimise the risk of disturbing sediments within Alexandra Canal
- Installation of coffer dams prior to works within Alexandra Canal, with floating sediment curtains deployed prior to coffer dam installation and maintained until coffer dams have been removed.
- Completing construction of culverts and associated inlet and outlet protection (eg rock dissipators and head/wing walls) as soon as possible after pipe/culvert installation.
- Maximising the diversion of turbid construction runoff into suitable Water Quality Improvement infrastructure.
- Controlling run-off during the construction of embankments (eg fill shaping and the construction of temporary dykes and batter drains)
- Diverting uncontaminated dirty water from formation works through sediment traps into pits and the stormwater drainage system as soon as practical to reduce surface flow lengths and velocities.
- Consider existing stormwater flows when directing water to existing pits and ponds to control potential flooding issues
- Potential disturbance of sediment in the Alexandra Canal to be considered for discharge of Water quality treatment infrastructure, stormwater etc
- Management of water within the former Tempe Landfill area will be in accordance with the Landfill Leachate, Gas and Odour Management Sub-Plan.

5.5 Erosion control measures to limit on-site erosion

The strategies to be used to control erosion on incomplete section of works are:

- Breaking the site into sub-catchment areas and implementing a range of erosion controls (eg weir type structures, diversion banks, progressive revegetation) to reduce flow velocities and to compliment and increase the effectiveness and efficiency of sediment controls in the lower areas.
- Using geotextile or similar linings to provide temporary surface protection in areas of concentrated flows (eg batter drains, culvert construction, temporary drains etc).
- Siting stockpiles of soil material in low-hazard areas clear of watercourses (ie at least 50 metres). Additional protection to be afforded with temporary vegetation, upslope diversion banks and downslope sediment control measures as required.

- Stockpiles to be in accordance with CEMP and sub plan requirements including the Stockpile Management Procedure.
- The toes of stockpiles no closer than 1m from clearing limits.

5.6 Sediment control long-term measures to prevent off-site sedimentation

The strategies to be used to control offsite impacts from works are:

- Installing control measures as close to the potential source of sediment as possible.
- Ensuring management of turbid water within a suitable timeframe after rain with one or a combination of:
    - Pump or tanker water to Leachate Treatment Plant (LTP) or Water Treatment Plant (WTP) for treatment where identified as being contaminated. The location of treatment will ultimately depend on where the excavation/construction water is located.
    - Pump-out for construction purposes or dust control.
- Ensure that dirty water generated by site activities is used on site where possible prior to further treatment and disposal off site. Examples for reuse include:
    - Construction water
    - Dust suppression
    - Rehabilitation of vegetated areas
    - Vehicle washdown
- Water not to be discharge from site prior to achieving acceptable water quality standards in accordance with EPL requirements and the Surface Water Monitoring Program.
- Managing water quality during de-watering activities (eg dust suppression, filtering techniques, flocculation with approved chemical flocculant, pumping for treatment into a water treatment plant), in accordance with a water movement permit system and EWMS/methodology to be implemented for dewatering
- Controlling the deposition of mud and soil material onto local sealed roads. Maintain hardstand areas as much as practicable to minimise mud/soil generation.
- Dust suppression via water carts, sprays and restricting plant and vehicle movements to designated routes, limiting vehicle speeds and using soil stabilisers or similar products to bind soil particles.
- Installation of controls such as coffer dams with floating sediment curtains deployed prior to coffer dam installation within Alexandra Cana. Controls are to be maintained until coffer dams have been removed. -(refer to Contaminated Sediments in Alexandra Canal Management Sub Plan)

5.7 Stabilisation and Revegetation

Key aspects to manage successful rehabilitation of disturbed areas to be implemented are:

- Ensuring the success of the later revegetation program by implementing a robust topsoil testing and management program.
- Keying-in of topsoil to batters with a suitable depth in accordance with specifications
- Progressively revegetating disturbed areas utilising appropriate non-invasive species.
- Temporary stabilisation of disturbed areas with a soil stabiliser, cover crops or similar.
- Leaving temporary erosion and sediment controls in place until the disturbed catchments have over 70% vegetation cover.
- Controlling dust through progressive revegetation techniques.

5.8 Inspection and Maintenance

The following tasks will be undertaken to ensure all aspects of soil conservation are being implemented:

- Arranging periodic inspections by the project Soil Conservationist and construction personnel to review and update control measures. Frequency will be determined based on the risk profile of the works being undertaken and the sensitivity of the location of works. All inspections will be documented in the site inspection form and records maintained on SharePoint.
- Additional inspections will be conducted:
    - During significant rainfall events exceeding 10mm within 24hrs and during prolonged rainfall to monitor the functioning of controls.
    - Within 24 hours of cessation of a rainfall event causing runoff to occur on or from the project.
- Dedicated resources to ensure the progressive and continual implementation and maintenance of temporary erosion and sediment controls (eg sediment fences, diversion banks, diversion drains, sediment traps).
- Initiating a program to ensure regular maintenance of all erosion and sediment control measures. Sediment cleaned from structures, including sediment basins, to be deposited in a secure location where further pollution will not occur.

5.9 Documentation and Recording

The following records and reports will be generated by implementation of this Strategy:

- Rainfall / climatic records, using Bureau of Meteorology - Sydney Airport information.
- Monitoring weather forecasts for planning and site ‘securing’ purposes.
- PESCPs;
- Inspection reports completed by the Project Soil Conservationist. The report will include sections for location, control, recommendations/comment, action and ‘close-out’;
- Register for Inspections and Maintenance to include volumes of sediment removed, surface water captured, treated, reused or disposed of and the method of disposal etc.
- For groundwater captured as surface water due to compaction of shallow groundwater tables in and around Tempe Landfill, registers and monitoring data required is as per the Groundwater Management Sub Plan (CoA C19)
- Site notes distributed internally between environmental and construction personnel.
- Dewatering procedure and records.
- Meeting minutes.
- Formal correspondence (eg Client, Environment Protection Authority).
- Water quality monitoring results (eg sediment basins, upstream and downstream) in accordance with the Surface Water Monitoring Program.

6 Conclusion

The strategies presented are considered to appropriate to address all issues relevant to erosion and sediment control and to minimise potential impact. Forward planning, adherence to a system of documentation and training will be key elements to ensure sound performance in the field.

1. Appendix A- Example PESCP

Progressive Erosion & Sediment Control Plan 01— Rev A

SYDNEY GATEWAY

A Joint Venture Project JOHN HOLLAND SEYMOUR WHYTE

This PESCP covers the following early works:

- Activity 1 – Contamination investigation works – test pits
- Activity 2 – Geotechnical and utility investigations – test pits and slit trenches
- Activity 3 – Geotechnical and contamination investigations – borehole drilling
- Activity 4 – Utility investigations – potholing
- Activity 5 – General concrete/saw cutting

NOTE: THIS IS A WORKING DOCUMENT AND WILL BE UPDATED ACCORDINGLY FOR EACH MAJOR STAGE OF WORK AS WORKS PROGRESS.

KEY CONTACTS

Environmental Manager – Stage 1: Ryan Maxwell – 0404 675

Environmental Manager– Stage 3: 049Tom Bath – 0447 491 159

Senior Environmental Advisor – John Bruun — 0404 675 049

Project Soil Conservationist (T.R.E.E.S.): John Wright—0418 434 516

Area Manager – Stage 1: Tom Laslett – 0401 226 461

Area Manager – Stage 3: Peter Toma – 0437 555 676

General Notes

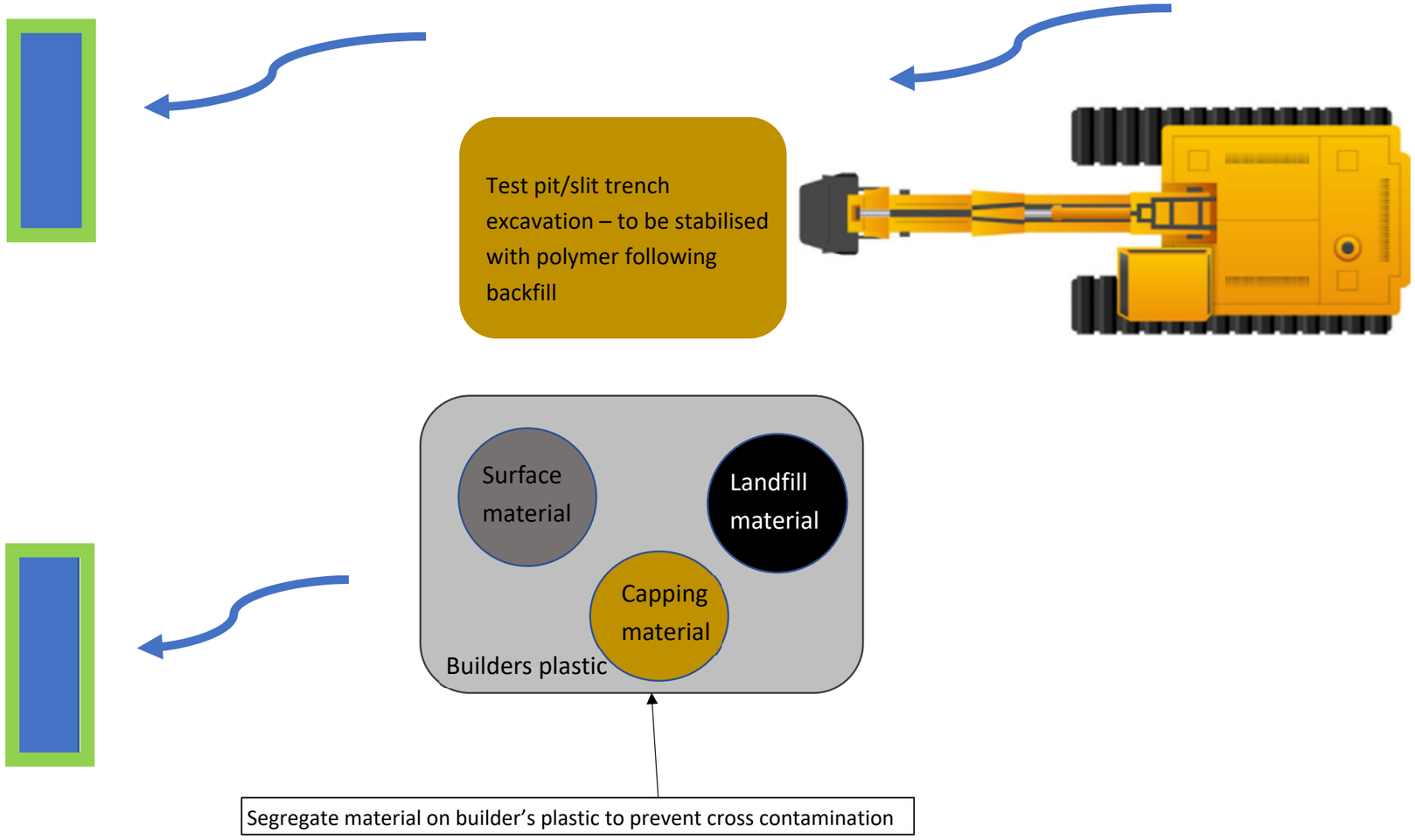
1. This plan will be read on conjunction with relevant environmental documentation i.e. CEMP, SWMP and relevant sub-plans.
2. Weather forecasts to be regularly monitored.
3. The principle of minimum disturbance to existing vegetation to be implemented with 'no-go' zones isolated with flagging.
4. Priority to be placed on the construction of permanent drainage works for clean water management.
5. Clean, dirty and contaminated water runoff to be separated.
6. Temporary erosion and sediment controls to be installed prior to site disturbance where reasonable and feasible.
7. Stockpile locations are indicated on the plan where relevant with temporary controls as necessary.
8. The diversion of dirty water runoff to sediment treatment infrastructure is to be maximised.
9. Runoff control from formations/tops of fills to sediment treatment infrastructure to be via fill shaping, diversion drains/banks, earth bunds along top edges of fill batters discharging to batter drains and stormwater pits etc.
10. The locations of temporary controls on this plan are indicative only with actual locations to be determined during works.
11. Temporary controls in addition to those shown on this PESCP to be constructed/installed as required and consist of (a) Erosion controls e.g. windrows on contours to reduce slope length and surface flow velocities; and (b) Sediment controls e.g. sediment fences, mulch sediment traps, mulch bund sediment traps.
12. Disturbed areas are to be progressively stabilised e.g. temporary treatments such as polymer binder, revegetation, geofabric or hardstand where appropriate.
13. Controls removed, damaaged or disturbed during works to be reinstated prior to forecast rain.
14. Areas to be fully secured with controls prior to any temporary suspension of works.
15. Controls to be implemented prior to forecast significant rainfall (>80% chance of >20mm).
16. Mulch to be stored and managed in accordance with the SWMP.
17. Dewatering to be conducted in accordance with the SWMP.
18. The tracking of mud/dirt onto local roads to be monitored and controlled.
19. Dust to be controlled onsite and along unsealed roads with controls such as water carts, limiting vehicle speeds, mulch blankets etc.
20. Temporary controls to be inspected weekly and prior to significant rainfall events. Maintenance/repairs to be undertaken as required.
21. This plan has been prepared as per the Blue Book Guidelines and standard drawings.
22. This plan is to be revised when required e.g. change in construction methods and/or site conditions.

Rev #	Reviewed by JHSW Environmental Rep	Date	Signature	Reviewed by Area Manager/Superintendent	Date	Signature	Endorsed by Soil Conservationist	Date	Signature
A							**John Wright (TREES P/L)**	**07/02/21**	

Progressive Erosion & Sediment Control Plan 01— Rev A

Activity 1—Contamination Investigation Works – Test pits

Plan View



Construction Methodology:

1. Works to be planned during dry conditions where practicable.
2. Install sediment controls around any downstream waterways i.e. stormwater drains, flow lines etc. Controls may include gravel socks, sediment fence etc. depending on ground conditions (refer to standard drawings)
3. Place builders plastic next to the test pit location.
4. Excavate the test pit ensuring that different material is stockpiled separately on the builders plastic to prevent cross contamination.
5. Water down the material if excessive dust generation is observed.
6. Once contamination testing is complete, backfill the test pit with the excavated material in reverse order. Ensure adequate compaction of the capping layer material is conducted.
7. Once backfilling is complete, stabilise the disturbed area with polymer. If rainfall is imminent or there is high chance of rainfall within 24 hours, cover the excavated area with geofabric.
8. If there is any excess material, place in a covered skip bin or local stockpiles and cover with builders plastic.
9. If material is being be disposed offsite, waste classification to be conducted in accordance with the EPA Waste Classification Guidelines. To be disposed of at an appropriately licensed facility.

Additional Construction Notes:

1. This PESCP will be applied to all test pits for contamination works. Depending on each test pit location and environmental constraints, slight variations from this PESCP may be required.
2. Map not to scale. Locations of controls in this PESCP are indicative only.
3. This PESCP was developed in consultation with the project Soil Conservationist.
4. Control to be installed in accordance with the Blue Book.

	Test pit excavation/footprint		Surface material stockpile		Landfill material stockpile		Pit protection i.e. gravel filter socks, sediment fence		Machinery i.e. excavator
	Builders plastic		Capping material stockpile		Stormwater drain/ receiving waters		Clean water flow		

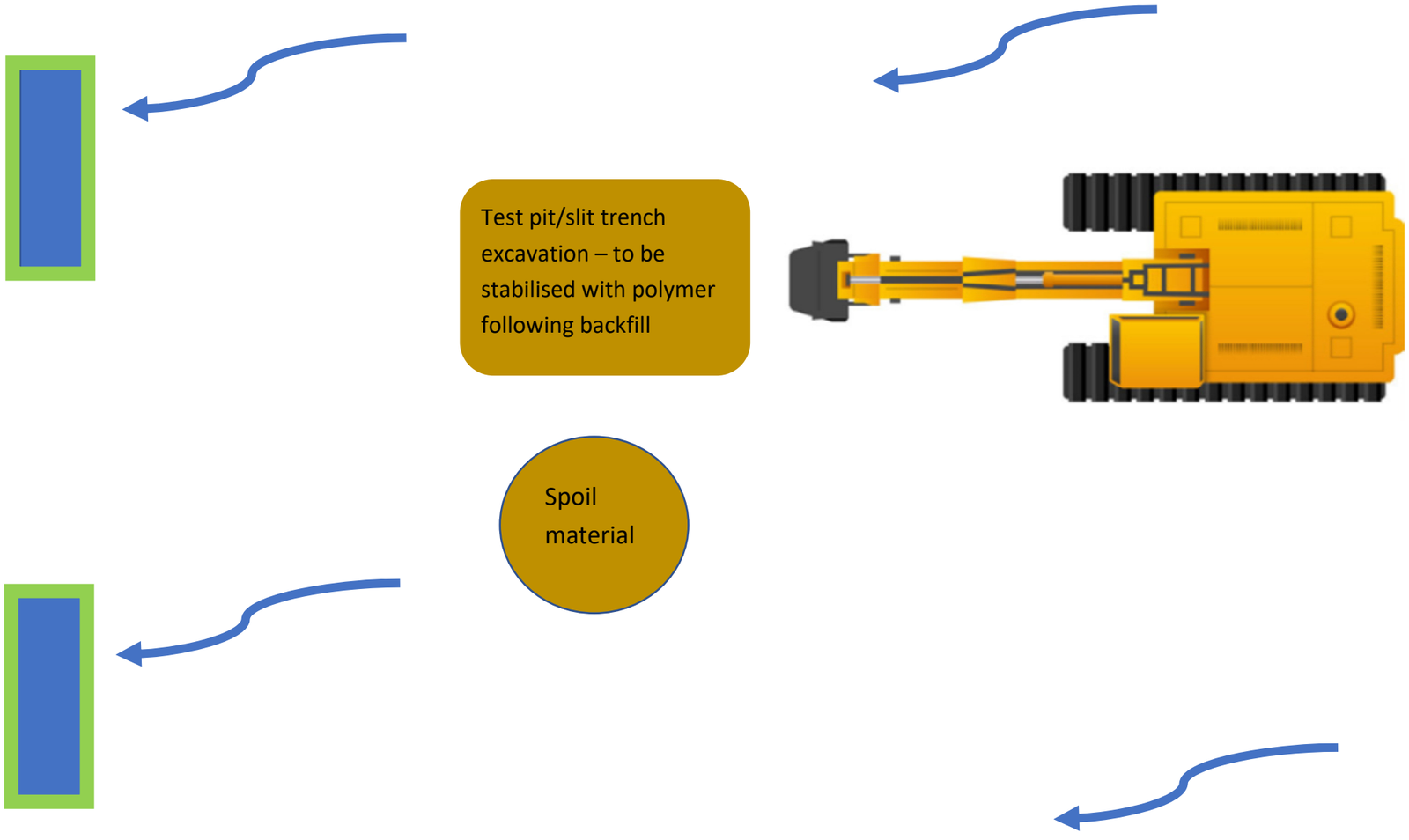
Progressive Erosion & Sediment Control Plan 01— Rev A

Activity 2—Geotechnical and Utility Investigation Works – Test pits, slit trenches

SYDNEY GATEWAY

A Joint Venture Project JOHN HOLLAND SEYMOUR WHYTE

Plan View



Construction Methodology:

1. Works to be planned during dry conditions where practicable.
2. Install sediment controls around any downstream waterbodies i.e. stormwater drains, flow lines etc. Control may include gravel socks, sediment fence etc. depending on ground conditions (refer to standard drawings)
3. Excavate the test pit and temporarily store adjacent to the excavation
4. Water down the material if excessive dust generation is observed.
5. Once testing is complete, backfill the test pit with the excavated material.
6. Once backfilling is complete, stabilise the disturbed area with polymer. If rainfall is imminent or there is high chance of rainfall within 24 hours, cover the excavated area with geofabric.
7. If there is any excess material, place in a covered skip bin or local stockpiles and cover with builders plastic.
8. If material is being be disposed offsite, waste classification to be conducted in accordance with the EPA Waste Classification Guidelines. To be disposed of at an appropriately licensed facility.

Additional Construction Notes:

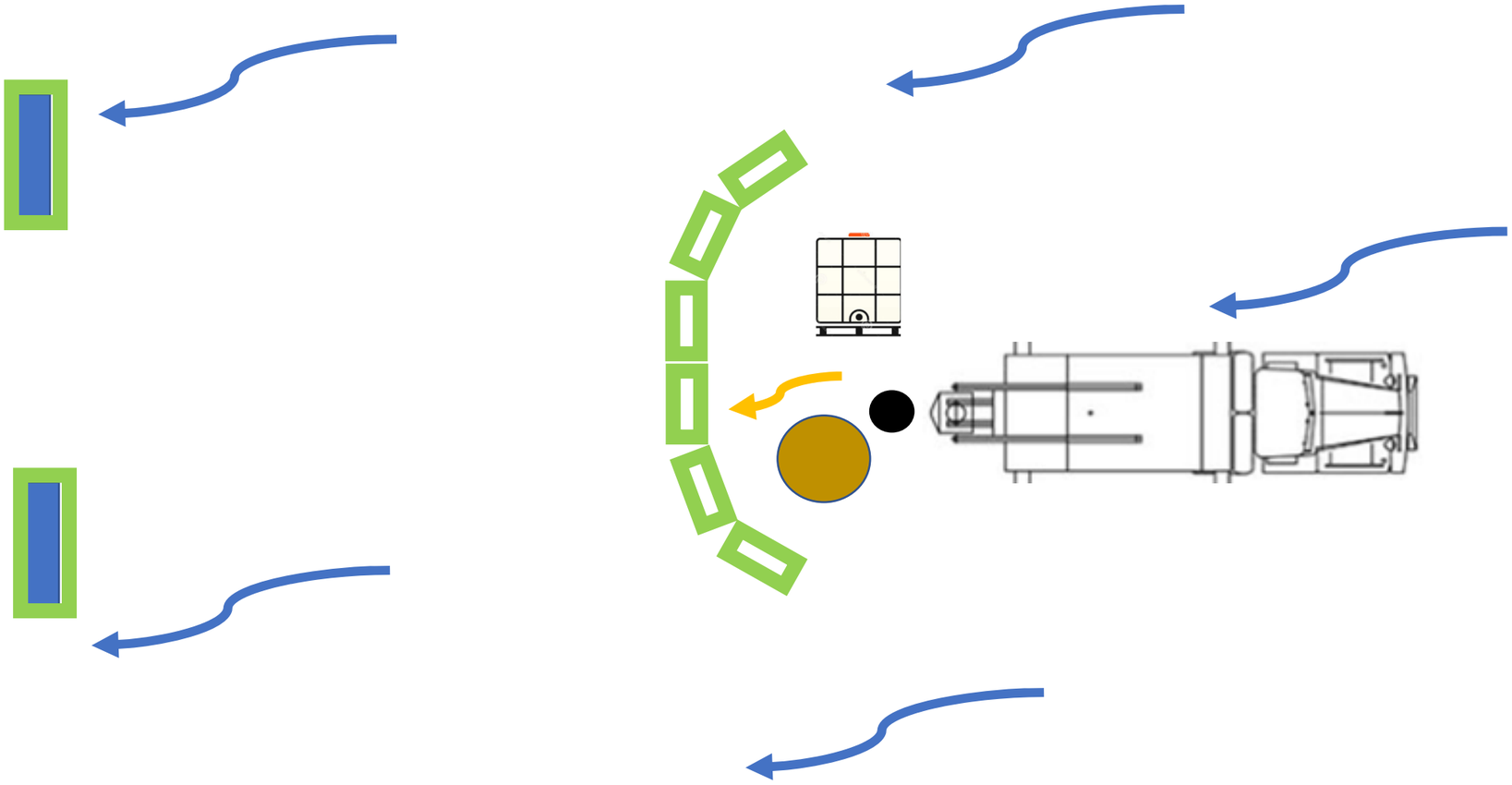
1. This PESCP will be applied to all test pits for contamination works. Depending on each test pit location and environmental constraints, slight variations from this PESCP may be required.
2. Map not to scale. Locations of controls in this PESCP are indicative only.
3. This PESCP was developed in consultation with the project Soil Conservationist.
4. Control to be installed in accordance with the Blue Book.

	Test pit excavation/footprint		Stormwater drain/ receiving waters		Pit protection i.e. gravel socks, sediment fence		Machinery i.e. excavator
	Builders plastic or geofabric		Spoil material		Clean water flow		

Progressive Erosion & Sediment Control Plan 01— Rev A

Activity 3—Geotechnical and contamination boreholes

Plan View



Construction Methodology:

1. Works to be planned during dry conditions where practicable.
2. Install sediment controls around any downstream waterbodies i.e. stormwater drains, flow lines etc. Control may include gravel socks, sediment fence etc. depending on ground conditions (refer to standard drawings)
3. Excavate the test pit and temporarily store adjacent to excavation.
4. Water down the material if excessive dust generation is observed.
5. Once testing is complete, backfill the test pit with the excavated material.
6. Once backfilling is complete, stabilise the disturbed area with polymer. If rainfall is imminent or there is high chance of rainfall within 24 hours, cover the excavated area with geofabric.
7. If there is any excess material, place in a covered skip bin or local stockpiles and cover with builders plastic.
8. If material is being be disposed offsite, waste classification to be conducted in accordance with the EPA Waste Classification Guidelines. To be disposed of at an appropriately licensed facility.

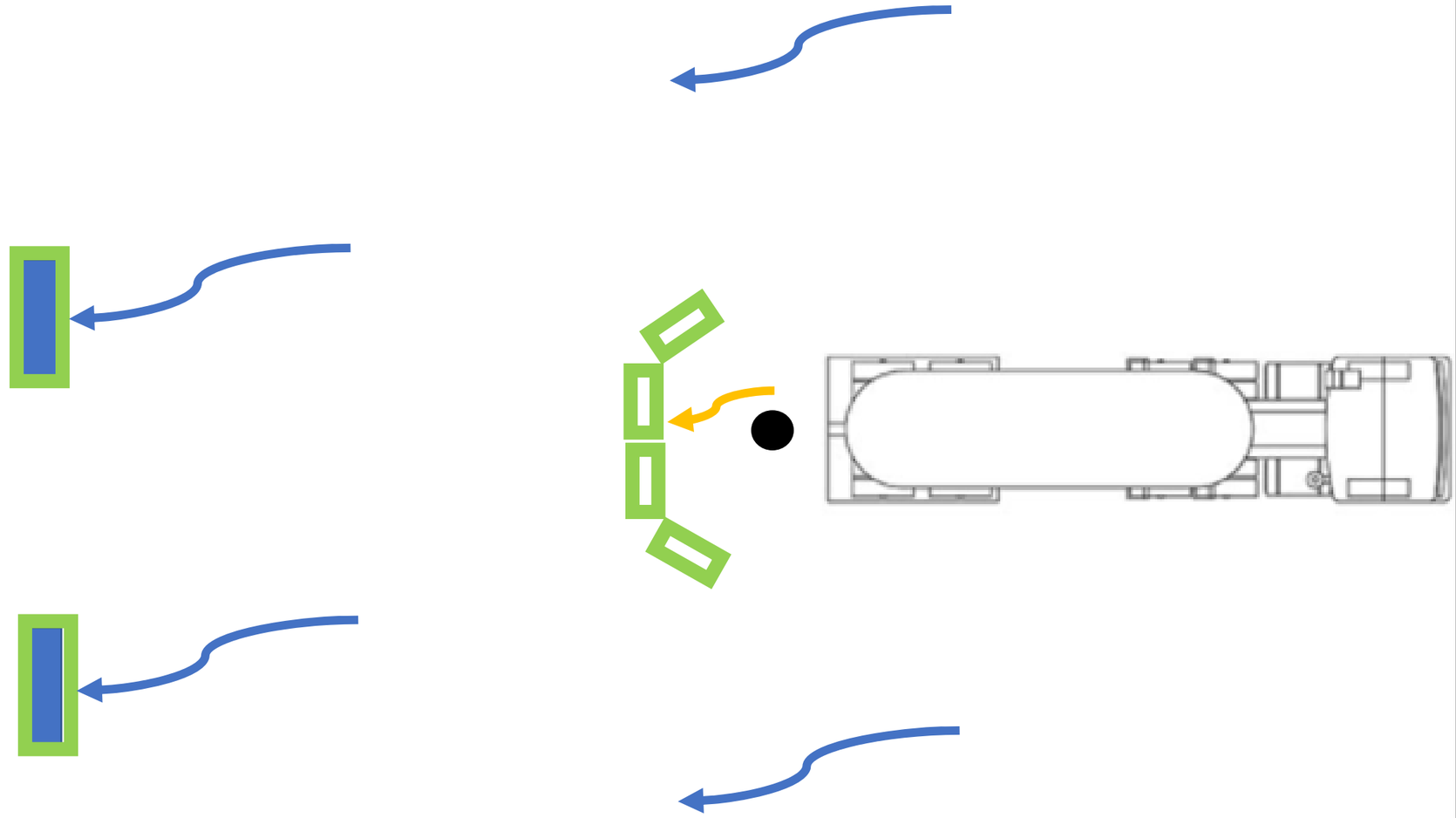
Additional Construction Notes:

1. This PESCP will be applied to all test pits for contamination works. Depending on each test pit location and environmental constraints, slight variations from this PESCP may be required.
2. Map not to scale. Locations of controls in this PESCP are indicative only.
3. This PESCP was developed in consultation with the project Soil Conservationist.
4. Control to be installed in accordance with the Blue Book.

	Spoil stockpile if required		Stormwater drain/ receiving waters		Pit protection i.e. gravel socks, sediment fence		Construction water flow		Receptacle to store construction water if required e.g. IBC
	Geotech drill rig		Borehole footprint		Clean water flow		Borehole rig		

Progressive Erosion & Sediment Control Plan 01— Rev A

Activity 4—Utility Investigations – potholing



	Stormwater drain/ receiving waters		Pit protection i.e. gravel socks, sediment fence		Construction water flow		Receptacle to store construction water if required e.g. IBC
	Borehole footprint		Clean water flow		Vacuum Truck		

Construction Methodology:

1. Works to be planned during dry conditions where practicable
2. Install sediment controls around any downstream waterbodies i.e. stormwater drains, flow lines etc. Control may include gravel socks, sediment fence etc.
3. Undertake Non-Destructive Digging (NDD) using Vacuum Truck. Transport Vacuum truck waste material to liquid waste skip bins at C1 compound.
4. Once positive identification is complete, backfill the Pothole with clean road base material.
5. Once backfilling is complete, stabilise the disturbed area with cold-mix asphalt. If rainfall is imminent or there is high chance of rainfall within 24 hours, complete backfill and stabilisation.
6. If material is being be disposed offsite, waste classification to be conducted in accordance with the EPA Waste Classification Guidelines. To be disposed of at an appropriately licensed facility.

Additional Construction Notes:

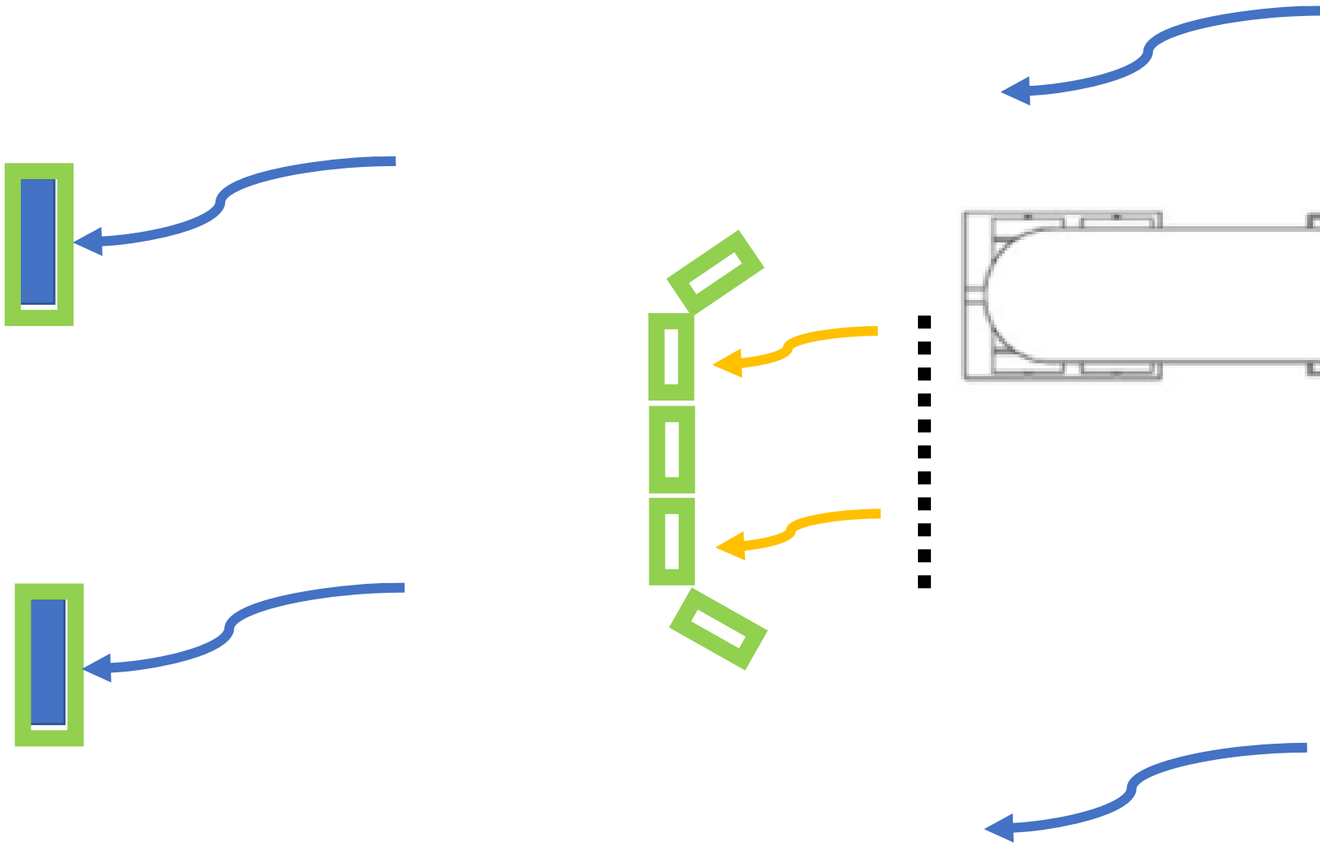
1. This PESCP will be applied to all test pits for utilities investigations. Depending on each test pit location and environmental constraints, slight variations from this PESCP may be required.
2. Map not to scale. Locations of controls in this PESCP are indicative only.
3. This PESCP was developed in consultation with the project Soil Conservationist.
4. Control to be installed in accordance with the Blue Book.

Potholing Notes:

1. If the potholing location is located directly adjacent to a waterbody/drain, additional sandbags will be installed around the potholing location to contain any sediment laden water runoff.
2. Suck truck waste to be disposed of at licensed of disposal facility (classification TBD by contamination consultant) OR in on-site storage receptacles.

Progressive Erosion & Sediment Control Plan 01— Rev A

Activity 5—Concrete/saw cutting



Construction Methodology:

1. Works to be planned during dry conditions where practicable.
2. Install sediment controls around any downstream waterbodies i.e. stormwater drains, flow lines etc. Control may include gravel socks, sediment fence etc. (refer to standard drawings)
3. Place sandbags downslope/ around the sawcut location
4. Utilise vacuum truck to remove any slurry generated by sawcutting
5. Transport Vacuum truck waste material to liquid waste skip bins at C1 compound.
6. If material is being be disposed offsite, waste classification to be conducted in accordance with the EPA Waste Classification Guidelines. To be disposed of at an appropriately licensed facility.

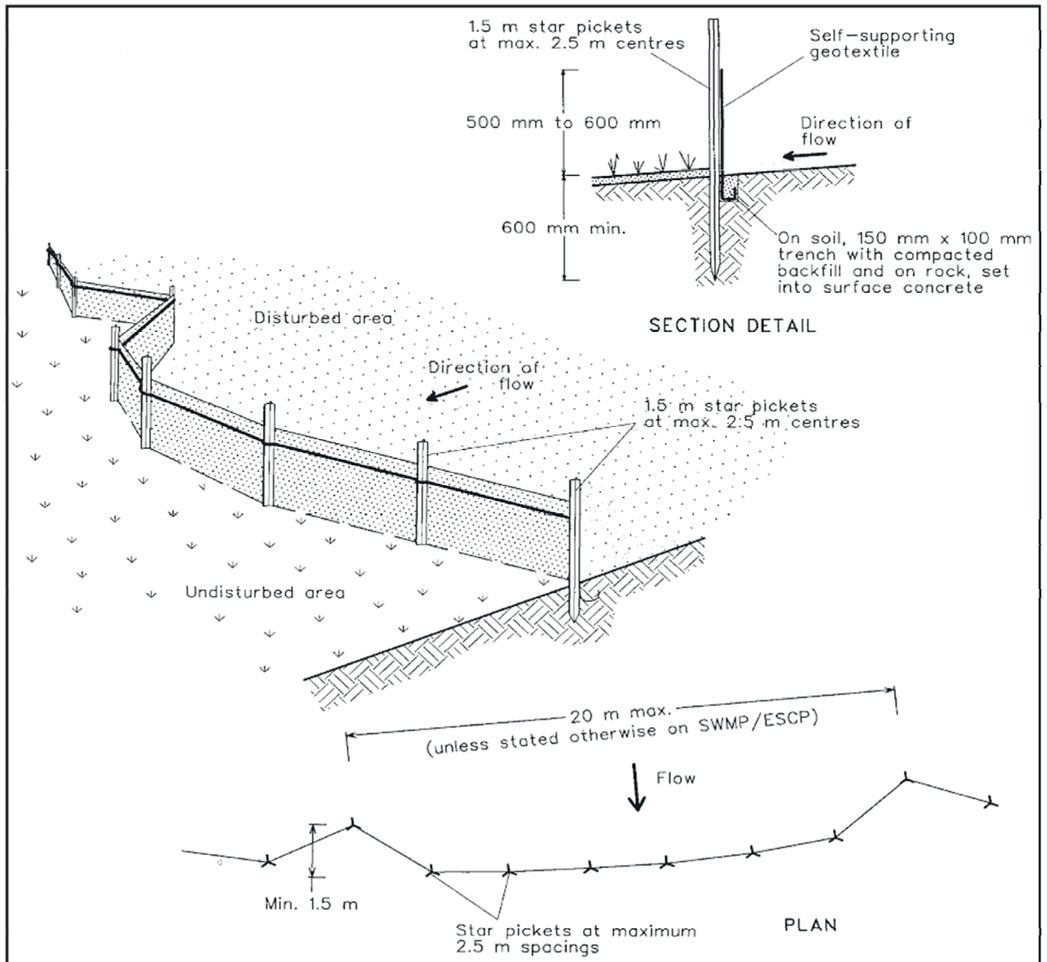
Additional Construction Notes:

1. This PESCP will be applied to all test pits for contamination works. Depending on each test pit location and environmental constraints, slight variations from this PESCP may be required.
2. Map not to scale. Locations of controls in this PESCP are indicative only.
3. This PESCP was developed in consultation with the project Soil Conservationist.
4. Control to be installed in accordance with the Blue Book.

	Stormwater drain/ receiving waters		Sand bag		Construction water flow		
	Concrete/saw cutting location		Clean water flow		Vacuum Truck		

Progressive Erosion & Sediment Control Plan 01— Rev A

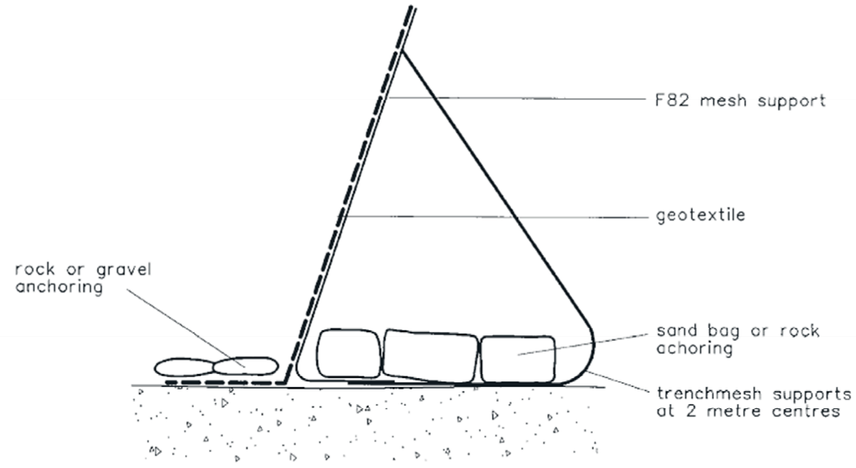
Standard drawings to be used throughout the works – sourced from the Blue Book



Construction Notes

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

SEDIMENT FENCE **SD 6-8**



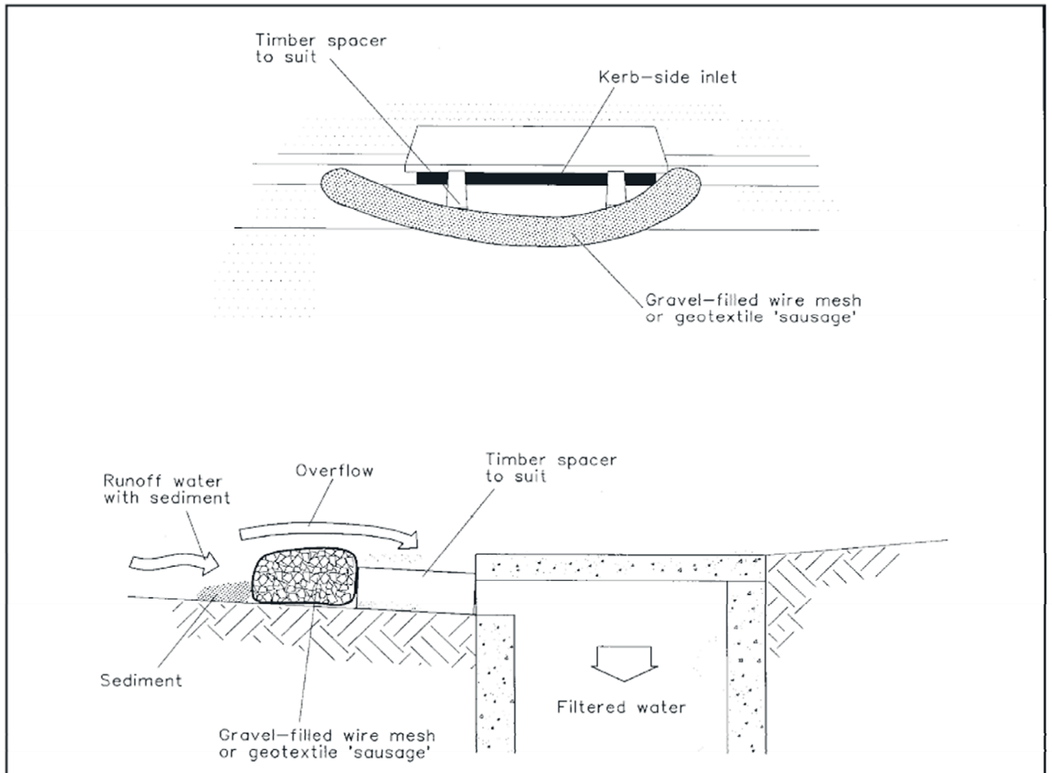
Construction Notes

1. Install this type of sediment fence when use of support posts is not desirable or not possible. Such conditions might apply, for example, where approval is granted from the appropriate authorities to place these fences in highly sensitive estuarine areas.
2. Use bent trench mesh to support the F82 welded mesh facing as shown on the drawing above. Attach the geotextile to the welded mesh facing using UV resistant cable ties.
3. Stabilise the whole structure with sandbag or rock anchoring over the trench mesh and the leading edge of the geotextile. The anchoring should be sufficiently large to ensure stability of the structure in the design storm event, usually the 10 year event.

ALTERNATIVE SEDIMENT FENCE **SD 6-9**

Progressive Erosion & Sediment Control Plan 01— Rev A

Standard drawings to be used throughout the works – sourced from the Blue Book

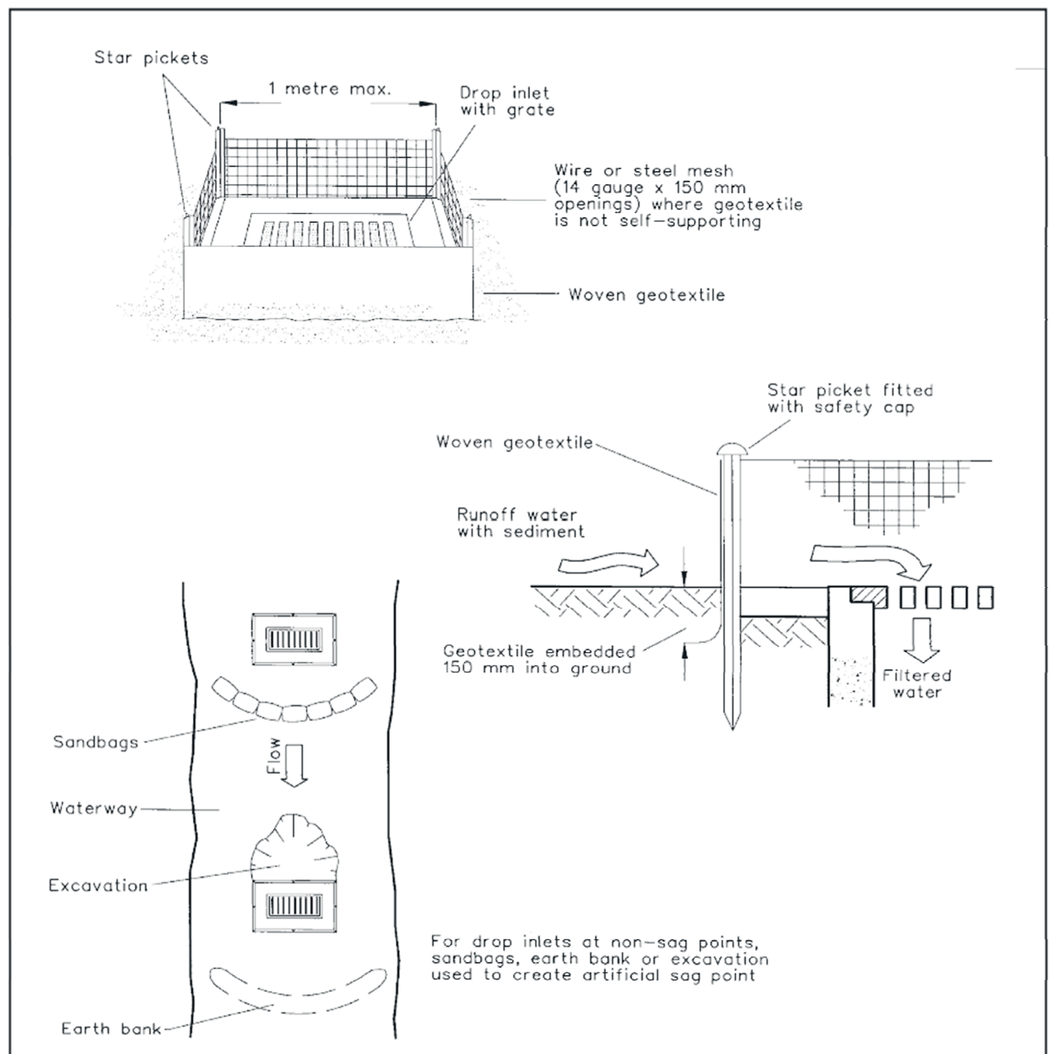


NOTE: This practice only to be used where specified in an approved SWMP/ESCP.

Construction Notes

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

MESH AND GRAVEL INLET FILTER **SD 6-11**



Construction Notes

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

GEOTEXTILE INLET FILTER **SD 6-12**

Progressive Erosion & Sediment Control Plan 01— Rev A

Standard drawings to be used throughout the works – sourced from the Blue Book

MATERIALS

SOCKS: MINIMUM 200mm DIAMETER SYNTHETIC OR BIODEGRADABLE TUBES MANUFACTURED FROM NON-WOVEN OR COMPOSITE FABRIC SUITABLE FOR THE 'FILTRATION' OF COARSE SEDIMENTS.

FILL MATERIAL: STRAW, CANE MULCH, COMPOSTED MATERIAL (AS4454), COARSE SAND, OR CLEAN AGGREGATE.

STAKES: MINIMUM 25 x 25mm TIMBER.

INSTALLATION

1. REFER TO APPROVED PLANS FOR LOCATION AND INSTALLATION DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, DIMENSIONS OR METHOD OF INSTALLATION CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. WHEN PLACED ACROSS NON-VEGETATED OR NEWLY SEEDED SLOPES, THE FILTER SOCKS MUST BE PLACED ALONG THE CONTOUR.

3. IF PLACED ON OPEN OR LOOSE SOIL, ENSURE THE FILTER SOCKS ARE TRENCHED 50 TO 100mm INTO THE GROUND.

4. ENSURE THE OUTER MOST ENDS OF EACH FILTER SOCK OR CONTINUOUS ROW OF FILTER SOCKS ARE TURNED UP THE SLOPE TO ALLOW WATER TO ADEQUATELY POND UP-SLOPE OF THE SOCKS, AND TO MINIMISE FLOW BYPASSING.

5. ENSURE THE ANCHORING STAKES ARE DRIVEN INTO THE END OF EACH SOCK AND ALONG THE LENGTH OF EACH SOCK AT A SPACING NOT EXCEEDING 1.2m OR SIX TIMES THE SOCK DIAMETER (WHICHEVER IS THE LESSER).

7. ADJOINING SOCKS MUST BE OVERLAPPED AT LEAST 450mm, NOT ABUTTED.

MAINTENANCE

1. INSPECT ALL FILTER SOCKS PRIOR TO FORECAST RAIN, DAILY DURING EXTENDED PERIODS OF RAINFALL, AFTER SIGNIFICANT RUNOFF PRODUCING STORMS OR OTHERWISE AT WEEKLY INTERVALS.

2. REPAIR OR REPLACE DAMAGED FILTER SOCKS.

3. REMOVE COLLECTED SEDIMENT AND DISPOSE OF IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

REMOVAL

1. ALL EXCESSIVE SEDIMENT TRAPPED BY THE FILTER SOCKS MUST BE REMOVED FROM THE DRAIN OR SLOPE IF SUCH SEDIMENT IS LIKELY TO BE WASHED AWAY BY EXPECTED FLOWS.

2. DISPOSE OF COLLECTED SEDIMENT IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

3. ALL SYNTHETIC (PLASTIC) MESH OR OTHER NON READILY BIODEGRADABLE MATERIAL MUST BE REMOVED FROM THE SITE ONCE THE SLOPE OR DRAIN IS STABILISED, OR THE SOCKS HAVE DETERIORATED TO A POINT WHERE THEY ARE NO LONGER PROVIDING THEIR INTENDED DRAINAGE OR SEDIMENT CONTROL FUNCTION.

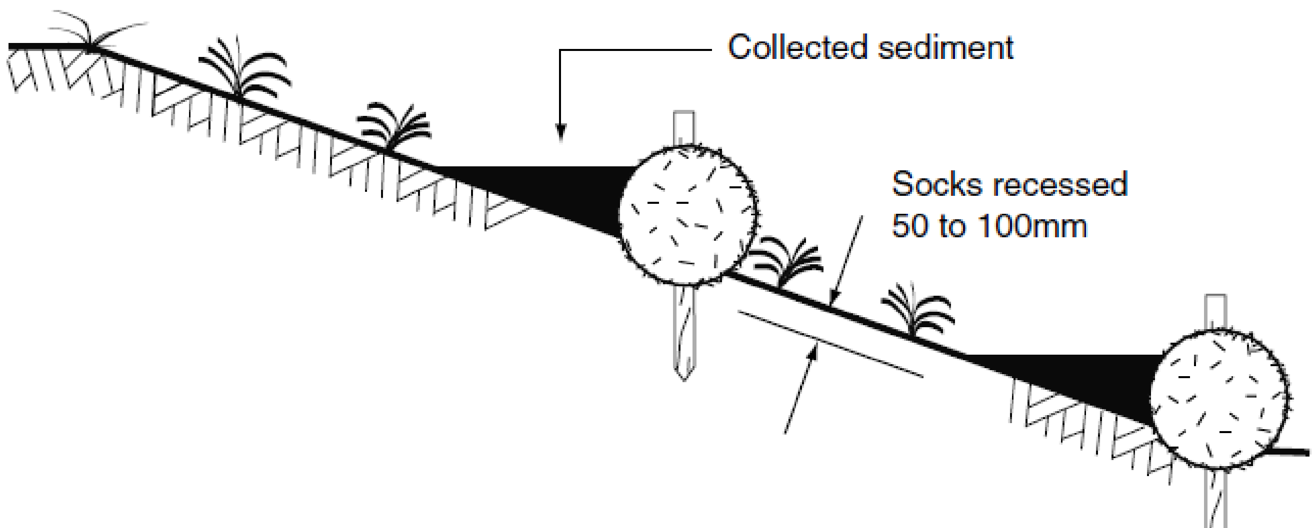


Figure 1 - Placement of filter socks

Drawn:	Date:		
GMW	Dec-09	Filter Socks - Sheet Flow	FS-02

Appendix B – Acid Sulphate Soils Management Plan

Appendix B

Acid Sulfate Soil Management Sub Plan

Sydney Gateway Road Project

June 2021

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Contents

Document control

Approval and authorisation

Title	Sydney Gateway Road Project Acid Sulphate Soils Management Sub-Plan
Endorsed by Environment Representative	Cameron Weller
Signed	
Dated	
Approved on behalf of NSW Roads and Maritime Services by	Mark Stevenson Project Director
Signed	
Dated	
Approved on behalf of John Holland Seymour Whyte JV by	Ivan Karaban Project Director
Signed	
Dated	

Document status

Revision	Date	Description	Approval
Draft	29/1/21	Internal Draft	
A	24/04/2021	Issued for consultation	
B	29/06/2021	Updated to amend formatting and issued for Approval to DPIE	IK

Distribution of controlled copies

This ASSMP as part of the CEMP is available to all personnel and sub-contractors via the Project document control management system. An electronic copy can be found on the Project website.

The document is uncontrolled when printed. One controlled hard copy of the ASSMP as part of the CEMP and supporting documentation will be maintained by the Quality Manager at the Project office [and on the project website].

Copy number	Issued to	Version
1	Transport for New South Wales	
2	Independent Verifier	
3	Environmental Representative	
4	Project Director	
5	Environment and Sustainability Manager	

Glossary / Abbreviations

Abbreviation	Expanded Text
ACM	Asbestos containing material
ANC	Acid Neutralising Capacity. Measurement of a soil's ability to neutralise or buffer acid. Conventionally expressed as Equivalent % CaCO3
ASM	Acid Sulfate Material
ASR	Acid Sulfate Rock
ASSMP	Acid Sulfate Soil Management Plan
CEMP	Construction Environmental Management Plan
CLM Act	*Contaminated Land Management Act 1997*
CoA	Conditions of Approval
DP&E	Department of Planning and Environment
DPI	Department of Primary Industries
EIS	Environmental Impact Statement
EEC	Endangered Ecological Community
EPA	NSW Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
EWMS	Environmental Work Method Statements
MDP	Major Development Plan
MSO	Monosulfidic Black Ooze
OEH	Office of Environment and Heritage
PASM	Potential Acid Sulfate Soil
PESCP	Progressive Erosion and Sediment Control Plan
POEO Act	*Protection of the Environment Operations Act 1997*
RAP	Remediation Action Plan
Roads and Maritime	Roads and Maritime Services
SAR	Site Audit Report
SAS	Site Audit Statement
SCR	Chromium Reducible Sulphur
SPOCAS	Suspension Peroxide Oxidation Combined Activity and Sulphur
TSC Act	*Threatened Species Conservation Act 1995*
UMM	Updated Management Measures
VENM	Virgin Excavated Natural Material

1 Introduction

1.1 Context

This Acid Sulfate Soil Management Plan (ASSMP) forms part of the Construction Environmental Management Plan (CEMP) for the Sydney Gateway Road Project (the Project). This ASSMP has been prepared to address the requirements of the Project Conditions of Approval (COA), as amended by the Submissions Report Updated Mitigation Measures (UMM), the Project Environmental Impact Statement/Major Development Plan (EIS/MDP), Transport for NSW Specifications D&C G36 (Environmental Protection) and G38 (Soil and Water Management), and all applicable legislation.

1.2 Background

The assessments undertaken in the EIS/MDP Chapter 13 and Technical Working Paper 5 Contamination and Soils identify that there is a low probability of ASS occurrence within the project site except for bottom sediments in Alexandra Canal and potentially in disturbed terrain. The project site is located on Class 1, Class 2 and Class 3 land.

The implementation of the management and mitigation procedures will assist to mitigate risks associated with the disturbance and management of acid sulfate soils..

2 Purpose and objectives

2.1 Purpose

The purpose of this ASSMP is to establish a set of best practice procedures for the identification and management of actual acid sulfate soil (ASS), potential acid sulfate soil (PASS), monosulfidic black ooze (MBO) and acid sulfate rock (ASR) if encountered during construction of the project. The terms ASS, PASS, MBO and ASR are referred to as acid sulfate materials (ASM) throughout this plan.

This plan has been prepared to address the applicable statutory requirements and aims to ensure that the commitments with regard to contaminated land are met.

2.2 Objectives

The key objective of the ASSMP is to ensure all CoA, environmental management measures and licence/permit requirements relevant to contaminated land are described, scheduled and assigned responsibility as outlined in:

- The environmental impact assessment prepared for Sydney Gateway Road Project
- Conditions of Approval granted to the project on 27 August 2020
- Roads and Maritime specifications G36, G38 and G40
- Environmental Protection Licence (# TBC)

The objectives of the plan will be to reduce the potential for environmental impacts caused by acid leachate from ASM, if encountered, will be achieved by implementing the following measures:

- ensure appropriate controls and procedures are implemented during construction activities to avoid or minimise potential adverse impacts from ASM along the project corridor
- provide staff with an increased level of understanding and awareness of ASM and their management
- ensure appropriate measures are implemented to comply with all relevant legislation, standards and guidelines as described in Section 3.1
- ensure appropriate measures are implemented to address the requirements of site approvals, licences or permits, the relevant updated mitigation measures (UMM) detailed in the EIS/MDP as amended by the Submissions Report, in addition to the Transport for NSW (TfNSW) G36 and G38 specification requirements (see Table 3-1 and Table 7-1).

3 Environmental Requirements

3.1 Relevant legislation and guidelines

3.1.1 Legislation

Legislation and regulations relevant to ASS management includes:

- Environmental Planning and Assessment Act 1979 (EP&A Act)
- Contaminated Land Management Act 1997 (CLM Act)
- Protection of the Environment Operations Act 1997 (POEO Act)
- Work Health and Safety Act 2011
- Protection of the Environment Operations (Waste) Regulation 2014
- Work Health and Safety Regulation 2017 and
- Waste Management and Resource Recovery Act 2016.

3.1.2 Guidelines and standards

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

- TfNSW QA Specification G36 – Environmental Protection
- TfNSW QA Specification G38 – Soil and Water Management
- Guidelines for the Management of Acid Sulfate materials: Acid Sulfate Soils, Acid Sulfate Rock and Monosulfidic Black Ooze (Roads and Maritime, 2005)
- Acid Sulfate Soil Manual (NSW Acid Sulfate Soil Management Advisory Committee, 1998)
- Acid Sulfate Soil and Rock Publication 655.1 (EPA Victoria, July 2009)
- Guidelines for the Use of Acid Sulfate Soil Risk Maps (2nd ed) (DLWC, 1998)
- Waste Classification Guidelines Part 4: Acid Sulfate Soils (NSW EPA, 2014)
- State Planning Policy 2/02 Guideline: Planning and Managing Development Involving Acid Sulfate Soil (Queensland Government, 2002)
- Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils in Queensland (Ahern, C.R., Ahern, M R & Powell, B, 1998.

3.2 Relevant Conditions of Approval and Updated Mitigation Measures

The table below details relevant approval conditions and updated mitigation measures that inform the development of this Plan. A cross reference is also included to indicate where the condition is addressed in this Plan or other Project management documents.

Table 3-1 Environmental management measures relevant to this ASSMP

Outcome	Ref #	Commitment	Timing	ASSMP Reference
Manage potential soil and water quality impacts during construction as a result of disturbance of ASM	CS9	A Construction Soil and Water Management Plan will be prepared as part of the CEMP and implemented during construction. The plan will detail processes, responsibilities and measures to manage potential soil and water quality impacts during construction, including potential impacts associated with the presence of existing contamination, stockpile management, saline soils and **acid sulfate soils**.	Pre-construction	This plan
	CS10	An Acid Sulfate Soils Management Plan will be prepared as part of the Construction Soil and Water Management Plan in accordance with the Acid Sulfate Soils Assessment Guidelines (ASSMAC, 1998). The plan will define the process and measures to manage actual and potential acid sulfate soil and sediment disturbed during construction. The plan will include a summary of available acid sulfate soil information relevant to the project site and identify any further soil/water analysis required as a precursor to implementing the management plan. Acid sulfate soils will be disposed off site (where required) in accordance with the Waste Classification Guidelines - Part 1 and Part 4: Acid sulfate soils (NSW EPA, 2014).	Pre-construction	This Plan

Outcome	Ref #	Commitment	Timing	ASSMP Reference
Manage potential contamination of groundwater as a result of disturbance of ASM	GW6	The existing groundwater monitoring program will continue during construction, and will be supplemented as required, to: • Confirm if acidification of groundwater is occurring due to exposure of acid sulfate soils	Construction	This is addressed in the Groundwater Management Sub Plan
Identify potential areas of ASM and risks associated with disturbance of these materials	G38 2.1.2 c (i)	The Soil and Water Management Plan (SWMP) must identify all risks relating to soil erosion, and pollution caused by sediments and other materials, and describes how these risks will be addressed during construction. The SWMP must include details of the following, where relevant: • soil properties (including dispersion properties and presence of acid sulphate soils);	Pre-construction	This is addressed in the Soil and Water Management Sub Plan.

4 Existing Environment

This section describes the existing environment of the Project, specific to known or suspected ASM. It also summaries previous investigations undertaken to date and outlines further investigation required.

4.1 Types of Acid Sufate Soils

There are two main types of acid sulfate materials which are expected to occur at the project location:

1. **Potential Acid Sulfate Soils (PASS)**: PASS contains iron sulfides or sulfidic material which has not been exposed to air and oxidised. These soils are located in an oxygen deficient environment, typically below the water table. The field pH of these soils is typically 4 or higher, sometimes ranging into the alkaline. The sulfides/sulfidic materials oxidise once exposed to air with the potential to generate sulfuric acid, and hence pose risks to the surrounding aquatic and terrestrial environment through acid run-off.

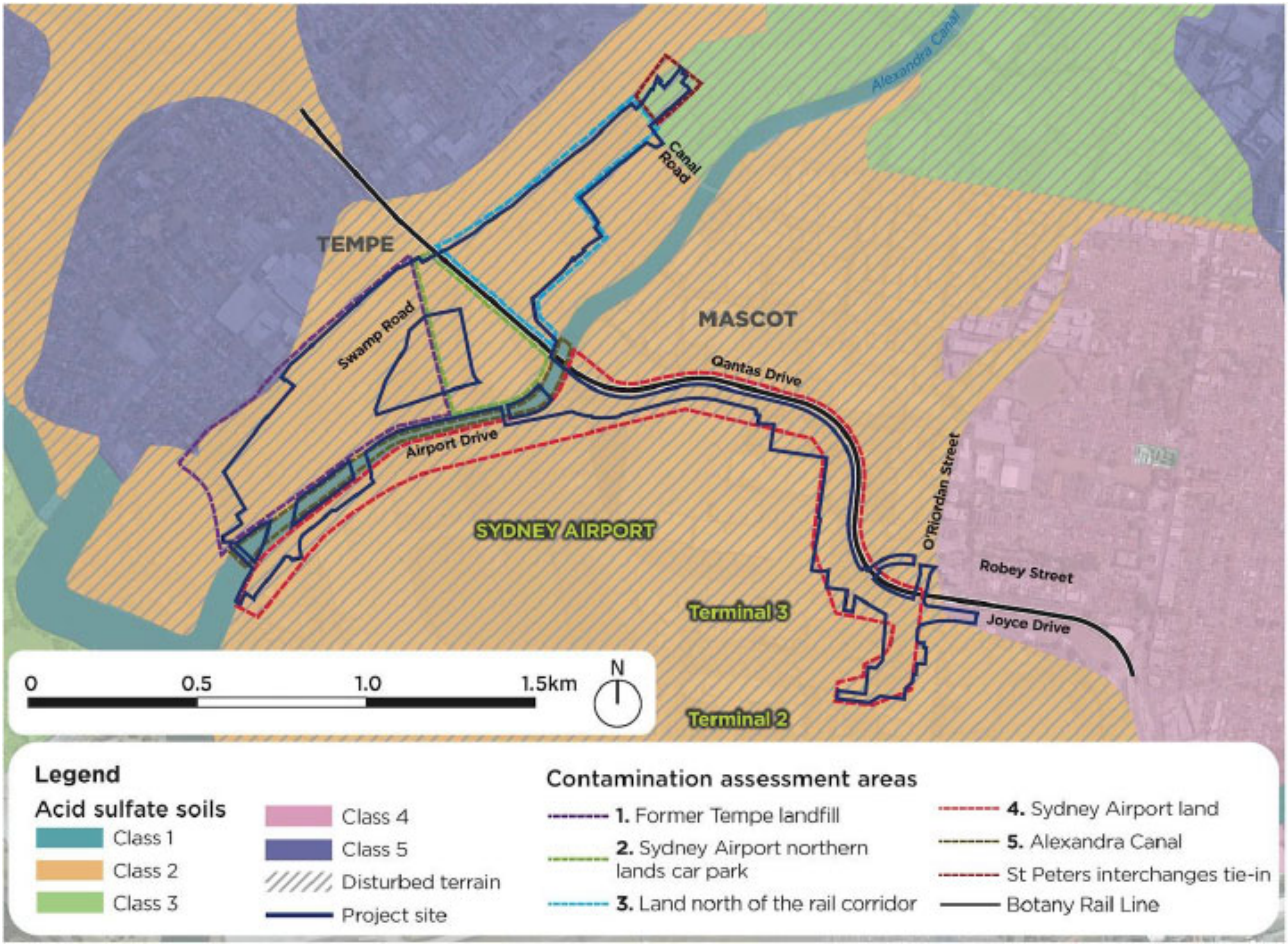
2. **Actual Acid Sulfate Soils (ASS)**: ASS are soils that contain highly acidic layers, which is a result of the oxidation of soil materials that are rich in iron sulfides. ASS can have field pH measurements of 4 or less in dry conditions and are typically characterised as possessing pale yellow mottling. This mottling is caused by the presence of the mineral Jarosite, a product of the oxidation of iron sulfides which generally requires a pH <3.7 to form. ASS may also contain dissolved metals such as aluminium, which can be toxic to aquatic fauna and flora.

Where ASS is stockpiled on site the potential exists that rain events could result in acidic runoff which may impact surface waters if runoff is not managed appropriately.

4.2 Previous investigations

Acid sulfate risk classifications for land within and in the vicinity of the project site has been initially derived from existing mapping. The risk classifications are based on the NSW Government acid sulfate soil risk mapping and are shown on Figure 1.

Figure 4.1 – Acid Sulfate Soil risk mapping (EIS/MDP Chapter 13)



Based on the mapping in Figure 4.1, the project areas and activities which have the potential to disturb ASM are identified in Table 4.1.

Table 4.1 – Acid sulfate soil classification and exposure risk

Location	Acid Sulfate Soil Class	Work that would potentially expose acid sulfate soils
Alexandra Canal	1	Any work below natural ground including: Outlet connections for stormwater discharge.
Former Tempe landfill (assessment area 1), Sydney Airport northern lands car park (assessment area 2), land north of the rail corridor (assessment area 3) and Sydney Airport land (assessment area 4)	2	Work beyond the natural ground surface and work by which the water table is likely to be lowered including: • Excavation for footings for reinforced soil walls ~1.5 metres below ground surface (mBGS) • Piling for Canal Road bridges (eastern side), ~15 mBGS • Piling for piers and abutments for bridge over Qantas Drive (~15 mBGS) • Piling for piers and abutments for bridges over Botany Rail Line and Airport Drive (~15 mBGS) • Excavation for footings for retaining

Location	Acid Sulfate Soil Class	Work that would potentially expose acid sulfate soils
		wall between bridge and the Tempe Landfill cut off wall and west of bridge (~2 mBGS) • Piling for piers and abutments for bridges over Alexandra Canal from Tempe Tip to Airport Drive (~15 mBGS) • Excavation for footings for retaining walls along Airport Drive and Qantas Drive (~2 mBGS) • Excavation for footing for retaining walls between Canal Road bridge and bridges over Botany Rail Line and Alexandra Canal (~2 mBGS) • Piling for piers and abutments for bridges over Botany Rail Line and Alexandra Canal (~15 mBGS) • Excavation for footing for retaining walls between Terminal 1 and 2 access bridge and Qantas Drive (~2 mBGS) • Piling for piers and abutments for bridge over Botany Rail Line and Alexandra Canal (~15 mBGS) • Services upgrade trenches (~1-3 mBGS)
St Peters interchange north of Canal Road	3	Work beyond one metre below natural ground surface and work by which the water table is likely to be lowered one metre below natural ground surface, including: • Excavation for footings for reinforced soil walls between St Peters Interchange and Canal Road (eastern side, ~1.5 mBGS) • Excavation for footings for reinforced soil walls under Canal Road bridges (eastern side, ~1.5 mBGS) • Piling for Canal Road bridges (eastern side, ~15 mBGS).
Joyce Drive, east of the intersection with O'Riordan Street	4	Work more than two metres below the natural ground surface and work by which the water table is likely to be lowered by more than two metres below natural ground surface.

4.3 Further investigations

During detailed design and prior to commencing major earthworks in areas noted as high risk of encountering PASS / ASS, a program of in-situ high-density targeted ASS / PASS soil sampling will be undertaken to identify and determine:

- The lateral and vertical extents of ASS/PASS (if any)
- Material texture and fineness
- Rates of liming.

Information obtained from this program will be used to:

- Quantify volumes of anticipated ASS / PASS
- Reduce holding times of ASS / PASS prior to liming
- Ensure correct liming rates are applied promptly to ensure efficiency in neutralisation
- Minimise intermixing of ASS / PASS with non – ASS / PASS materials on site.

4.4 Monosulfidic black ooze

Monosulfides and Monosulfidic Black Ooze (MBO) are characterised by their black and often oily appearance and, when disturbed, by the release of hydrogen sulfide (H_2S, also known as rotten egg gas). They generally accumulate in low energy ASS environments such as waterways and lagoons, forming thick 'blankets' of organic rich, gel like materials. When disturbed in significant quantities they can cause acidification of waterways and deoxygenation of waters. Where drains and wetlands are constructed MBO can continue to accumulate where favourable conditions exist, and present an ongoing management issue. It should be noted that MBO has not been identified along the project alignment to date during preliminary site investigations however may be present in some areas of the project such as Alexandra Canal, Sluice Gates and the Northern Pond area.

4.5 Acid sulfate rock

Acid Sulfate Rock (ASR) includes geological rock units that contain sulfide and sulfate minerals (pyrite). All rock has the potential to contain varying quantities of sulfide / sulfate minerals. Elevated concentrations are generally associated with metalliferous ore deposits and coal units, but can also occur in other forms such as uplifted marine sedimentary rocks and wind driven sediments containing pyrite. To date these materials have not been identified on the project.

Pyrite (FeS_2) can either be present as a fine (microscopic/framboidal) or a primary mineral (macroscopic). The particle size range will determine the rate and severity of reaction, with finer particles offering a higher proportional surface area to mass ratio, and hence quicker oxidisation rates. ASR much like ASS, is generally not a hazard when left in anaerobic conditions (below water table or deep within fine grained units with low oxygen diffusion rates). However, when fresh pyrite-containing rock is disturbed during road construction such as in deep cuttings or drainage excavations, oxidisation can occur through exposure to air and water.

The oxidisation and weathering process can lead to the generation of acidity, which then increases the solubility of sulfates. The leaching of sulfates and increase in acidity can degrade construction materials such as steel and concrete and potentially pollute water resources (surface and groundwater). Where rock units contain naturally elevated heavy metals concentrations, additional acidity may leach the currently bound metals into solution with damaging impacts on the surrounding environment. It should be noted that ASR has not been identified along the project

alignment to date during preliminary site investigations,any additional investigations required for detailed design etc will include assessment of these materials.

5 Environmental aspects and impacts

5.1 Construction activities

Construction activities can cause the exposure of ASR, ASS or oxidation of PASS material which can lead to environmental impacts. Some of the common causes of exposure and/or oxidation are:

- Excavation and exposure to air of ASR, ASS and PASS materials;
- Exposure of subsurface PASS material due to water table lowering activities (e.g. dewatering);
- Discharge of sub-surface water as a result of settlement due to pre-loading and reduction in available pore space (during settlement water is 'squeezed' out of the soil material), which may produce acidic leachate where it flows through oxidised ASS;
- Embankment settlement can depress the underlying material with respect to the water table. In some circumstances heave at the toe of the embankment by displacement may raise PASS material above the water table;
- Oxidation of pyrite in site won (rock from cuttings) or imported fill material.

Key aspects of the Project that could result in disturbance of ASM include:

- General earthworks, particularly during site establishment;
- Vegetation clearing (water table effects);
- Bulk earthworks;
- Operating, crushing and screening ASR;
- Work in waterways;
- Piling works.

5.2 Impacts

The potential for impacts will depend on a number of factors. Primarily impacts will be dependent on the nature, extent and magnitude of construction activities and their interaction with the natural environment. Potential impacts due to the interaction of PASS / ASS / ASR with construction can include:

- Weakening of concrete and steel infrastructure, resulting in increased maintenance and replacement costs;
- Damage to aquatic environments due to release of sulfuric acid generated from oxidised ASS during construction;
- Mobilisation of aluminium, iron and manganese from soils as a result of increased acidity from disturbance of ASS.

Chapter 6 of this ASSMP provides a suite of practical mitigation measures that will be implemented to avoid or minimise the impacts of PASS / ASS throughout the project.

6 Environmental control measures

Specific measures and requirements to meet the objectives of this ASSMP by addressing contract specifications, CoA and EMM in relation to impacts on contaminated land are lined in Table 6 1.

6.1 Planning and ASM Management

6.1.1 Project areas where PASS / ASS has been confirmed

Where existing site information or future targeted investigations confirm the presence of ASM, the planning stage for the particular work activity will trigger a review of the extent/s of any excavation required and, based on the information available, the Project team will decide on the most efficient PASS / ASS management measures. If PASS / ASS requires containment and treatment on site, it will be managed in accordance with the activity specific EWMS which will be developed using the strategies and protocols set out in Appendix B. In summary, site crews involved in any activities where PASS / ASS management is required will be briefed prior to the activity commencing on the following key aspects and environmental control measures:

1. Identification and demarcation of confirmed areas of PASS / ASS at the work location
2. Construction and location of PASS / ASS treatment pads, approved haul routes and spoil containment during transport
3. Quarantine procedures regarding use of PASS / ASS treatment pads (i.e. only to be used for confirmed PASS / ASS or field-tested PASS / ASS awaiting laboratory confirmation)
4. Lime treatment methods of PASS / ASS at treatment pads, including plant and materials
5. Confirmation testing methods and frequency for PASS / ASS neutralisation
6. Re-use of treated PASS / ASS.

6.1.2 Treatment of excavated ASM

There are several options available to manage works in areas where ASM are present:

- Avoid excavation into ASM
- Return ASM to below the water table to avoid oxidation
- Excavate and dispose of materials

Where direct disposal onsite or at an approved location offsite can be achieved, materials will be direct loaded into bins/trucks for removal to an approved facility. The materials must be received at the proposed disposal point within 16 hours of disturbance and placed below the permanent water table within 24 hours of excavation.

The NSW EPA Waste Classification Guidelines Part 4: Acid Sulfate Soils (2014) states that

"*Potential ASS may be disposed of in water below the permanent water table, provided:*

- *this occurs before they have had a chance to oxidise, i.e. within 24 hours of excavation and*
- *they meet the definition of 'virgin excavated natural material' (VENM) under the Protection of the Environment Operations Act 1997, even though they contain sulfidic ores or soils."*

Where ASS is to be treated on-site, lime neutralisation will be carried out in accordance with an EMWS and the liming rates provided by the laboratory from analysis of the soil disturbed. A

PESCP will be developed prior to excavation to cover the setup and management of the treatment areas.

If lime neutralisation treatment of excavated PASS / ASS regularly fails to meet the verification target, then a review of the treatment approach will be conducted. This may include a re-assessment of:

- The concentration of the total potential acidity of the acid sulfate materials;
- The type and source of neutralising agent used;
- The method and efficacy of mixing the neutralising agent through acid sulfate materials.

Based on this assessment, aspects causing poor treatment results would be amended accordingly. Treated soils will not be reused on or off site until verification targets have been achieved.

6.1.3 Stormwater and sediment retention features of treatment pads

The PASS / ASS treatment or stockpile areas will be regularly monitored in accordance with the procedures in the SWMP and Erosion and Sediment Control Strategy to ensure the construction design and operation of the areas are adequate for the amount of materials required to be stored in the areas. Inspections will focus on:

- The height of the bunds;
- The area and depths of the leachate collection ponds;
- The grade and drainage characteristics of the area surrounding the treatment areas.

If site monitoring and inspections identify inadequacies in containment areas, a review and appropriate changes to the design of the PASS / ASS treatment site stormwater retention features will be implemented as soon as practicable and prior to additional material being added to the treatment/stockpile areas.

6.1.4 Unexpected finds

If ASS or PASS is identified in unexpected areas, appropriate actions will be taken to ensure potential environmental damage is minimised. The PASS / ASS management flowchart is included at Appendix A for reference of the procedure to be followed. The site response to unexpected finds of PASS / ASS shall include:

1. Works in potentially affected PASS / ASS areas will cease and the Environment team notified to investigate;
2. If field tests indicate that PASS / ASS may be present, then samples will be taken for confirmation testing and to determine the applicable liming rate using an approved laboratory;
3. If ASS is suspected or proven to occur in the vicinity of the work area, investigate an alternate construction method that avoids the need to disturb PASS / ASS, if reasonable and feasible or arrange for treatment and disposal.

Table 6-1 ASM management and mitigation measures

ID	Measure/Requirement	When to implement	Responsibility	Reference	Evidence
General					
ASSM 1	Training will be provided to all project personnel, including relevant sub-contractors on ASM management practices and the requirements from this plan through inductions, toolboxes and targeted training as required.	Pre-construction / Construction	Environment Manager	G38/G36, CEMP	Induction records Toolbox training records
ASSM 2	Acid sulfate material control measures from this plan will be included in relevant TRAs, Environmental Work Method Statements (EWMS) and/or Site Environment Plans (SEPs).	Pre-construction / Construction	Project Engineer Supervisor Environment Manager Environment Coordinator	Good practice, G36 Section 4.13(g)	TRA's EWMS SEP's
ASSM 3	Strategies to remove or reduce the risk of ASS disturbance will be identified during pre-construction planning activities such as Design reviews, TRAs and during the development of the applicable EWMS.	Pre-construction / Construction	Project Engineer Supervisor Environment Manager Environment Coordinator	SWMP	TRA's EWMS
Dewatering					

ID	Measure/Requirement	When to implement	Responsibility	Reference	Evidence
ASSM 4	Any groundwater dewatering must be undertaken in accordance with the controls set out in the GWMP. A Permit to Discharge will be completed and authorised by the JHSW environment team prior to discharge in accordance with the SWMP and CIR/RAP (where relevant). Presence of PASS / ASS within area to be dewatered will be considered when reviewing and approving the Permit to Discharge.	Construction	Project Engineer, Supervisor, Leading Hand, Environment Manager, Environment Coordinator	GWMP, GW6, CIR, RAP's, SWMP, Good practice	Permit to discharge
Management of PASS/ASS materials					
ASSM 5	Should any evidence of ASM be observed in the field, or reported the personnel that discovered or reported the find will immediately notify their Supervisor who will notify the Environment team in line with Appendix A. All work in the vicinity of the identified material will cease and the material will be screened by trained staff (e.g. Environment team). If confirmed as PASS/ASS on site using field screening tests, samples are to be sent for laboratory analysis and to determine liming rates. Further advice on recognition of ASS is provided in Appendix B.	Construction	All field staff, Environment Manager, Environment Coordinator	G36 Section 4.13(g)	Site diary Incident report(s), Lab tests, EWMS

ID	Measure/Requirement	When to implement	Responsibility	Reference	Evidence
ASSM 6	Should any offsite disposal of acid sulfate materials be required, this will be carried out in line with the waste management procedures detailed in Appendix C and the EWMS.	Construction	Project Engineer Supervisor Leading Hand Environment Manager Environment Coordinator	G36, WRMP	Waste classification documentation, Disposal location approval
ASSM 7	Treatment pad areas will be located within the site boundary, at least 50 metres from any waterway and will be sited on an elevated area and well above floodplain levels.	Construction	Project Engineer Supervisor Leading Hand Environment Manager Environment Coordinator	SWMP App A	Stockpile Management Procedure EWMS
Inspection, monitoring and records					
ASSM 8	During excavation of ASM materials, the Project Engineer and Supervisor will ensure the following is recorded daily: • Details of source location including chainage, offset, and depth; • Volume of excavated material; • Quantity of agricultural-lime added to excavation walls as a guard layer; • Disposal/storage location.	Construction	Project Engineer Supervisor	WRMP	Daily site diary Waste classification documentation Waste dockets

ID	Measure/Requirement	When to implement	Responsibility	Reference	Evidence
ASSM 9	All materials stored on site in treatment pads and stockpile areas will require treatment in accordance with the approved procedures in Appendix A and B.	Construction	Environment Manager Environment Coordinator Project Engineer	WRMP	Testing and lab records Validation records Waste dockets

7 Compliance management

7.1 Roles and responsibilities

The JHSW Project Team's organisational structure and overall roles and responsibilities are outlined in Section 3.3 of the CEMP. Specific responsibilities for the implementation of environmental controls are identified in Section 6 of this Plan.

7.2 Training

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

- Existence and requirements of this ASSMSP
- Relevant legislation
- Roles and responsibilities for ASM management
- Mitigation and management measures
- Procedures to be implemented in the event of an unexpected find of ASM.

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

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

7.3 Targeted training

Targeted training in the form of toolbox talks or specific will also be provided to personnel with a key role in ASM management. Examples of potential training topics include:

- Acid sulfate material stockpile locations, setup requirements and control methods
- ASM and MSO locations and presence near or in drainage lines and creeks
- Field identification of acid sulfate materials including:
    - Post-oxidation soil pH of <4
    - A sulphurous smell following disturbance of soils
    - Pale yellow surface encrustations
    - Excessive iron staining on drain surfaces or stream banks; iron stained drain water; orange red ochre deposits around water bodies
    - Excessive corrosion of concrete and /or steel structures exposed to ground or drainage waters
    - Blue-grey, blue-green or grey waterlogged soils which smell of rotten egg gas
    - Handling, treatment and validation of acid sulfate materials.

7.4 Monitoring and inspections

Regular monitoring and inspections will be undertaken of ASM handling, treatment and validation activities during construction as set out in the Table below.

Additional requirements and responsibilities in relation to inspections are documented in Section 3.9.1 and Section 3.9.2 of the CEMP.

Monitoring	Record	Responsibility	Timing
Regular monitoring of all ASM management activities	Weekly Environmental Inspection	Environmental team Project Engineers Supervisors	Weekly
Any incidents relating to ASM will be reported in accordance with the Environmental Incident Classification and Reporting Procedure.	Environmental Incident Report	Environmental team	As required
The excavation and treatment or disposal of PASS ASS materials.	Daily site diary Lot records	Project Engineers Supervisors	Daily (as required)
Identification of unexpected ASM	Unexpected finds procedure	Project Engineers Supervisors Environmental team	As required
Stockpiles and treatment pads	Weekly Environmental Inspection Daily site diary	Environmental team Project Engineers Supervisors	Weekly
Disposal of materials	Disposal Dockets	Environmental team Project Engineers	Monthly

7.5 Auditing

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

Audit requirements are detailed in Section 3.9.3 of the CEMP.

8 Review and improvement

8.1 Continuous improvement

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

The continuous improvement process will :

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

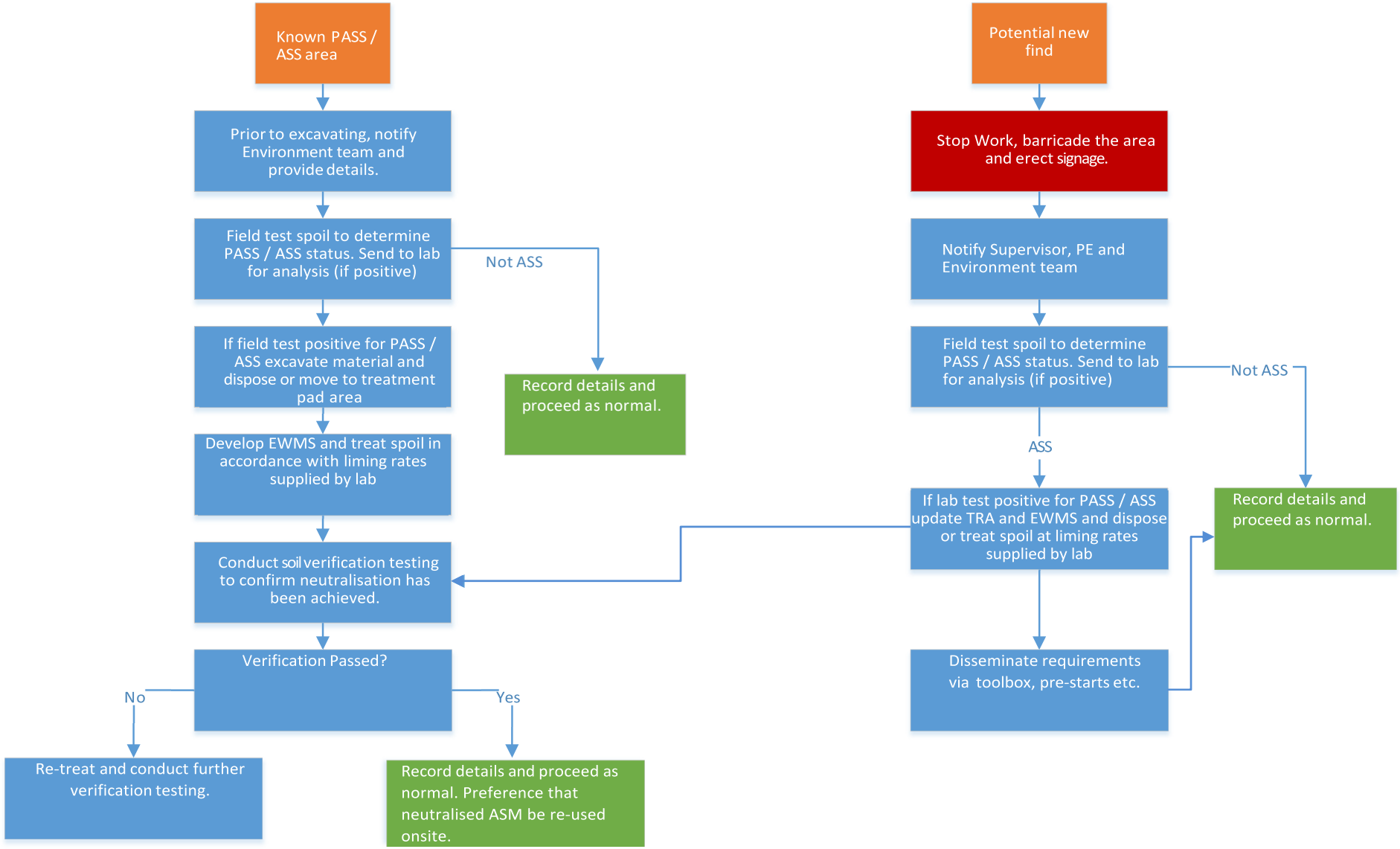
8.2 Plan update and amendment

The processes described in Section 3.9 to Section 3.13 of the CEMP may result in the need to update or revise this Plan. This will occur as needed.

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

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

Appendix A Acid Sulfate Materials Management Flow Chart



Appendix B - Strategies and Protocols for Handling and Treatment of Acid Sulfate Materials

1 Handling and treatment Strategies

1.1 Identification of acid sulfate materials

The preliminary visual checking of potential ASS will be based on material type, colour and consistency. Dark grey and black clays, silts and sands will be classified as suspected acid sulfate soils. Given the close proximity of the project site to the river, it should be assumed that all natural soils/sediments below the water table could be potential acid sulfate soils.

Where suspected from visual checking, a field screening test using the National Acid Sulfate Soils Guidance – National acid sulfate soils sampling and identification methods manual (2018). Field pH tests (pH_f, a field pH test and pH_{fox}, a field peroxide test) will be performed by trained operators.

Generally soils that record a pH_f of below 4.0 pH units will be managed as potential acid sulfate soils. If field testing (pH_f and pH_{fox}) return positive results, laboratory confirmation and liming rate is required, and samples will be submitted to the laboratory for Sulfur Reducible Chromium Suite (S_{CR}) testing.

1.2 Management of excavation works

Excavation of ASM carries a high risk of environmental degradation and must be undertaken with due care to ensure that the material does not oxidise. Best practice with PASS is to minimise levels of disturbance and to ensure that the material is kept wet, treated or disposed of quickly, before oxidation can occur.

General best practice for excavation works include:

- Excavation and scraping works be undertaken in a controlled manner and by experienced operators, to the minimum extent required to meet the design;
- Excavation will occur in manageable strips that can have any rectification works completed on them quickly;
- The excavated materials will be placed immediately into trucks, for transport to the PASS / ASS treatment area or disposal site. If materials are to be stockpiled prior to bulk transport offsite, the excavated materials will kept as close as possible to the excavation site and kept wet and covered. Stockpiling of these materials will be limited to 16hrs with excess materials not disposed of to be relocated to dedicated ASM treatment and stockpile areas;
- Daily pH monitoring of excavation faces in known PASS / ASS areas is to occur, particularly those below natural water table levels if dewatering is occurring;
- A stockpile of lime will be kept onsite to spread over affected areas if pH is shown to be declining;
- If in doubt around handling or treatment methods crews are to seek advice from the Environment team; and
- Records of the works being carried out each day and any PASS / ASS field testing results are to be maintained in a site diary.

1.3 Management of piling

Augered piling and pile excavation or clearing will potentially be a source of PASS/ASS due to the depth of excavation required and will be managed in accordance with the Piling EWMS. During piling, the following process will be followed:

- Prior to the commencement of drilling each set of piles, the existing data will be reviewed and depths of PASS be noted and tool boxed to the piling crew as part of the pre-start.
- When the drilling approaches within 500 millimetres of the PASS material, as identified in the existing environment report, spoil being removed from the piling will be field tested in accordance with Appendix B Section 1.1 to determine the presence of ASS.
- If material is positively identified to be ASS, the material will be transferred to specific labelled bins/trucks to ensure separation from other inert material to minimise risk of contamination of the inert material.
- The ASS material will be disposed of to approved facilities in accordance with Section 6.1.2 or transferred to the PASS/ASS stockpile site and treated and managed in accordance with this document. Neutralisation with lime will be carried out using the liming rates as supplied by the laboratory.

1.4 Stockpile management

Stockpiling of PASS/ASS will be kept to a minimum both in volume and in time stored onsite. Where stockpiling is necessary then the following protocols will be followed:

- Stockpiling will only occur in the designated treatment and stockpile area/s of the site within a purpose built earth bund with sealed base and with an appropriately sized leachate collection sump/s.
- Where practicable, leachate collection sumps shall be designed against the 5-day, 85th percentile rainfall depth event for the site. Details of typical PASS treatment area setups are provided in Figures B-2 and B-3;
- Stockpiles are to be surrounded by appropriate impervious bunds;
- If treatment is not proposed daily pH monitoring is to occur on stockpiles of PASS materials. If soil or leachate water pH declines, then the material will require treatment prior to disposal or reuse;
- Stockpiled material is to be appropriately disposed of in accordance with the waste classification (see Appendix C) or protocols for onsite reuse.
- A stockpile / PASS treatment area register will be maintained that includes date formed, date disposed, any treatment or monitoring results, disposal location and classification.

1.5 Dewatering

Dewatering can lead to *insitu* development of ASS caused by oxidation as a result in groundwater changes. Once this occurs it can also lead to discharge of acidic groundwater. To minimise the risk of causing *insitu* ASS development, the following will be implemented:

- Dewatering activities will be kept to a minimum both in depth of dewatering and in duration of groundwater extraction;
- Monitoring of groundwater levels around the dewatering zone is required to assess the level of drawdown and provide for ongoing pH monitoring of water throughout the activity. Regular monitoring of the surrounding groundwater levels and pH levels will commence prior to dewatering and continue throughout the dewatering activity, and until water levels recover following cessation of dewatering;

- Water quality testing of discharge water is to occur throughout the dewatering period to ensure compliance with any licensing obligations. The pH correction of acidic groundwater is to occur prior to discharge via approved methods;

1.6 Transport procedures

No offsite disposal of PASS / ASS is to occur without appropriate waste classification, and materials will be transported to facilities licensed to accept the material. All offsite transport is to be carried out by transporters holding appropriate licences for the waste classification and in accordance with the requirements of the NSW EPA, 2014 *Waste Classification Guidelines, Part 4: Acid Sulfate Soils*.

In addition to general environmental controls for minimising sediment migration (such as rumble bars and sweeping of truck wheels, as the materials are likely to be saturated), haul trucks used for offsite disposal will have sealing tailgates to prevent spillage of sediment and leachate onto public roads. Appropriate waste tracking documentation will be maintained and reconciled with landfill records supplied by transporters. Guidelines for waste classification for offsite disposal are set out in Appendix C.

1.7 Onsite treatment of ASM

If onsite treatment of PASS / ASS is to occur, then the following protocol will be adopted.

- A treatment pad area is required to be prepared generally in line with Figures B-2 and B-3 of this ASSMP. An impermeable base layer and leachate collection system are required to minimise potential impacts to soils and groundwater;
- The PASS treatment pad area will be located within the site boundary and at least 50 metres from any waterway and will be sited on an elevated area and well above floodplain levels;
- Each receival of PASS / ASS to the treatment pad area will be accompanied by, or be awaiting, the results of laboratory PASS confirmation testing and the correct liming rate;
- Soils to be treated will be spread in layers on the impervious pad;
- Dependent upon quantities of ASM to be treated, lime will be applied via the most suitable method (e.g. spreader truck through to hand application), followed by careful but thorough mixing of the full depth using an excavator with tooth bucket or similar equipment;
- Lime will be applied at the rate recommended, though if the recommended rate is greater than 20kg / tonne this will be placed in stages with field screening carried out between mixing events to avoid over liming. Figure B-1 below provides the details around how liming rates for PASS / ASS are determined by the laboratory;
- Post-treatment field pH screening will be carried out at a rate of 1 sample per 200m^3 of treated PASS / ASS material;
- If post-treatment field pH screening results fail, then add further lime at a rate of no more than 10kg per tonne at a time and repeat the mixing and validation process;
- Successfully treated material may be reused on site in suitable areas, once validation targets have been achieved or disposed of using the appropriate waste classification; and
- Appropriate records will be kept and maintained regarding the treatment of PASS.

The tonnes (t) of pure fine aglime, $CaCO_3$ required to fully treat the total weight/volume of Acid Sulfate Soils (ASS) can be read from the table at the intersection of the weight of disturbed soil [row] with the existing plus potential acidity [column]. Where the exact weight or soil analysis figure does not appear in the heading of the row or column, use the next highest value.

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

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

Note: Lime rates are for pure fine aglime, $CaCO_3$ assuming an NV of 100% and using a safety factor of 1.5. A factor that accounts for Effective Neutralising Value is needed for commercial grade lime. (See the *Information Sheets on Neutralising Agents – Neutralising Considerations*).

‡ An approximate soil weight (tonnes) can be obtained from the calculated volume by multiplying volume (cubic m) by bulk density (t/m^3). (Use 1.7 if BD is not known). Dense fine sandy soils may have a BD up to 1.7, and hence $100m^3$ of such soil may weigh up to 170t. In these calculations, it is necessary to convert to dry soil masses, since analyses are reported on a dry weight basis.

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

Figure B-1: Acid sulfate soil neutralisation rates using lime

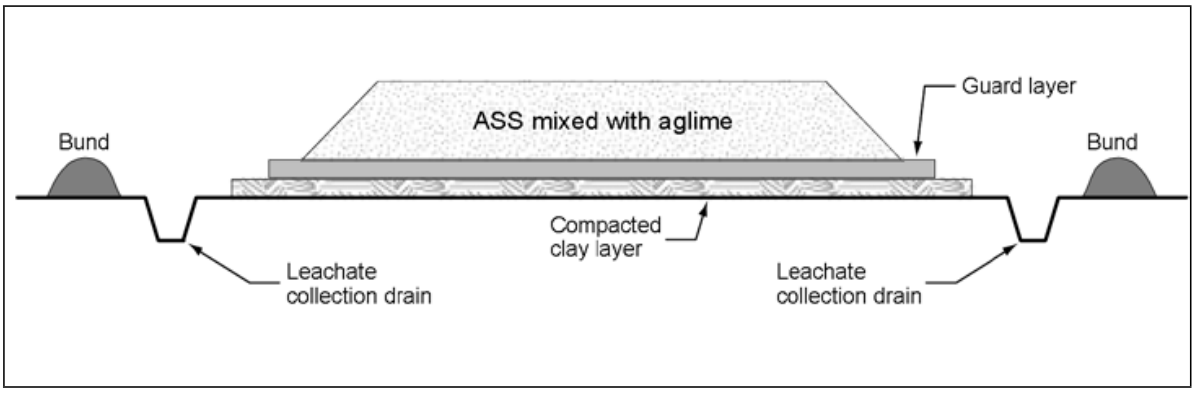


Figure B-2: Typical cross section of a treatment pad

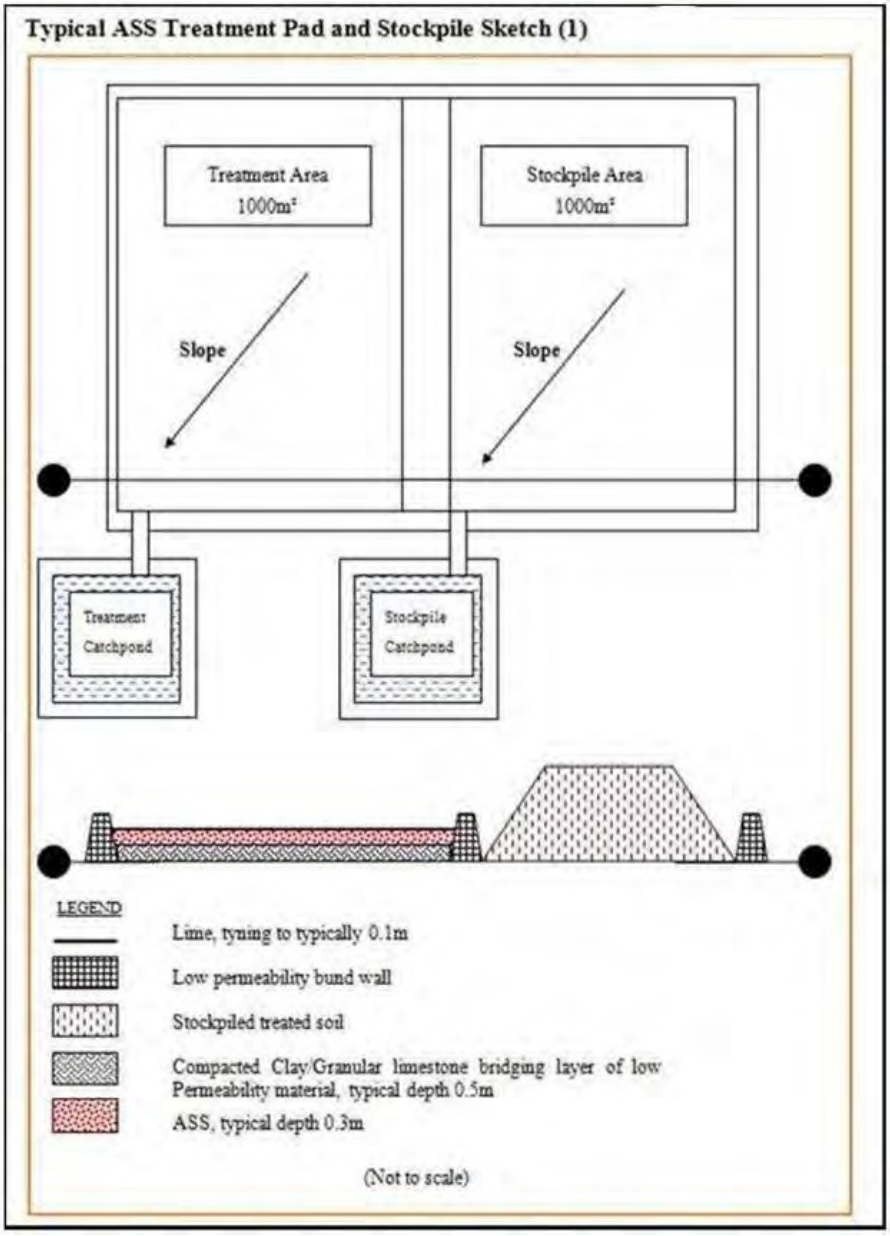


Figure B-3 Typical layout of a treatment pad

Appendix C – Surface Water Quality Monitoring Program

Appendix C

Surface Water Quality Monitoring Program – SSI 9737

Sydney Gateway Road Project

June 2021

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Contents

1 Surface Water Quality Monitoring Program

1.1 Purpose

This surface water quality monitoring program (SWQMP) is for the establishment and management of a monitoring program to ensure that potential environmental impacts associated with the Sydney Gateway Road Project (SGWP) are adequately monitored during construction. The program addresses the Minister's Conditions of Approval (CoA), EIS/MDP updated management measures, as revised by the submission report, Technical Working Paper 8 Surface Water mitigation measures, NSW EPA EPL (#TBC) and all applicable legislation.

The scope of the SWQMP is to describe how the John Holland Seymour Whyte JV (JHSW) will monitor potential impacts to surface water during construction. Operational monitoring and mitigation measures are not included in the scope of this construction phase plan.

Figure 1-1 Water quality sampling points (from EIS/MDP TWP 8 2019)

1.2 Objectives

The key objective of the SWQMP is to ensure all CoA, UMM, and licence/permit requirements relevant to surface water monitoring are described, scheduled, and assigned responsibility.

The monitoring program includes baseline locations in the Alexandra Canal catchment and in Mill Stream. These waterbodies have been monitored since December 2017 and provide a suitable baseline data for use in deriving trigger values in accordance with Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000) during construction.

By utilising the existing sampling points and trigger values from the EIS/MDP as modified by the Submission Report data is ensured to be comparable with existing information collected over the EIS/MDP period. The sampling points detailed in the EIS are shown in Figure 1-1.

1.3 Consultation

This program was provided to DPIE Water, and Sydney Water, Inner West Council, City of Sydney Council, and Bayside Council as part of the consultation on the Soil and Water Management Sub Plan.

1.4 Legislation, regulation, guidelines, and policy

This procedure has been developed referring to the following legislation, regulation, guidelines and policies.

- EIS/MDP Ministers Conditions of Approval (CoA)
- Protection of the Environment Operations Act 1997 (POEO Act)
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ 2000) (ANZG 2018).
- Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (2004).
- Australian Drinking Water Guidelines (NHMRC 2011)
- PFAS National Environmental Management Plan 2018 (PFAS NEMP)
- Contaminated Land Management Act 1997
- NSW Water Quality and River Flow Objectives (DECCW, 2006)
- Volume 1, 4th Edition (Landcom, 2004) and Volume 2D, Main Road Construction (DECC, 2008)
- NSW MUSIC Modelling Guidelines (BMT WBM, 2015)
- Botany Bay and Catchment Water Quality Improvement Plan (SMCMA 2011)

2 Relevant Conditions for this Monitoring Program

This monitoring program has been developed to comply with UMM SW6 as noted in the table below.

UMM Ref.	Condition Requirements	Document Reference
UMM SW6	A water quality monitoring program will be developed and implemented as part of the Construction Soil and Water Management Plan to monitor potential surface water quality impacts. The program will define: • Monitoring parameters • Monitoring locations • Frequency and duration of monitoring. • The monitoring program will include ongoing baseline monitoring to determine the water quality of potential receiving waters prior to commencement of construction. • Water quality monitoring will continue for a minimum of 12 months following the completion of construction, or until affected watercourses are certified by a suitably qualified and experienced independent expert as returned to an acceptable condition (or as otherwise required by any project conditions of approval). • All surface water data related to Alexandra Canal will be provided to Sydney Water for the duration of the monitoring program..	This program. *(note this program only covers construction, operational monitoring not included in this program)*

3 Existing Environment

3.1 Surface water baseline monitoring

Project-specific water quality monitoring was undertaken over a 26 month period between 21 December 2017 and 20 February 2020. Water samples, which were collected from 11 locations in Alexandra Canal, Mill Stream and Cooks River, were analysed to establish baseline water quality conditions in the study area. Figure 3.1 shows the locations of background sampling points.

Figure 3.1 – Background surface water quality monitoring locations

3.2 Background surface water quality

A review of this data indicated that both the Alexandra Canal and Mill Stream sub-catchments are in poor condition. The analysis indicates that:

- Samples obtained from the Cooks River and Alexandra Canal frequently exceeded ANZECC guidelines default trigger values for total nitrogen, total phosphorus, aluminium, iron, manganese, mercury, zinc and ammonia
- Samples obtained from Mill Stream frequently exceeded ANZECC guidelines default trigger values for total nitrogen, total phosphorus, aluminium, copper, iron, lead, manganese, mercury, zinc, total suspended solids, turbidity and ammonia, as well as the limits of acceptable contamination specified in Schedule 2 of the Airports (Environment Protection) Regulations 1997.

In relation to PFAS, the results indicate that:

- PFAS compounds, including perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), were detected in almost all samples obtained from the Cooks River, Alexandra Canal and Mill Stream
- Concentrations of PFAS were below the 95 per cent level of protection criteria for marine species from the PFAS National Environmental Management Plan (HEPA, 2018).

3.3 Baseline surface water quality criteria

The ANZG (2018) guidelines adopt a risk-based approach that uses trigger values that can be modified to be applicable to regional, local or site-specific guidelines. The trigger values are the criteria used for concentrations that, if exceeded, would indicate a potential environmental problem, and so 'trigger' a management response. Table 3-1 below provides indicative site-specific water quality trigger values for Alexandra Canal for short term monitoring. These values will be used for surface water quality monitoring as detailed in this Monitoring Program and are based upon the baseline water quality monitoring completed for the EIS/MDP and Appendix E of the Response to Submissions Report.

Table 3-1 Water Quality monitoring criteria for Alexandra Canal

Parameter	Unit	Alexandra Canal
pH	pH units	7.0 to 8.5
Turbidity	NTU	10
Aluminium	µg/L	0.5
Arsenic	µg/L	2.3
Barium	mg/L	2
Boron	µg/L	5,100
Cadmium	µg/L	5.5
Chromium (VI)	µg/L	20
Chromium (III)	µg/L	49
Copper	µg/L	3
Cobalt	µg/L	14
Iron	µg/L	300
Lead	µg/L	6.6
Manganese	µg/L	80
Mercury	µg/L	0.40
Nickel	µg/L	70
Zinc	µg/L	23
Bicarbonate alkalinity as $CaCO_3$	mg/L	124
Ammonia	ug/L	1200
Nitrate	ug/L	15
Nitrite	ug/L	15
Total Phosphorus	ug/L	30
Total Nitrogen	ug/L	300
PFOA	µg/L	220
PFOS	µg/L	0.13
TPH – C6-C9 fractions	µg/L	150
TPH – mineral oil (>C9 fractions)	µg/L	600
F2-Napthalene	mg/L	70
Ethylbenzene	µg/L	110
Total xylenes	µg/L	830

Parameter	Unit	Alexandra Canal
p-xylene	µg/L	200
m-xylene	µg/L	100
o-xylene	µg/L	350
Naphthalene	µg/L	70
Anthracene	µg/L	0.4
Phenanthrene	µg/L	2
Fluoranthene	µg/L	1.4
Benzo(a)pyrene	µg/L	0.2

Notes:
The above table, sourced from Appendix E of the Response to Submissions Report, contains pollutants that have not been detected in the surface or groundwater monitoring but which are potential contaminants of concern if detected in future monitoring data. Trigger values for all watercourses should be revised as future monitoring data is collected.

*80th percentile site monitoring value is lower than 80% protection level for aquatic ecosystems

**Bioaccumulative toxin 95% protection level was above the 80th percentile monitoring value

No separate aquatic ecosystems values available and ANZG (2018) default trigger values are higher than 80th percentile value so ANZG (2018) default trigger values is adopted

^No values recommended in ANZG (2018) as they are under development, values adopted from the PFAS National Environmental Management Plan 2.0 (2020) instead

+Low reliability trigger values from ANZG (2018) adopted

++Australian Drinking Water Guidelines (NHMRC, 2018) trigger value adopted in absence of value available from ANZG (2018)

+++Airports (Environment Protection) Regulations 1997 freshwater trigger values adopted in absence of values available from ANZG (2018) and monitoring data.

4 Construction monitoring program

The mobilisation of sediments and pollutants during construction works are identified as a potential impact on surface water within the highly urbanised and disturbed catchments and waterways. A soil conservation consultant will be engaged to provide design input into erosion and sediment controls to control dirty water and separate clean water flows around the works.

Other potential impacts during the construction stage include increased turbidity from soil disturbance, increased pH from the use of concrete products, discharge of poorly treated water from water quality treatment infrastructure, erosion and sediment migration from areas of existing and known contamination.

Construction water quality sampling locations have been chosen to continue the data sets from the background sampling program at relevant up and downstream locations in the waterways around the Project. Surface water sampling locations were selected based on the accessibility and adherence to Project safety requirements. Not all baseline monitoring locations identified in the EIS/MDP will be utilised for surface water monitoring during the construction phase of the Project. This is due to the waterbody being adequately represented in other water sampling locations.

Construction monitoring locations are identified in Table 4-1 and Figure 4-1 below.

Table 4-1: Sampling locations - construction

EIS/MDP Site Ref	New Site Ref	Water Body	Location Description	Location Reference	Monitoring Purpose
-	SW1	Alexandra Canal	Upstream of construction site	Latitude – 33.920147 Longitude – 151.1789	Background upstream
SW2	SW2	Alexandra Canal	Within construction site	Latitude – 33.9252 Longitude – 151.1745	Immediately adjacent to major drainage culvert
SW5	SW3	Alexandra Canal	Downstream boundary of construction site	Latitude – 33.9299 Longitude – 151.1633	Downstream (outgoing tide)
-	SW4	Cooks River	Downstream of construction site	Latitude – 33.9341 Longitude – 151.1605	Downstream (outgoing tide)
SW10	SW6	Mill Stream (Mill Pond Upper)	East of project	Latitude – 33.9382 Longitude – 151.1977	Background downstream of Sydney Airport Drainage
SW11	SW5	Mill Stream Mill Pond Lower)	East of project	Latitude – 33.9389 Longitude – 151.1945	Downstream of Sydney Airport Drainage

Figure 4-1 Construction surface water monitoring locations

Monitoring throughout construction at all locations in Table 4-1 will be as detailed in the analysis suites below (Table 4-2):

Table 4-2 Summary of Construction Surface Water Quality Monitoring

Type of Measurement	Suite Reference	Frequency of Monitoring	Analytes to be Sampled
In situ Measurements	Analyte Suite 1	Monthly at all Sites	pH, electrical conductivity (EC), temperature, dissolved oxygen (DO), reduction-oxidation potential (redox), turbidity and direction of flow for tidal locations only
Laboratory analysis	Analyte Suite 2	Monthly at all Sites for the first three (3) months, then quarterly for the remainder of construction	• pH, total dissolved solids (TDS), total suspended solids (TSS), turbidity, carbonate and bicarbonate alkalinity, total alkalinity • Nutrients: nitrate, nitrite, total nitrogen, ammonia and total phosphorus • Contaminants of concerns including PFAS, TRHs and heavy metals as per the analytes in Table 3.1
Quarterly Wet Weather Events (>20mm)	Analyte Suite 3	One sample maximum per quarter where rainfall occurs	• Nutrients: nitrate, nitrite, total nitrogen, ammonia and total phosphorus • Contaminants of concerns including PFAS, TRHs and

Type of Measurement	Suite Reference	Frequency of Monitoring	Analytes to be Sampled
			heavy metals as per the analytes in Table 3.1

The following site specific trigger values are proposed for short term water quality monitoring within the waterways during construction:

- For physical and chemical stressors, use the least stringent of the 80th percentile values from the monitoring data and the default trigger values for aquatic ecosystems in marine waters
- For non-bioaccumulative toxicants, use the least stringent of the 80th percentile values from the monitoring data and the 80% species protection level for marine waters
- For bioaccumulative toxicants, use the least stringent of the 80th percentile values from the monitoring data and the 95% species protection level for marine waters.

A full list of proposed site specific trigger values for water quality monitoring during construction is tabulated in Section 3.3 above. These values are based upon baseline monitoring completed as part of the EIS/MDP and Appendix E of the Response to Submissions Report.

Where a discharge from water treatment infrastructure to a waterway is identified to be outside of discharge criteria, Suite 3 sampling will be initiated within 24 hours of becoming aware of the event. Sampling will be conducted in the nearest up and downstream locations for the relevant catchments.

Exceedances of the water quality objectives at downstream monitoring locations (SW6 in Alexandra Canal and SW11 in Mill Stream) would be investigated as follows:

- The concentration at the downstream monitoring location would be compared to the concentration at the upstream monitoring location;
- If the concentration at the upstream location exceeds or is equal to the concentration at the downstream location, no further action is required;
- If the concentration at the upstream location is lower than the concentration at the downstream location and exceeds the site-specific trigger value, then the monitoring data should be reviewed against long-term averages;
- If the review confirms the exceedance of the site-specific trigger value at the downstream location and the lower concentrations at the upstream location, and the exceedance deviates from long term averages and variability in the historic monitoring data, then an investigation into the source of contamination and risks to environmental values would be undertaken;
- If the investigation indicates potential for risks to environmental values, an action plan to mitigate potential harm would be developed.

5 Monitoring methods and sampling protocols

5.1 Sample collection

Grab samples will be collected manually from the sampling locations identified in Table 3.1 . The volume of sample collected will be sufficient for the required physico-chemical (field) parameter analysis using a multi-probe water quality meter(s).

5.2 Field measurements

Field physico-chemical parameters including pH, DO, ORP, temperature, and turbidity will be measured at each sampling location using a fully calibrated multi-probe water quality meter(s). Other observations including odour and colour will also be recorded.

The multi-probe field water quality meter(s) will be calibrated against known standards, as supplied by the manufacturer, at the start and completion of each day of water quality sampling.

5.3 Recording of field results

Results for each monitoring location will be recorded on appropriate field sheets (hard copy or digital) using unique sampling identification nomenclature consisting of the sample date, location, and sampler details.

5.4 Decontamination

Sampling equipment will be cleaned (decontaminated) between each sample. Where a sample site shows evidence of contamination (i.e. there is an algal bloom, or the site smells strongly of hydrocarbons, sewage or something else) equipment will need to be cleaned thoroughly. In addition, equipment will need to be cleaned periodically to prevent a build-up of dirt.

The following method will be followed:

- Rinse the equipment in tap water
- Clean with De-Con 90 (a phosphate free detergent), or equivalent
- Rinse again with tap water
- Rinse three times with de-ionised water, and finally
- Allow to dry.

De-ionised and tap water will be available for washing equipment in the field, if required.

5.5 Quality Assurance and documentation

Quality assurance and control protocols during sampling and recording of physico-chemical (field) parameters will be undertaken monthly (each sampling event) in accordance with ANZECC/ARMCANZ (2000b) to ensure the integrity of the dataset.

As part of sampling, quality assurance and control samples during sampling will be undertaken to ensure the integrity of the dataset. These are to include:

- Rinsate blanks (one per sampling event only)
- Blind duplicates (at a rate not less than 20% of total samples)
- Split duplicates (at a rate not less than 20% of total samples).

Samples are to be transported to a NATA-accredited laboratory under documented chain of custody protocols.

Field results will be checked for accuracy before leaving the site and errors or discrepancies will be cross-checked and further investigation initiated if required.

Monitoring and calibration records will be maintained in accordance with the appropriate standard.

5.6 Review

This plan will be updated as part of the Soil and Water Quality Management Sub Plan update as detailed in Section 8 of the Plan.

6 Reporting

Any reporting required under the EPL will be captured in a future revision to this Monitoring Program once the EPL is finalised.

All surface water data related to Alexandra Canal will be provided to Sydney Water for the duration of the monitoring program. This will be provided within one month of the proceeding monitoring period.

Appendix D – Spill Response Procedure

Spill Response Procedure

Soil & Water Management Sub-Plan (State) – SSI 9737

Sydney Gateway Road Project

April 2021

Contents

Document control

Revision	Date	Description	Approval
A	8/02/2021	Draft for review	
B	24/04/2021	Issued for consultation	

Distribution of controlled copies

Copy number	Issued to	Version
1	Transport for New South Wales	
2	Independent Verifier	
3	Environmental Representative	
4	Project Director	
5	Environment Manager	

1 Purpose

A spill response procedure is required for the project in accordance with:

- G36 Environmental Protection specification; and
- G38 Soil & Water Specification

This procedure explains the processes and procedures to be carried out for spill response associated with construction activities.

2 Induction / Training

All personal involved in the project will be trained during the project induction in the requirements of this spill response procedure. Training will also include toolbox talks, pre-starts and targeted training as required. Records of all training, including inductions, will be maintained. Records will include the name and role of the attendee as well as the name of the course.

3 Scope

This procedure includes site specific advice and control measures for responding to spills and ensure compliant and appropriate response, handling, and disposal. It is intended that the environmental safeguards outlined in this plan will be incorporated into the pre-construction and construction phases of the project. Spill response & management and mitigation will be undertaken in accordance with the RMS Spill Management and Response Environmental Fact Sheet Issue 4 (15 September 2009) management plans and procedures for the project.

4 Spill Response Summary

1. Control the source of the spill; stop the leak, close the valve, turn off the machine.
2. Contain the spilled material to a smallest area possible.

    a) Spills on land: On bare soil, use soil to create a bund to prevent the spill from spreading. Shovel up or excavate any contaminated soil and dispose of to a licensed landfill site. On non-impervious surfaces use spill kit socks (or sandbags or similar) to form a bund downhill from the spill to stop it spreading; place spill kit under leaks; broadcast absorbent material over the spill and work towards the centre of the spilled material with a stiff bristle broom. Mop up liquids with spill kit pads or pillows; sweep, shovel or vacuum up granular absorbent material; dispose to a licensed landfill site.

    b) Spills on water: Deploy floating boom on downstream side of spill. Consider wind direction and current or tidal flows. Slowly pull the boom around the spill and then draw it back into a small area. Position hydrophobic absorbent pads or hydrophobic granular material over the surface of the spill contained by the floating boom.

3. Contact and report spill to Supervisor and / or Environment Representative.
4. Identify the spilled material and refer to Material safety Data Sheets (MSDS) for any specific Personal Protective Equipment (PPE) requirements.

5. Clean-up using the spill kit materials, absorbent sweep, absorbent pads, and implement any specific procedure specified in the MSDS.

6. Place the spill response materials in the contaminated waste bags and place the contaminated materials in the allocated area on site. Pending disposal to a licensed facility. Do not place contaminated materials into general waste bins.

7. Communicate details of the incident and response efforts. Complete the Environmental Incident Report and submit the details and improvements to the relevant stakeholders.

8. Restock the spill kits after use.

4.1.1 Spill Response Procedure Photographic Example

- Turn off the plant / equipment causing the leak. Contain the spilled material to a smallest area possible, using booms, bunds or another suitable material. When the spill is contained, and the leak and source has been stopped. Contact the Supervisor.

- Once contained, install absorbent sweep. Ensure that the absorbent sweep is placed across the spill and thoroughly swept in multiple times.

- Use the absorbent pads to soak up the spill. Place all spill materials into the clearly labelled contaminated waste bags and tie up the bag

- Once the pads and absorbent sweep has be used, conduct a final spray of the dispersant to collect any surface remnants caused by the spill. Use pads to collect the surface remnants and placed in contaminated waste bag.

- If the spill is on the ground. Remove the contaminated and earthen materials and place in the contaminated waste bags.

- Place all materials, absorbent sweep, spill pads and contaminated earthen materials into the contaminated waste bags.

- Place the contaminated waste bags into the designated hydrocarbon waste site facility. This will include steel drums, fully bunded, signed and secured.

- Restock the spill kits. Ensure they have all items including:
    - Absorbent Pads
    - Absorbent Mini-Booms
    - Absorbent Pillows
    - Absorbent Sweep
    - Contaminated Waste Disposal Bags & Ties
    - Nitrile Rubber Gloves
    - Heavy Duty Brush and Shovel Set
    - Laminated Instructions

Appendix E – Tannin Management Procedure

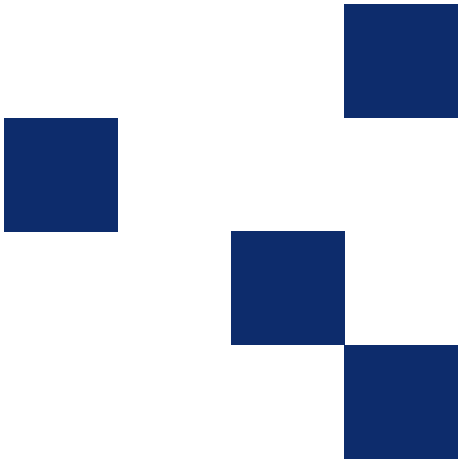
Transport Roads & Maritime Services

NSW GOVERNMENT

ENVIRONMENTAL DIRECTION

Management of Tannins from Vegetation Mulch

JANUARY 2012



ABOUT THIS RELEASE

Environmental Direction number	25
Environmental Direction title	Management of Tannins from Vegetation Mulch
Author	Environment Branch (Environmental Policy)

Issue	Date	Revision description
1	December 2011	Final draft
2	January 2012	Final

CONTENTS

1 PURPOSE

The purpose of this environmental direction is to set RMS's minimum management measures to minimise the generation and discharge of tannins from vegetation mulch on Roads and Maritime Services (RMS) construction projects. Additional background information on tannins and the use of mulch on construction sites is included in section 3 of this direction.

2 MANAGEMENT MEASURES

The primary focus must be to minimise tannin generation on construction sites.

2.1 General mulch management measures

These general mulch management measures are to be followed for all RMS construction projects.

2.1.1 Planning and works staging

The first step in planning and works staging is to identify the amount of mulch to be generated. With this information, a strategy can be prepared to manage mulch on site. Staging of chipping, tub grinding and/or mulching activities should be planned to reduce the volume of mulch to be managed at any one time. The volume of excess mulch can then be assessed and plans made to dispose of this off site.

Other general considerations at the planning and works staging phase are as follows:

- Mulch stockpile sites should be established with appropriate controls in place before the main site clearing activities commence. Limited clearing may be required earlier for establishment of stockpile areas and access.
- Stage the mulching of cleared vegetation to ensure that mulch can be progressively moved to elevated, or otherwise suitable, stockpile locations. It is preferred that mulch should be transferred to a stockpile or reused on the day of mulching.
- Plan to efficiently reuse mulch in progressive works to reduce the time that mulch is concentrated in stockpile locations.
- Excess mulch can be managed by community giveaway. This takes considerable time and mulch needs to be suitably located and managed as this occurs. The conditions for community giveaway of mulch are included as Appendix 3.
- Any other form of bulk offsite mulch disposal (eg to Council parkland or a development site) must be assessed to ensure waste management provisions are adhered to for off site disposal.

2.1.2 Stockpile location and management

- Mulch stockpile sites should be established on elevated ground where possible.
- Stockpile sites with a duration of not more than 1 month should be constructed not less than 20 metres from a watercourse, including floodplains.
- Stockpile sites with a duration of more than 1 month should be constructed not less than 50 metres from a watercourse, including floodplains.
- Mulch stockpiles should be designed and constructed to divert upgradient water to prevent it from entering the stockpile site.

2.1.3 Management measures for the use of mulch on site

- Do not use mulch for surface cover or sedimentation controls in any low lying areas of the site that remain consistently wet. Alternative controls such as geofabric (for surface protection) or sediment fence will be required in these areas.
- Do not spread surface mulch in thicker than 100mm layers. Mixing mulch with topsoil is encouraged for batters to prevent loss of topsoil during initial stabilisation. It should be noted that mulch will generally cause nitrogen draw down which may inhibit plant growth, unless mulch has been composted first.
- Care is to be taken to ensure that excessive mulch is not applied for sedimentation controls such as perimeter bunds or catch dams.

2.1.4 Monitoring and response

- Monitor the site for generation of tannins. Tannin impacts can be readily identified visually as dark coloured ponded water. Site staff should be trained to identify and report potential impacts to the site project management or environment staff.
- Review management practices where required to prevent the generation of tannins in identified problem areas.

2.2 Mulch management methods for high risk sites

2.2.1 High risk sites

High risk sites, where additional management measures may be required, include:

- where large quantities of mulch will be generated and stockpiled.
- where high tannin generating vegetation types are to be mulched (see 3.1).
- where the receiving environment is identified as sensitive (eg Marine Park, threatened aquatic species habitat).
- where tannins have been observed to be generated or discharged from an operating site with standard management controls.

2.2.2 Stockpile management measures for high risk sites

- Mulch stockpiles for high tannin generating vegetation types should incorporate an impermeable bund to capture stockpile leachate or tannin impacted water. Impervious bunds must be a minimum of 300 mm high, preferably higher to capture tannin impacted water. All bunded stockpiles that are in place for a period longer than one month must include a lined discharge point for overflow in extreme rainfall events.
- Stockpiles established on sloping sites must be designed to provide temporary stormwater containment equivalent to a 300 mm minimum height bund on a flat site.
- Tannin impacted water should be pumped out of bunded stockpiles within 5 days of the end of a rainfall event to maintain the storage capacity. This water should be used for on site purposes including dust suppression and landscape watering. These activities must be managed to prevent any pooling or runoff of tannin impacted water.
- Bunded stockpiles must be inspected within 24 hours of cessation of any rainfall event greater than 10mm to ensure tannin impacted water does not overflow.

2.3 Site management procedures

Site management procedures must be prepared for all sites where tannins are identified as a potential issue. Site management procedures should be based on the management measures provided in this Environmental Direction.

3 BACKGROUND

3.1 Tannin generation from vegetation mulch

See Plates 1 – 3 in Appendix 1.

Tannins are naturally occurring plant compounds. Tannin generation from vegetation mulch is likely to be highest from low-lying coastal floodplain areas. The species of vegetation (eg *Melaleuca*) will have a major impact on the likelihood of tannin generation.

Tannin generation is generally highest from mulched vegetation that is stockpiled in areas that are subject to inundation. Placement in wet areas will result in accelerated leaching of tannins into water, concentration of tannins in pooled water, and greater impacts on water quality.

3.2 Tannin impacts on water quality

See Plates 4 – 5 in Appendix 1.

The main concern with the discharge of water that is high in tannins is that it may increase the biological oxygen demand (BOD) of the receiving environment. Increases in BOD may result in a decrease in available dissolved oxygen. A lack of dissolved oxygen is identified as the main cause of about 80 percent of fish kills in NSW rivers and estuaries.

Tannin impacts may result in dark coloured water discharge from construction sites. This impact can be obvious and may raise the concern of the community and other stakeholders including regulatory authorities. Once discharged to the environment, tannins may reduce visibility and light penetration and change the pH of receiving waters. These impacts may affect aquatic ecosystems in receiving environments.

Tannins cannot be readily treated with standard construction site water quality controls. Once water on site is impacted with tannins it is not possible to treat effectively with currently approved flocculants. Minimisation of tannin generation in the first place is the management strategy that must be applied.

3.3 Use of mulch on construction sites

See Plates 10 – 16 in Appendix 2.

The RMS Biodiversity Guidelines provide guidance on the benefits of reusing various sizes of vegetation for different purposes. Mulch is a readily available and cheap source of material for temporary site stabilisation and sedimentation control. The re-use of mulch reduces the need to transport this material off-site and reduces handling and disposal costs for construction contracts.

Unprotected mulch sedimentation controls should not be placed in concentrated flow lines where mulch may be washed away. Mulch may be protected by wrapping it with geofabric or other materials to provide a stable control. All temporary catch dams constructed from mulch must have a stable outlet to minimise the washing away of mulch in high rainfall events, and the possible failure of the control.

4 ADDITIONAL RESOURCES

- RTA Biodiversity Guidelines- Protecting and Managing Biodiversity on RTA Projects, 2011
- Pacific Highway Mulch Protocol 2011

5 APPENDICES

Appendix 1: Plates showing tannin generation & water quality impacts

Plate 1: Melaleuca vegetation community – mulch from this vegetation type will generally produce high amounts of tannins.

Plate 2: Vegetation mulching activity – mulch should be progressively moved into prepared stockpile areas.

Plate 3: Tannin generation from recently felled and partially mulched vegetation in an area subject to localised inundation. Mulched vegetation should be progressively moved to prepared stockpiles to manage tannin impacted water.

Plate 4: Tannin impact in stormwater at the discharge point from a road construction site. The discharge of impacted water may be obvious to community and other stakeholders.

Plate 5: Tannins in a drainage line generated from very thickly applied mulch on the batter above. Note that the sedimentation fence is not effective in treating the tannins.

Appendix 2: Plates showing the use of mulch for erosion & sedimentation controls

Plate 6: Mulched vegetation stockpiled in a low-lying area subject to inundation. This is not an appropriate stockpile location and may increase the generation of tannins from stockpiled mulch.

Plate 7: Mulch being placed as batter erosion control. Mulch should not be applied in layers more than 100 mm thick for surface stabilisation.

Plate 8: Site showing recent application of a mulch/topsoil mix on batters (40% mulch to 60% topsoil). Mulch mixes are used to provide temporary stabilisation to prevent the loss of topsoil from batters in heavy rainfall events. Mulch use is also shown as a mounded sedimentation control to prevent sediment entering the median drain.

Plate 9: A mulch/topsoil mix used to provide temporary batter stabilisation and to assist cover crop establishment.

Plate 10: Successful establishment of cover crops on batters where mulch has been used with topsoil to assist temporary stabilisation.

Plate 11: Geofabric wrapped mulch bunds used for sedimentation control

Plate 12: Mulch used as a bund for a temporary sedimentation catch dam. Mulch is effective as it can provide both containment and filtering of site water. Mulch should not be used as a control in areas of concentrated flow where it may be washed away. Any mulch containment control should have a defined and lined outlet that allows discharge from the control without washing mulch away. Note that this control does not have a defined discharge outlet which should be installed to prevent failure of the control in heavy rainfall events.

Appendix 3: Minimum requirements for community mulch giveaways

The purpose of community mulch giveaways is to provide mulch for residential landscaping purposes.

The activities of a community mulch giveaway are permissible under the *Protection of the Environment Operations (Waste) Regulation 2005 – General Exemption Under Part 6, Clause 51 and 51A* (the Raw Mulch Exemption 2008). However, the activities remain subject to other relevant environmental regulations within the Act and Regulations. The Raw Mulch Exemption 2008 is subject to the following conditions:

- The raw mulch can only be applied to land for the purposes of filtration or as a soil amendment material or used either singularly or in any combination as input material(s) to a composting process.
- The consumer must land apply the raw mulch within a reasonable period of time.

Further information can be found at: www.environment.nsw.gov.au/resources/waste/ex08mulch.pdf

It is the mulch generators responsibility to ensure that the mulch is reused in an environmentally responsible manner.

A safe work method statement (SWMS) must be prepared that identifies potential OHS risks and all prevention and mitigation measures. The SWMS must apply to both the community and site workers involved in the mulch giveaway.

Each member of the community who participates in the mulch giveaway must read and understand a site specific information sheet. A template information sheet is attached as Appendix 4.

The site occupier must maintain written records for each load of mulch that is taken away and to ensure that each community participant understands the conditions of the community mulch giveaway information sheet. A suggested template to record this information is attached as Appendix 5.

Appendix 4: Community mulch giveaway information sheet

The following community mulch giveaway information sheet must be populated with site specific information.

Community Mulch Giveaway
Information Sheet

Details of Mulch Supply	
Site Occupier	<insert name of contractor / alliance etc>
Project Name	<insert project name>
Location	<insert location of mulch stockpile>
Mulch stockpile access directions	<insert adequate directions for community members to find the stockpile location>

Background

- This information sheet supports the non-commercial giveaway of mulch for local residents.
- The product is raw vegetation mulch from <insert project location / name>.

Conditions

- Any one individual may only take a maximum of 5 trailer loads from this project.
- The mulch may only be used for residential landscaping purposes.
- Mulch must not be placed in or immediately adjacent to waterways.
- The raw mulch can only be applied to land for the purposes of filtration or as a soil amendment material or used either singularly or in any combination as input material(s) to a composting process.
- The consumer must apply the raw mulch to land within a reasonable period of time.

Community Safety Requirements

- <add in any safety requirements or mitigation measures from the SWMS that apply to the community>
- <add in any safety requirements or mitigation measures from the SWMS that apply to the community>
- <add in any safety requirements or mitigation measures from the SWMS that apply to the community>
- <add in any safety requirements or mitigation measures from the SWMS that apply to the community>

Appendix 5: Records template for community mulch giveaway

The records in the following suggested template must be kept as a minimum.

Community Mulch Giveaway Record Sheet				
Date	**Car Registration**	**I have read and understand the 'Community Mulch Giveaway Information Sheet'**	**Name**	**Signature**
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		

Appendix F – Stockpile Management Plan

Appendix F

Stockpile Management Procedure – SSI 9737

Sydney Gateway Road Project

April 2021

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Contents

Figures

1 Stockpile Management Procedure

1.1 Purpose

This procedure is for the establishment and management of temporary stockpile areas within the approved project boundary to ensure that environmental impacts associated with stockpiling are minimised during construction.

Temporary stockpile sites will be required to store various material including, but not limited to excavated materials, topsoil, mulch, excess timber for landscaping and revegetation works, concrete, pavement, rock, steel and other materials required for construction.

Temporary stockpile locations will be established at the beginning and throughout the project period, depending of stage and type of construction works. Once the project is complete the temporary stockpile site will be de-commissioned, and the land restored back to its original condition or as per specifications on the Issued for Construction Drawings.

Permanent stockpile sites, contaminated soils and waste management are not covered by this Procedure. The Remedial Action Plans (RAP) will designate specifics for material handling depending of classification and specific requirements. The Waste Management Plan will define how and where the waste material is to be reused, recycled, stockpiled or disposed of; the receptacles that will be used for storing identified waste materials prior to reuse, recycling, stockpiling or disposal.

TfNSW Guidelines Section 3.5 of G38: Soil and Water Management (2020) states that erosion controls and sediment capture measures will be established and regularly maintained to divert offsite stormwater, manage onsite stormwater runoff and stabilise stockpiles. These measures are to be implemented in accordance with Progressive Erosion & Sediment Control plans that will be developed on the Technical Guideline EMS-TG-010: Stockpile Site Management and Volume 1 and Volume 2 of the Blue Book: Managing Urban Stormwater: Soils and Construction (2004)

1.2 Legislation, regulation, guidelines, and policy

This procedure has been developed by way of referring to the following legislation, regulation, guidelines and policy.

- Technical Guideline EMS-TG-010: Stockpile Site Management (Roads and Maritime, 2008)
- Volume 1 and Volume 2 of the Blue Book: Managing Urban Stormwater: Soils and Construction (Landcom, 2004)

1.3 Work activities

The stockpiling procedures will be included in Environmental Work Method Statement

(EWMS 006 – Earthworks)

Typically, this will cover:

- Locations where the materials will be temporarily stockpiled
- Select material and fill, such as sand and rock
- Topsoil, wood chips, mulch, and vegetation
- Excavated natural material (ENM)
- Recycled Asphalt Pavement
- Concrete or asphalt, block material removed or excavated from pavement
- Pre-coat aggregate

- Asphalt, such as cold mix
- Neutralised & verified acid sulfate soils
- Road base materials
- Construction material laydown areas

1.4 Assessment and Approval of Stockpile Sites

The new stockpile location is to be assessed against Sensitive Area Plans & The Stockpile Locations Checklist. (Appendix A). The engineer or supervisor shall utilise the Stockpile Location Checklist to assess the potential stockpile location.

This will include determining if the stockpile locations are within NSW or Commonwealth Jurisdiction, the proximity to airport operational restricted airspace including obstruction of High Intensity Approach Lighting (HIAL) and Obstacle Limitation Surface (OLS). The Stockpile Locations Checklist requires approval form the JHSWJV Environmental Manager and forms a component of the pre lodgement works application with SYD and the Commonwealth representatives for Commonwealth land. Further approvals may be required where Airport Operations may be affected.

Following this approval, the supervising engineer shall note the new stockpile details within the project stockpile register.

Each new temporary stockpile will be justified in terms of the availability of existing sites in the area, haulage costs (to existing sites) the environmental, social and stakeholder risks.

Prior to utilising the approved stockpile site, it must be captured in the progressive erosion and sediment control plans an all controls installed on site and functioning prior to use.

Please note dust mitigation from stockpiles is essential due to the proximity to the Airport.

1.5 Stockpile Controls

The following controls will be implemented before any stockpile is established to manage it use and operation during construction.

- Containment controls will be implemented to ensure runoff and sediment loss is controlled. This will include constructing stockpiles on hardstand (impervious) bunded areas when possible.
- Stockpiles will be managed to minimise soil disturbance and erosion
- Be trimmed to a regular shape and rolled or bucket pressed to minimise dust
- All temporary stockpiles in place for longer than two weeks will be stabilised with soil binder, fabric covers, temporary seeding (topsoil materials) or similar
- Establish erosion control and sediment measures, and maintain them regularly, to divert offsite stormwater, manage onsite stormwater and stabilise stockpiles
- Stockpile sites will be signposted to identify their locations. The signposts will be used to assist in identifying assets and where materials will be delivered and stored.
- Locate stockpiles outside of the protection zone of trees and protected vegetation in accordance with the CEMP and sub plans
- Locate stockpiles away from known heritage areas as identified in the CEMP and sub plans
- Where possible, locate stockpiles at least 5.0m from likely areas of concentrated water flows and drainage lines
- Keep stockpile materials separate, do not cross contaminate stockpile materials.

- Controls will be implemented to ensure that construction traffic working on stockpile sites do not track mud onto the wider road network or cause the spread of pathogens, diseases, or weeds.
- Biosecurity listed weeds will be managed and treated in accordance with the Flora and Fauna Management Plan
- Upslope run on water will be diverted around the temporary stockpile site
- Downslope of the temporary stockpile site will have sediment fences and / or bunds, sumps and geo textile lined overtopping points.
- The height of all stockpiles will be limited, where practicable, to limit dust generation, visual amenity impacts or Airport Operations.
- All vehicle carrying materials for stockpiling will be covered to prevent the spread of dust and odours.
- Stockpiles containing potential acid sulphate soils will be lined, bunded and managed in accordance with the Acid Sulphate Management Plan & relevant guidelines

1.6 Mulch Stockpiles

Locate and manage mulch stockpiles to minimise and manage tannin generation. Refer to SWMP Annexure F Tannin Management Procedure, which includes TfNSW Environmental Direction: Management of Tannins from Vegetation Mulch (RMS 2012).

- Mulch stockpile sites will not be established on low lying areas within the wider catchment
- Stockpile sites will not be in drainage lines or flood prone areas (1:10 ARI)
- Mulch stockpiles will be contained by earthen perimeter bunds at 300mm high to prevent run on surface water from entering the stockpile site and to capture tannin leachate
- Stockpiles must be arranged to minimise any damage to natural vegetation and trees
- Stockpiles must be monitored for temperatures to avoid spontaneous combustion

1.7 Induction and training

Supervisors and relevant personnel will be trained in this procedure. Prior to requesting the assessment of a stockpile location, the engineer or supervisor is to check current locations to ensure the existing approved sites cannot be utilised. Minimise the number of stockpiles across the Project, wherever practicable.

1.8 Record keeping and monitoring

Routine inspections will be undertaken of each stockpile site, the frequency of which will be determined by what is being stockpiled, the stockpile location and the sensitivity of the receiving environment.

The inspections will focus on the effectiveness of control measures in minimising environmental impacts

The inspection will consider:

- any impact on local environmental sensitivities.
- the effectiveness of the dust control measures.
- the integrity of the hardstand and bunding.
- the encroachment or storage of materials outside of the designated stockpile areas.

- any residential impacts or complaints; any evidence of illegal dumping.
- the height of vegetation growth (to ensure it does not present a visual amenity risk, fire risk or would be at risk of forming a protected habitat) and general housekeeping
- In instances of non-conformance, corrective actions will be defined and implemented. A follow-up site inspection will be conducted once the corrective action is implemented.

1.9 Decommissioning

- Stockpile decommissioning will include, removing all stockpile material from the site, reusing, recycling or disposing of it at a licensed facility
- Stabilising the site by planting and/or landscaping the site as per the IFC Drawings
- Removing control measures such as erosion and sedimentation devices once the site stabilisation has occurred
- Undertaking a site inspection and confirming stabilisation / restoration

1.10 Review

This Stockpile Management Procedure will be updated, where

- A routine site audit or inspection identifies any non-conformance created by the procedure
- Following and incident or emergency
- Following a change in legislation
- Following a major change in construction method

2 Stockpile Controls – Examples

Example 1 – Stockpiles are to be rolled or bucket pressed to reduce erosion and dust

Figure 1 - Bucket pressed stockpile

Example 2 – Unexpected contaminated material stockpiles will be covered with geotextile, watered down, fenced and signed with additional downslope controls.

Figure 2 - Asbestos stockpile (Unexpected find)

Example 3 – Temporary stockpiles planned to be inactive for over 2 weeks will be stabilised to prevent erosion and dust

Figure 3 - Soil Binder

Example 4 – Clean run on water will be diverted around any temporary stockpiles to prevent erosion and protect water quality. Stockpile diversion bunds will be wrapped in geotextile to ensure they have residual strength. The bund also acts as a containment for dirty water eroding from the stockpile.

Figure 4 - Upslope diversion bunds

Example 5 – Temporary stockpile locations will have downslope perimeter controls that include sediment fences, edge bunds, sumps, and stabilised overtopping points.

Figure 5 - Downslope controls

Example 6 – Temporary stockpiles set back from perimeter controls and edge bunds to ensure site drainage during rainfall.

Figure 6 - Stockpile setbacks

Example 7 – Temporary stockpiles can utilise sand bags for short term control or in circumstances that fences and bunds cannot be installed due to ground conditions

Figure 7 - Sandbag Controls

Example 8 -Temporary stockpiles on the Project will be stabilised for Christmas shutdown periods to minimise erosion and dust impacts

Figure 8 - Soil Binder Application

Appendix A Stockpile Locations Checklist

Temporary Stockpile Location Assessment Criteria (The Site)	Does the proposed stockpile meet the criteria? (Yes / No)	If No, provide description, justification and alternative solution and / or additional mitigation measures to demonstrate how potential impacts and risks will be managed
Within the approved project boundary (Project Area)		
Does not require the removal of trees or vegetation		
Trees on site can retained can be protected in accordance with the CEMP and sub plans		
Located outside of any existing tree protection zones		
Not located within a drainage line or concentrated water flow path		
Located outside of a 1:10 ARI flood zone		
Located away from sensitive receiver locations as identified in the CEMP and Sub plans		
Stockpiles are clear of the SYD HIAL and below OLS?		
The location and relevant work activities are compliant with the Noise Catchment it is located in		
The site is positioned so that the stockpiled material is accessible at any time including future works		

Temporary Stockpile Location Assessment Criteria (The Site)	Does the proposed stockpile meet the criteria? (Yes / No)	If No, provide description, justification and alternative solution and / or additional mitigation measures to demonstrate how potential impacts and risks will be managed
The site does not impact on any heritage area, EEC or other protected zone.		
Has the proposed stockpile location been included in the ESCP for the area		

Appendix G – Unexpected Contaminated Land and Asbestos Finds Procedure

UNEXPECTED CONTAMINATED LAND AND ASBESTOS FINDS MANAGEMENT PROCEDURE

MANAGEMENT AND RESPONSIBILITY

INDUCTION/ TOOLBOX TALKS
All personnel are to receive Project/ Site Inductions and on-going training via Toolbox Talks which will include requirements of this procedure

Environment Coordinator
Site Supervisor
All personnel

NO EVIDENCE OF CONTAMINATION OBSERVED
If observations do not indicate the presence of potential contamination, then excavation works continue.

EVIDENCE OF UNEXPECTED CONTAMINATION OBSERVED

IF OBSERVATIONS INDICATE PRESENCE OF POTENTIAL UNEXPECTED CONTAMINATION THEN STOP ALL WORK IN THE IMMEDIATE AREA AND PREVENT FURTHER ACTIVITY IN THE AREA. NOTIFY THE SITE SUPERVISOR AND ENVIRONMENT CO-ORDINATOR AND CORDON OFF AREA.

Site Supervisor
Site Engineer
Project Manager
Lead Safety Manager (to be notified)

- Do not touch or disturb the item/ material. Ensure relevant PPE is being worn.
- Delineate the find from the rest of the worksite and install signage
- Initial notification to TfNSW, ER/AEO, JH HSE, Environment and Community Teams
- Inform the Project Manager regarding the potential contamination find. The following detail should be provided:
  - The location of the potential contamination
  - Odor (if any)
  - Depth
  - Surrounding material and works being undertaken at the time of discovering the material
  - Visual appearance

ADDITIONAL ASSESSMENT
If required, the Project Manager is to obtain assistance from a suitably qualified environmental scientist/ engineer in identifying the potential hazard to human health or the environment in accordance with NSW regulatory requirements; this may include sampling and laboratory analysis.

Site Supervisor
Site Engineer
Project Manager
Lead Safety Manager (to be notified)
Project Environment Manager (to be notified)

MANAGEMENT STRATEGY - STATE
- Develop a plan for managing and/or re-mediating the suspect material. If required, develop/update a Remediation Action Plan (RAP). **HOLD POINT** – RAP (if required) needs to be submitted 5 days prior.
- Environment Manager to notify TfNSW and ER
- Obtain any necessary approval(s) including any approvals from the Site Auditor.

MANAGEMENT STRATEGY - COMMONWEALTH
- Develop a plan for managing and/or re-mediating the suspect material. If required, develop/update a Remediation Action Plan (RAP). **HOLD POINT** – RAP (if required) needs to be submitted 5 days prior.
- Environment Manager to notify TfNSW and AEO
- Obtain any necessary approval(s) including any approvals from the Site Auditor.

Project Manager
Lead Safety Manager
Project Environment Manager

STRATEGY IMPLEMENTATION
- If the material is to be removed waste classification is to be undertaken in accordance with the NSW Waste Classification Guidelines (EPA2014) and disposal at a facility licensed to accept the class of waste.
- If the material will be remediated onsite, to be done in accordance with RAP, Contamination Management Plan and any other relevant requirements.
- Document compliance with the approved management and remediation provide relevant documentation to the disposal site and the regulator (if required).

Environment Coordinator
Site Supervisor
Site Engineer

Report to Comcare

RE-COMMENCEMENT OF WORKS
Once the contamination find has been addressed the Project Manager is to approve re-commencement of works in the vicinity of the remediation site. Depending on the nature and extent of contamination, validation may be required by the site auditor and/or contamination consultant.

Project Manager

CONTINUE WITH ACTIVITY

General Indicators of Contamination

- Asbestos cement fragments or other potentially asbestos containing materials
- Odorous or stained soil
- Buried chemical drums or containers
- Presence of waste materials or building debris
- Tarry or ashy material
- Brightly or unusually coloured material
- A yellow and/ or red mottling in the soil profile indicates there may be Acid Sulfate Soils (ASS)

Asbestos

An unexpected find occurs when ACMs not identified in the Asbestos Register is found on site. In the event of an unexpected find the below steps are to be followed:

1. The area is to be demarcated, works in the area to cease and workers warned
2. Notify the Site Supervisor, The Site Supervisor will notify the Project Manager
3. Control dust by with dust suppression i.e. water cart, wetting down the area
4. Arrange for testing of the suspected ACM and monitoring of the area (if required)
5. An asbestos removalist is to be engaged to provide recommendations to treat the area, as required
6. The area is to be made safe

Asbestos finds are to be managed in accordance with the Project WHS Management Plan

Documentation

The below documentation may be relevant to this unexpected contamination finds procedure:

- JHSW Project WHS Plan (which includes asbestos management);
- JHSW Contamination Management Plan
- RMS G36 Environmental Protection - Section 4.2
- TfNSW Publication – Guideline for the Management of Contamination September 2013
- TfNSW Environment Fact Sheet – Asbestos Waste
- Environmental Incident Classification and Reporting Procedure RMS November 2018
- Voluntary Remediation Agreement (VRA) No. 26050
- The licensed asbestos removalist must notify the state/territory and commonwealth regulator (Comcare) as follows:
  - in writing at least 5 days before works commences
  - immediately over the phone in the case of emergency removal work (must be followed up in writing 24 hours of the phone notification 1300 366 979)

Appendix H – TfNSW Specification Compliance

Other requirements detailed in the relevant TfNSW Specifications (G36 and 38) are detailed in Table below. This includes reference to required outcomes, the timing of when the commitment applies and relevant documents or sections of the environmental assessment influencing the outcome and implementation.

Table - Other environmental requirements relevant to this SWMP

Ref #	Commitment	Timing	How addressed
G36 4.2.5	Implement relevant control measures to divert any surface runoff away from the contaminated land, and capture and treat any surface runoff contaminated by exposure to the contaminated land.	Construction, Environment Manager	Refer to Appendix A, PESCP Section 6 of this Plan details water treatment measures.

Ref #	Commitment	Timing	How addressed
G36 4.3	Comply with the requirements in the following: • relevant legislation and Australian Standards; • EPA "Bunding and Spill Management Guidelines" contained within EPA "Environmental Protection Manual for Authorised Officers"; • RMS "Code of Practice for Water Management". • Store chemicals, fuel and lubricants in suitably located and bunded areas to minimise the impact of any spillage or contamination on the Site and adjoining areas. Do not locate these storage areas within 50 m of any aquatic habitat, flood prone areas, or on slopes steeper than 1:10. • Do not refuel or maintain plant and equipment, mix cutting oil with bitumen, or carry out any other activity which may result in spillage of a chemical, fuel or lubricant at any location which drains directly to waters or environmentally sensitive areas, without the appropriate temporary bunding being provided. Do not leave refuelling operations unattended.	Construction, Environment Manager	A spill response Procedure has been developed and is included in Appendix D.
G36 4.3	As part of the CEMP, prepare a procedure(s) for the following activities, as a minimum, to minimise the possibility of pollution of the Site: • refuelling or maintenance and cleaning of plant and equipment including concrete agitators, bitumen spray bars and asphalt pavers; • on-site batching of concrete and asphalt; • mixing of bitumen with cutting oil and additives;	Construction, Environment Manager	A spill response Procedure has been developed and is included in Appendix D.

Ref #	Commitment	Timing	How addressed
	• application of liquid membranes, including paint and thermoplastic, resin, emulsion, precoat agent and curing compound; • bulk fuel or chemical deliveries; • removal and disposal of excess chemicals and water used for washing down of equipment; • pumping out of oil and grease collection pits; and • decanting operations such as for fuel, chemicals and bitumen.		
	Include in the procedure(s) the following, as a minimum: • details of the management of the bunded areas including monitoring of the bunded areas, drainage requirements and measures to ensure that bund capacities are maintained; • details of the management associated with the removal and transportation of chemical drums from bunded areas; • routine maintenance requirements of machinery, pumps and other equipment to prevent and/or minimise leaks; and installation of controls for the capture and filtering of all chemicals that may runoff in storm events, for example wax and hydrocarbon curing compounds, bitumen tack coat and saw cutting material.		A spill response Procedure has been developed and is included in Appendix D.
G36 4.3	Keep adequate quantities of suitable material to counteract spillage readily available. Clean up all chemical spills immediately. If spills result in an environmental incident, report the incident in accordance with Clause 4.14.	Construction, Environment Manager	A spill response Procedure has been developed and is included in Appendix D.
G36 4.14	If required by an EPL, prepare and include in the CEMP an environmental incident reporting and investigation procedure, including Pollution Incident Response Management Plan, as	Construction,	A PIRMP will be developed as

Ref #	Commitment	Timing	How addressed
	required by Part 5.7 of the Protection of the Environment Operations Act 1997 (NSW) (POEO Act).	Environment Manager	required under the POEO Act. The incident investigation and reporting procedure is included in the CEMP.
G36 4.16	Prior to Completion, restore at your own cost any areas disturbed by you (such as areas for site compounds, material storage, access and haul roads and the provision of the Principal's Project accommodation) to a condition similar to that existing before disturbance, unless authorised otherwise by the Principal. Restoration includes spill clean up and soil remediation where applicable, topsoiling of the area, weed control and seeding, planting, watering and maintenance. Refer to Specifications RMS R178 and RMS R179 as applicable.	Construction, Environment Manager	Reinstatement of areas will be completed in accordance with design requirements. For soil remediation, actions relating to reinstatement will be detailed in the applicable Remediation Action Plan (RAP).
G38 2.1.1	The SWMP must be prepared by a person with demonstrated skills and experience in preparing the SWMP in accordance with the guidelines in the publication "Managing Urban Stormwater: Soils and Construction Volumes 1 and 2d" (the BLUE BOOK).	Construction, Environment Manager	This Plan, Appendix A
G38 2.1.2	The Soil and Water Management Plan (SWMP) must identify all risks relating to soil erosion, and pollution caused by sediments and other materials, and describes how these risks will	Construction, Environment Manager	This Plan, Appendix A

Ref #	Commitment	Timing	How addressed
	be addressed during construction. Purpose and objectives of SWMP. • Approvals, licence requirements and relevant legislation. • Site investigation and assessment of the following: • soil properties (including dispersion properties and presence of acid sulphate soils); • rainfall records and design parameters; • waterways and other water related sensitive environments; • groundwater; • possibilities of, and limitations on, water extraction. Environmental control measures, including: • responsibility for its implementation, including the names and contact details of the person(s) responsible; • resources required for its construction, monitoring, maintenance and removal; • implementation schedule for the measures, related to construction activities; • monitoring and maintenance of the environmental controls Other associated plans, Environmental Work Method Statements (EWMS) and procedures.		
G38 2.1.2	Construction sediment retention basins, including details of the following: • design of the construction sediment retention basins, including any temporary modifications to the operational basins, providing details of the approach, standards, criteria and references used in the design of the basins; • management of the basins; • procedures for testing, treatment and discharge of water from the basins;	Construction, Environment Manager	Appendix A of this Plan provides for the overall strategy for development of erosion and sediment controls for the

Ref #	Commitment	Timing	How addressed
	• procedures for the periodic removal and disposal of the sediment collected within the basins. • Training, including: • site induction; • environmental training; • toolbox training.		works.
G38 2.2.2	The ESCP must include details of the following where relevant: • erosion and sediment control measures required: • before clearing and grubbing of the Site; • before removal of topsoil and commencement of earthworks within the catchment area; • how upstream water will be managed so it is not polluted by the construction activities; • method of tree removal in intermittent watercourses, leaving grasses and small understorey species undisturbed wherever possible; • scour protection measures for haul roads and access tracks when these are an erosion hazard due to either their steepness, soil erodibility or potential for concentrating runoff flow; • measures for stabilising temporary drains; • measures to minimise erosion during construction of embankments; • measures to minimise erosion and control sedimentation from stockpiles; • methods of constructing batters to assist the retention of topsoil on the batter slopes; • measures to temporarily trap sediment in median areas at regular intervals;	Construction, Environment Manager	Appendix A of this Plan provides for the overall strategy for development of erosion and sediment controls for the works.

Ref #	Commitment	Timing	How addressed
	• controls in runoff flow paths to reduce flow velocities and minimise the potential for erosion;		
G38 2.2.2	• measures for controlling waste water discharge on or around the Site from dewatering (refer to Clause 3.5), surface washing, grit blasting, saw cutting, drilling, washing vehicles and plant and any other activities which add pollutants to water; • measures to be put in place during an extended shut-down of the Site or when rainfall above a certain trigger level is predicted; • maintenance of erosion and sediment control structures including measures to restore their capacity; • inspection and auditing program for all erosion and sediment controls to ensure that no disturbed area is left without adequate erosion and sediment controls.	Construction, Environment Manager	Appendix A of this Plan provides for the overall strategy for development of erosion and sediment controls for the works.
G38 2.2.3	When preparing the ESCP, subdivide the site into sections based on the separate catchment areas, or alternatively into high risk areas, that will be affected by Work Under the Contract. Progressively, before work begins on any section of the Site, prepare a drawing for that section showing all controls required to avoid erosion and sedimentation of the Site, surrounding areas, watercourses, drainage systems, water bodies and wetlands. Update each drawing regularly as the site conditions changes during the progress of Work Under the Contract. Include as part of the ESCP a procedure for updating the drawings, and keep a register of all such drawings with the dates of submission, approval, and commencement of work on that section. Include on the drawings locations of all ancillary activities and/or areas that may impact on water quality, such as: • access and haulage tracks; • borrow pits;	Construction, Environment Manager	Appendix A of this Plan provides for the overall strategy for development of erosion and sediment controls for the works.

Ref #	Commitment	Timing	How addressed
	• stockpile and storage areas; • temporary work areas; • materials processing areas; • compound areas; • concrete and asphalt batching areas.		
8	The Contractor must carry out a water quality impact assessment associated with discharges from sedimentation basins or water quality treatment plants that receive water runoff or discharges from the Construction Site. The assessment must take into consideration the environmental values of the waterway and discharge criteria as identified in the Environmental Documents.	Pre-Construction, Environment Manger	A water quality impact assessment is currently being prepared to satisfy this requirement.
12c	Stockpiling of material must be managed in accordance with an approved stockpile management plan.	Construction, Environment Manger	A Stockpile Management Plan is included in Appendix F of this Plan.