BESIX Watpac

Barangaroo Station

Soil & Water Management Procedure

N217

BR COP

15 March 2023

Project overview

Project Site Address:
25 Hickson Road
Barangaroo
NSW 2000

Project Commencement Date:
12 March 2021

BESIX Watpac State Division Address:
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Name	Role & Title	Signature	Date
[redacted]	Reviewer / Planning & Environment Manager	[redacted]	28/02/2023
[redacted]	Author / Construction Manager	[redacted]	28/02/2023
[redacted]	Reviewer / Contractor's Representative	[redacted]	28/02/2023

Note: A controlled copy of the Soil and Water Management Procedure will be distributed to the Sydney Metro Principal's Representative, Independent Certifier (IC) and other nominated stakeholders, and it will be made available to all BR COP employees and subcontractors in soft copy format through the project document control system.

This procedure, when printed, will be uncontrolled and it will the responsibility of each user to confirm the currency of the plan through the project document control system.

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Soil & Water Management Procedure

ID	Requirement	Reference
Conditions of Approval (CoAs) – SSI 7400 (Mod 9)		
E65	All reasonably practicable erosion and sediment controls must be installed and appropriately maintained to minimise any water pollution. When implementing such controls, any relevant guidance in the Managing Urban Stormwater Series must be considered.	Section 6
E66	A Site Contamination Report, documenting the outcomes of Phase 1 and Phase 2 contamination assessments of land upon which the CSSI is to be carried out, that is suspected to be, or known to be, contaminated must be prepared by a suitably qualified and experienced person in accordance with guidelines made or approved under the Contaminated Land Management Act 1997 (NSW).	Section 6
E67	If a Site Contamination Report prepared under Condition E66 finds such land contains contamination, a site audit is required to determine the suitability of a site for a specified use. If a site audit is required, a Site Audit Statement and Site Audit Report must be prepared by a NSW EPA Accredited Site Auditor. Contaminated land must not be used for the purpose approved under the terms of this approval until a Site Audit Statement is obtained that declares the land is suitable for that purpose and any conditions on the Site Audit Statement have been complied with	Section 6
E69	An Unexpected Contaminated Land and Asbestos Finds Procedure must be prepared and must be followed should unexpected contaminated land or asbestos be excavated or otherwise discovered during construction.	Section 6.3
E70	The Unexpected Contaminated Land and Asbestos Finds Procedure must be implemented throughout construction.	Section 6.3
E107	The CSSI must be constructed and operated so as to maintain the NSW Water Quality Objectives where they are being achieved as at the date of this approval, and contribute towards achievement of the NSW Water Quality Objectives over time where they are not being achieved as at the date of this approval, unless an EPL in force in respect of the CSSI contains different requirements in relation to the NSW Water Quality Objectives, in which case those requirements must be complied with.	Section 7
Revised Environmental Mitigation Measures (REMMs)		
SWC1	Updated desktop contamination assessments would be carried out for Chatswood dive site, **Victoria Cross Station, Artarmon substation,** Blues Point temporary site, Barangaroo Station, Central Station and Waterloo Station **and the Sydenham Maintenance Centre site within surface track works south.** If sufficient information is not available to determine the remediation requirements and the impact on potential receivers, then detailed contamination assessments, including collection and analysis of soil and groundwater samples would be carried out. Detailed contamination assessment would also be carried out for the Barangaroo power supply route within Hickson Road and the Marrickville power supply route adjacent to Sydney Park and Camdenville Oval. In the event a Remediation Action Plan is required, these would be developed in accordance with Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land (Department of Urban Affairs and Planning and Environment Protection Authority, 1998) and a site auditor would be engaged.	Section 6
SWC2	Prior to ground disturbance in high probability acid sulfate areas at Barangaroo Station, Waterloo Station and Marrickville dive site, **Sydenham Station and the surface track works south,** testing would be carried out to determine the presence of acid sulfate soils. If acid sulfate soils are encountered, they would be managed in accordance with the Acid Sulfate Soil Manual (Acid Sulfate Soil Management Advisory Committee, 1998).	Section 6
SWC3	Erosion and sediment control measures would be implemented in accordance with Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and Managing Urban Stormwater: Soils and Construction Volume 2 (Department of Environment and Climate Change, 2008a). Measures would be designed as a minimum for the 80th percentile; 5-day rainfall event.	Section 6
SWC4	Discharges from the construction water treatment plants would be monitored to ensure compliance with the discharge criteria in an environment protection licence issued to the project.	Section 7
FH1	Detailed construction planning would consider flood risk at Barangaroo Station, Martin Place Station and the Waterloo Station construction sites. This would include identification of measures to avoid, where feasible and reasonable, not worsen existing flooding characteristics	Section 8

	up to and including the 100 year annual recurrence interval event in the vicinity of the project. Not worsen is defined as: › A maximum increase flood levels of 50mm in a 100 year Average Recurrence Interval flood event › A maximum increase in time of inundation of one hour in a 100 year Average Recurrence Interval flood event › No increase in the potential for soil erosion and scouring from any increase in flow velocity in a 100 year Average Recurrence Interval flood event.	
HR1	All hazardous substances that may be required for construction would be stored and managed in accordance with the Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005) and Hazardous and Offensive Development Application Guidelines: Applying SEPP 33 (Department of Planning, 2011).	Section 9
WM1	All waste would be assessed, classified, managed and disposed of in accordance with the *NSW Waste Classification Guidelines*	Section 6
WM2	100 per cent of spoil that can be reused would be beneficially reused in accordance with the project spoil reuse hierarchy.	Section 6
CEMF		
15.1a	Soil and Water Management Objectives a. The following soil and water management objectives will apply to construction: i. Minimise pollution of surface water through appropriate erosion and sediment control; ii. Maintain existing water quality of surrounding surface watercourses; and iii. Source construction water from non-potable sources, where feasible and reasonable.	Section 4
15.3	Soil and Water Mitigation a. Examples of surface water and flooding mitigation measures include: i. Clean water will be diverted around disturbed site areas, stockpiles and contaminated areas; ii. Control measures will be installed downstream of works, stockpiles and other disturbed areas; iii. Exposed surfaces will be minimised, and stabilised / revegetated as soon feasible and reasonable upon completion of construction; iv. Dangerous good and hazardous materials storage will be within bunded areas with a capacity of 110 per cent of the maximum single stored volume; and v. Spill kits will be provided at the batch plants, storage areas and main work sites.	Section 8 & 9

1 Document Purpose

The purpose of the soil and water management procedure is to minimise potential adverse soil and water environmental impacts occurring during BESIX Watpac's construction activities.

2 Construction Overview

The following construction activities have been identified as having the potential to impact upon soil and water:

- Structural and civil completion works to the station box;
- Alterations and installation of underground service infrastructure including, gas, electricity and communications;
- Stormwater trunk mains works from Hickson road precinct to the existing pit at western end of the Site;
- Installation of a cooling water system within the Barangaroo cutaway and associated trenching and pipework;
- Hickson Road precinct works including road, footpath, cycleway, landscaping, street lighting, stormwater, utilities works and ventilation pod risers;
- Backfilling and surface reinstatement of the temporary northern (Hickson Road) shaft;
- Staging and temporary works required to deliver the permanent works, including removal of the temporary Hickson Road bridge structure;
- Discharge of water off site from the Water Treatment Plant (WTP);
- Relocation of the WTP on Site, including the use of a Temporary Water Treatment Plant (TWTP) during relocation works; and,
- Discharge of water off site from the western civil pit (bypassing the WTP).

3 Potential Impacts

Construction activities occurring on site may result in the following negative impacts to soil and water:

- Soil erosion;
- Soil contamination; and,
- Water pollution.

4 Soil and Water Management Objectives

The following soil and water management objectives will apply to construction activities:

- Minimise pollution of surface water through appropriate erosion and sediment control measures;
- Ensure that all contaminated soil is managed in accordance with relevant legislation and the Spoil Management Plan Sampling, Analysis & Quality Plan (SMPSAQP);
- Ensure that acid sulfate soil is manage in accordance with relevant legislation and the Acid Sulfate Soils Management Plan (ASSMP);
- Maintain existing water quality of surrounding surface watercourses;
- Ensure compliance with *NSW Water Quality Objectives* through the adoption of the Water Discharge Impact Assessment (WDIA) and implementation of a Water Quality Monitoring Program (WQMP);

- Ensure no uncontrolled surface water run-off from the site into Sydney Harbour;
- Re-use 100% of spoil that can be reused in the project; and,
- Mitigate flooding risk through an engineered approach with robust planning and controls.

5 Roles and Responsibilities

5.1 Key BESIX Watpac Personnel

An overview of the specific responsibilities of the BESIX Watpac project team for water and soil management as they relate to each role on the project are outlined in Table 1 below:

Table 1 Roles and Responsibilities

Role	Authority and Responsibility
Project Director **Construction Managers**	• Manage the delivery of Barangaroo Metro Station including overseeing the implementation of the CEMP, associated sub-plans and procedures
Environment and Planning Manager	• Oversee the implementation of all environmental, soil, water and groundwater management initiatives • Report on environmental performance • Authority to direct personnel and subcontractors to carry out actions to avoid or minimise environmental impacts • Review of water quality monitoring reports (CWQMR) prepared by the water quality monitoring consultant • Conduct an investigation in the event of a water quality exceedance • Authority to discharge water offsite from the WTP.
Environmental Co-ordinator/Site Engineer	• Daily weather monitoring • Visual inspection to establish whether mitigation measures are required • On site environmental monitoring and visual inspections of mitigation measures in place • Records keeping and reporting in implemented mitigation measures • Monitoring and record keeping of the on-site WTP • Collection of water quality samples and undertaking of field analysis of certain samples collected • Coordinate on site testing with agencies undertaking testing and laboratories analysing sampling results
Site Manager **Project Engineers** **Construction Foremen**	• Visual inspections of mitigation measures in place • Establishment of mitigation measures • Record keeping in relation to mitigation measures • Ensure compliance with the CEMP and soil and water procedure • Conduct inductions and toolbox talks in relation to soil and water responsibilities • Authority to direct personnel and subcontractors to carry out actions to avoid or minimise environmental impacts
Sustainability Manager	• Track and report soil and water elements against sustainability targets, Conditions of Approval and the Revised Environmental Mitigation Measures • Provide evidence for Compliance Tracking Reviews
Commercial Manager	• Ensure that relevant soil and water and groundwater management requirements are considered in procurement

5.2 Specialist Consultants

5.2.1 Contamination and Acid Sulphate Soils Expert

BESIX Watpac have engaged Douglas Partners, a consultancy specialist in geotechnical, environmental and groundwater engineering, to carry out a desktop analysis of existing environmental investigations undertaken in the vicinity of the Barangaroo Metro Station and to produce a Spoil Management Plan Sampling, Analysis & Quality Plan (SMPSAQP), Acid Sulphate Soils Management Plan (ASSMP) and establish the spoil testing regime to be implement by BESIX Watpac during construction. Douglas Partners will also review the Remediation Action Plan (RAP) and Site Audit Statement (SAS) produced by the TSE Contractor for the excavation of the station.

5.2.2 Environmental Engineering

BESIX Watpac have engaged WSP as the specialist environmental engineering consultant responsible for producing the Water Discharge Impact Assessment (WDIA) for the existing on-site Water Treatment Plant (WTP) to assess its fitness for purpose for in treating ground and surface water collected as part of BESIX Watpac's construction activities and to ensure that *NSW Water Quality* objectives are being maintained in accordance with CoA E107. WSP have also produced two memorandum amendments to the WDIA as outlined below.

- The first memorandum contemplates discharge of water directly off site, bypassing the WTP, to enable dewatering required for the installation of civil stormwater pipework and junction pits. This activity is limited to the discharge of water from the western civil pit as shown below in Figure 1, to allow the put base slab to be poured and the pit constructed.
- The second memorandum covers the change in discharge location from the assumed location in the WDIA, to the existing and actual discharge location adjacent to Duke's Pier. The memorandum changes the discharge capacity at the existing outlet from 15 l/s to 7 l/s to mitigate disturbance of the sediment on the seabed floor, however, continues to permit a discharge of 15 l/s during or following inclement weather events. The memorandum also confirms that the discharge capacity at the assumed location in the WDIA, which is the permanent stormwater outlet at Nawi Cove, can remain at 15 l/s.

Figure 1 Western Civil Pit

5.2.3 Water Quality Monitoring

BESIX Watpac have engaged an independent environmental consultancy to undertake monitoring of the water quality in Sydney Harbour (SW_B_01), the discharge point of the WTP (BN-3) and groundwater within the station box at Basement levels 3 (GR-2) and 6 (GR-1), in accordance with the requirements of the Water Quality Monitoring Program (WQMP) on a monthly and quarterly basis.

During the relocation of the WTP on Site, a temporary WTP will be established for use while the original WTP is decommissioned and re-established. During this period a Temporary Water Treatment Plant – Water Quality Testing Program has been developed for use to confirm the TWTP and re-established WTP are working to specifications.

6 Soil Management

The following mitigation measures will be implemented during construction to minimise potentially adverse impacts on soil, and to meet the requirements as outlined in the CEMF and Revised Environmental Mitigation Measures (REMMs):

6.1 Contamination and Acid Sulfate Soils

Extensive environmental investigations, and remediation, have been undertaken in the Barangaroo area in the vicinity of the Barangaroo Metro Station as summarised in Table 2 below:

Table 2 Summary of Key Environmental Investigations undertaken in the vicinity of Barangaroo Metro Station

No	date	Author	Title	Scope/Purpose	Comment
1	1 June 2010	ERM	Overarching Remedial Action Plan for the Barangaroo Project Site, Sydney	Covers 22 Ha area including Hickson Road and former gasworks site. Identifies the remediation options on the Remediation area and makes recommendations	Engaged by the Barangaroo Delivery Authority. Summarises contamination issues identified in previous Environmental Site Assessments (those key being two by ERM 2007&2008 which include Stage One and Stage Two investigations, one by Coffey 2008 focussing on road section between Nos 30 and 38 Hickson Rd, one by URS 2001, and various earlier other studies). The declared Remediation Site covers the former gasworks and portion Hickson Road adjacent.
2	May 2016	Jacobs	Technical Paper 8: Phase 1 Contamination Investigation (incorporating Preliminary Site Investigation)	Forms part of Environmental Impact Statement (EIS) for the Sydney Metro Chatswood to Sydenham.	Engaged by TfNSW. Uses information provided by the Barangaroo Delivery Authority on seven previous studies in 2012, 2013, six from JBS, and one from Environ in and around Barangaroo Central. Recommendations informed CoA and REMMs as relating to Contamination.
3	May 2018	Douglas Partners	Remediation Action Plan Sydney Metro City & South West - Tunnel and Station Excavation Works Package Proposed Barangaroo Station, Hickson Road, Barangaroo	Covers the basement bulk excavation footprint only. Purpose is to render site suitable for proposed land use.	TSE's Remediation Action Plan. Commissioned by John Holland CPB Ghella JV. Referenced previous Douglas Partners report on Preliminary site investigation March 2018, detailed site investigation May 2018, PSM Hydrogeological Interpretive Report 19 March 2018, all the above referenced reports and two reports from Golder May 2016, and January 2017.
4	27 February 2019	Douglas Partners	Addendum to Remediation Action Plan (TSE)	Provides qualification on limits to groundwater modelling, and proposed alternative assessment approach with inspections and sampling	Addendum is a brief letter
5	September 2021	Douglas Partners	Report on Validation of Remediation (TSE)	Assesses the suitability of the site for the proposed station following completion of remediation works. Report considers sources of contamination within the bulk excavation and contaminated groundwater potentially present outside of the bulk excavation.	Undertaken by the preceding TSE Contractor confirming remediation carried.

The excavation of the station footprint has been undertaken by the TSE Contractor and remediated by the TSE Contractor in accordance with the TSE Remediation Action Plan (RAP). The site has been assessed as suitable for its intended future us as a station by others (Table 2 report No. 5), and further contamination assessment for this purpose is not required. This assessment does not, however, assess (nor is it reliant on the absence of) contamination at the site outside of the station box bulk excavation footprint. The remainder of the site therefore potentially contains contaminated soils which may require management during works.

For the remainder of the site, outside of the station box bulk excavation footprint, the land use will not be changed for the proposed works, and Douglas Partners consider that the works do not to trigger the need for contamination assessment under the *Contaminated Land Management Act (CLM Act) 1997*.

BESIX Watpac has engaged Douglas Partners as the specialist consultant responsible for preparing a Spoil Management Plan Sampling, Analysis & Quality Plan (SMPSAQ) which sets out the requirements for managing spoil excavated during the works to meet the requirements of the POEO Act. BESIX Watpac have prepared an Unexpected Contaminated Land and Asbestos Finds Procedure (UCLAFP) based on the requirements as outlined in the SMPSAQ and to meet the requirements of CoA E69 and E70. The adopted thresholds for on-site re-use have been determined with consideration of waste minimisation in accordance with CoA E106 and environmental risk associated with keeping contamination impacted soil on site.

To satisfy Condition E66 of the COA and Condition SCW1 of the REMM, Douglas Partners have undertaken a desktop review of the existing contamination and acid sulfate soil assessments listed in Table 2 as well as any others documentation provided by Sydney Metro. The subsequent Preliminary Site Investigation (PSI) Report summarised the current understanding of contamination issues at the Site and identified what further investigation was required to meet the above objectives. The report concluded:

"Based on the results of this PSI, it is considered that testing is required to determine the waste classification of soils and bedrock for off-site disposal, the need for treatment of ASS, and the suitability of soil/ rock for re-use on site (from a contamination perspective), as applicable. Given that there has been significant land disturbance (and potential redistribution of materials) at the site since circa 2014 (including for the TSE project and previous construction projects at Barangaroo Reserve, Nawi Cove and Barangaroo Central) which has not been captured in previous reports (apart for the station box extent), it is considered that the contamination data presented in previous reports (outside of the station box extent) cannot be relied upon for waste classification assessment purposes.

It is recommended that some in situ investigations be undertaken (prior to excavation work) at proposed significant excavation areas to the south and west of the station box extent. The purpose of the in situ investigations would be to:

- *To gain a better understanding of the extent of ASS and associated liming rates for treatment;*
- *Determine the preliminary waste classifications of the various soil materials so that materials with (likely) different waste classifications can be segregated (if possible) during excavation. This may minimise quantities of hazardous waste and restricted solid waste requiring disposal; and*
- *To provide an early indication if materials should not be reused at the site due to levels of contamination potentially posing a risk to identified human health or ecological receptors."*

Staged in-Situ waste classification works were undertaken by EP Risk between October 2021 and January 2023 with a peer review of waste classification documentation to be undertaken by Douglas Partners in 2023. No recommendations for remediation have yet been made based on the conclusions of the PSI or in-Situ waste classification investigations, therefore no Site Audit Statement or Site Audit Report is required under Condition of E67 of the COA. The PSI provides advice on any contamination specific work health and safety measures that are considered appropriate for the works, based on the available data. Subsequent to this PSI in-situ soil investigation works were undertaken for the purpose of waste classification. Stockpiled spoils excavated from Site have also been subject to waste classification. Classification reports undertaken also provide an assessment of the suitability of the material to be reused on Site following excavation. A peer review of material classification reports will be undertaken to confirm waste classification and land use assessment has been undertaken in accordance with the relevant guidelines, currently the 2014 NSW Waste Classification Guidelines and the National Environmental Protection (Assessment of Site Contamination) Measure 2013.

Acid Sulfate Soil (ASS) is expected to be present at the site, and Douglas Partners have prepared an Acid Sulfate Soil Management Plan (ASSMP) describing the works required to treat and manage ASS to mitigate on-site pollution incidents and for disposal in accordance with the POEO Act. The ASSMP has been developed in accordance with the requirements of the Acid Sulfate Soil Manual (Acid Sulfate Soil Management Advisory Committee, 1998) (ASSMAC, 1998). This item addresses REMM SCW1. Prior to ground disturbance in high probability ASS areas testing will be carried out to determine the presence of

ASS in accordance with the requirements of REMM SCW2. If ASS is present then works will be conducted in accordance with the ASSMP.

BESIX Watpac will implement the SMPSAQ during all excavation works, and the ASSMP where required. BESIX Watpac will also include contamination risks identified by the above reports listed in Table 2 in the applicable Work Method Statement(s) where relevant.

Stockpiled spoil will be managed in accordance with the recommendations of the SMPSAQ. Erosion and sediment control measures will be implemented on site and surrounding stockpiled materials accordance with Managing Urban Stormwater: Soil and Construction (Landcom, 2008) – the "Blue Book and REMM Condition SCW3 to ensure there is no risk of contaminated spoil, or water runoff, from site.

6.2 Waste Classification and disposal

Soils to be disposed of off-site will be classified in accordance with the *POEO (Waste) Regulation 2014*, and POEO Act (including the NSW EPA Waste Classification Guidelines, where applicable) prior to leaving the site in accordance with REMM WM1.

Each excavated area / stockpile will be tracked on the Material Tracking Register to identify where the material was excavated from and document the soil classification and volumes of each stockpile. The Material Tracking Register will be read in conjunction with a site map mark-up of the stockpiles, to assist in managing where material was excavated from and tracking the different classification of materials on site. Once waste classification reports are issued, it will be determined whether the spoil can be reused, or whether it needs to be taken to a licenced landfill in accordance with the SMPSAQ and/or ASSMP. All material that is taken to licenced landfills will be tipped at locations licenced to take the classification of spoil. Tipping dockets from the licenced landfill will be provided by the civil subcontractor and be recorded in the Material Tracking Register. Waste Classification Report references will also be recorded in the relevant section of the Materials Tracking Register.

If in-situ waste classification identifies contamination, ex-situ waste classification will be conducted. If upon visual inspection excavated material does not look or smell like its in-situ classification, an ex-situ waste classification will be undertaken. The visual inspection of all stockpiles will be undertaken and documented as required.

6.3 Unexpected Contamination

Where unexpected contamination in the form of contaminated soil, ASS or asbestos is discovered on site, the SMPSAQ outlines the process to be followed to mitigate environmental risks from unexpected contamination. In addition, and to meet the requirements of CoA E69 and E70, an Unexpected Contaminated Land and Asbestos Finds Procedure (UCLAFP) has been prepared by BESIX Watpac to outline the responsibilities of all site personnel as they relate to unexpected contamination and the process to be followed, and individual responsibilities, should it be observed or suspected on site. The UCLAFP is an appendix of the CEMP.

6.4 Erosion and Runoff

Erosion and sediment control measures will be implemented in accordance with *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom, 2004) and *Managing Urban Stormwater: Soils and Construction Volume 2* (Department of Environment and Climate Change, 2008a) Measures will be designed as a minimum for the 80th percentile, 5-day rainfall event. Control measures will be placed downstream of stockpiles and disturbed excavation works and stockpiles will not be located in drainage lines, channels or overland flow paths.

Progressive Erosion and Sediment Control Plans (ESCPs) will be developed and implemented to detail all required erosion and sediment control measures for the site prior to any works commencing. ESCPs will be updated progressively throughout the project to reflect the current and changing site conditions. Any amendments to the ESCP will be approved by the Planning and Environment Manager.

6.5 Soil Monitoring

Monitoring activities, as outlined in Table 3 will be implemented during construction to minimise adverse impacts to soil and testing of excavated material will be undertaken in accordance with the SMPSAQ:

Table 3 Monitoring Activities

Monitoring Activities	Frequency
Inspections of erosion and sediment control measures in place including a record of issues identified and rectification	**Weekly and before any significant inclement weather event**
Additional inspections will be undertaken prior to and following significant rainfall events, classed as greater than 20mm over a 24-hour period	**Prior to and following significant rainfall events (>20mm in 24 hours)**

6.6 Material Importation

Soil is to be imported for filling of the temporary northern shaft, backfill of the station box to form the new Hickson Road alignment, and other excavations where on-site spoil is not deemed suitable for use as fill. Imported materials, including a suitable growth medium, will be used for landscaping.

Soil imported to the site will meet the following requirements:

- The soil must be legally able to be imported onto the site in accordance with the *Protection of the Environment Operations (Waste) Regulation 2014* and any required works specific approvals;
- The soils must meet the assessment criteria in Appendix C of the SMPSAQP;
- The soils must meet the geotechnical requirements for their proposed use;
- The soils must be classified as VENM, Excavated Natural Material (ENM) or other materials legally able to be imported onto the site based on a Resource Recovery Order and Exemption. Soils must be assessed in accordance with the EPA requirements. For VENM this generally includes having no signs of concern, metal concentrations at background levels and organic compounds below appropriate laboratory limits of reporting. For non-VENM materials the EPA requirements would generally include assessment in accordance with the appropriate Resource Recovery Order. Prior to importation, appropriate documentation should be provided to, and approved by, the Environment and Planning Manager or Construction Manager and the materials should, where practicable, be inspected at the source site to confirm that there are no signs of contamination. Quarried materials (i.e., materials sourced from a quarry that are not recycled) need not be subject to assessment by the Environmental Consultant, however other inspection and record keeping requirements still apply to these materials;
- The material must be inspected during importation, and any materials not meeting the description given in the provided documentation or displaying signs of contamination will be rejected. The Environmental Consultant may also conduct inspections during and / or following importation to check the same; and,
- Additional testing of the imported material may be required, as recommended by the Environmental Consultant, commensurate with the documentation provided for review and the material type/classification. The contractor will track and keep a record of all soil materials imported onto the site in the material tracking register.

7 Water Management

7.1 Background Information

BESIX Watpac has been awarded the Barangaroo Metro Station package, which includes the below scope of works;

- Station fitout works including secondary structural elements;

- Third party works including Hickson Road construction, public domain works, utilities, and landscaping; and,
- Interface works including the provision of facilities, plant and equipment for Interface Contractors.

The Tunnel and Excavation Contractor (TSE) was a JV between John Holland, CPB and Gheller (JHCPBG), who carried out the excavation of the Barangaroo station box and shark's fin underground structure. TSE were responsible for managing groundwater, surface water, and construction surface water on site, managed in accordance with their documentation as follows:

- Construction Environmental Management Plan (SMCSWTSE-JCG-TPW-EM-PLN-002010);
- Construction Soil, Water and Groundwater Management Plan (SMCSWTSE-JCG-TPW-EM-PLN-002014);
- Stormwater and Flooding Management Plan (SMCSWTSE-JCG-TPW-DN-PLN-0020032);
- Water Reuse and Discharge Management Procedure (SMCSTSEJCG-TPW-EM-MPR-003002); and,
- Surface Water Quality Monitoring Program (SMCSWTSE-JCG-TPW-EM-RPT-097238)

As part of the requirement to manage the groundwater, surface water and construction water TSE installed a Water Treatment Plant (WTP) that has been maintained by Aquatic Engineering Pty Ltd. The WTP has been handed over to BESIX Watpac who are now are responsible for its management. The WTP is currently configured to treat 15 L/s of water. The WTP is located adjacent to Nawi Cove as shown in Figure 2 and discharges into a stormwater drainage pit that discharges directly into Sydney Harbour at the discharge point shown below in Figure 7 and 5.

7.2 Existing Water Management Arrangements

The station box is fully tanked up to basement level 3 (B3), where there is a break in the tanking behind the shoring wall to allow for the construction of the future southern entrance between Barangaroo Station and the neighbouring Block 7 development. The TSE works included installing a 250mm diameter civil drainage depressurisation pipe at B3 level that reduces the hydrostatic pressure on the Hickson Road heritage wall, also known as the High Street Cutting, and drains groundwater to a holding tank on B3. Water entering the un-tanked section of the shoring wall at the southern entrance is drained to this holding tank via a series if geotechnical strip drains. The groundwater in the holding tank is then pumped to the WTP for treatment prior to being discharged into Sydney Harbour. This depressurisation system will remain in place until the southern entrance between Block 7 and Barangaroo Station is constructed, which is anticipated to be after August 2023, when BESIX Watpac will have completed Barangaroo Station.

Sump pumps are in place at the bottom of the northern shaft at basement level 6 (B6) as shown in Figure 3 that capture groundwater entering the northern shaft through the rock face and pump it to the WTP for treatment prior to discharge into Sydney Harbour. Principle Contractor status of the northern shaft was handed to the Linewide contractor on 31 March 2022. BESIX Watpac will continue to treat the water pumped from B6 to the WTP whilst the Linewide contractor finalises arrangements to treat the water themselves. A pre-pump inspection record is filled out before BESIX Watpac accept water from the Linewide contractor which confirms that no visible oil and grease is present in the water and no recent spills or incidents have occurred.

The WTP and all associated pipework and pumps are nominated as 'Handover Items', being a key piece of equipment used for the operation of the site that were transferred from TSE to BESIX Watpac on site possession. BESIX Watpac operate the WTP to treat groundwater and surface water collected on site during construction activities and utilise the same network of pits and pumps to collect water and transfer it to the WTP for treatment prior to discharge into Sydney harbour (subject to water quality monitoring parameters being met as per the WQMP).

Figure 2 Location of the on site existing Water Treatment Plant (WTP)

Figure 3 Dewatering Sump Pit & Pump in the Northern Shaft Basement 6 (GR-1)

Figure 4 WTP Discharge Point through existing stormwater network

Figure 5 WTP Discharge Point through existing stormwater network

7.3 Water Treatment Plant

The TSE Contractor previously discharged water from the WTP under an Environmental Protection Licence (EPL 20971), which nominated discharge criteria for key pollutants, as per Table 4 below.

Table 4 Barangaroo WTP discharge Criteria under TSE EPL 20971 condition L2.8

Parameter	Unit	Discharge Criteria
pH	pH units	6.5 – 8.5
Total Suspended Solids	mg/l	50
Oil and Grease	Visible	Not visible

Once the Site was handed over to BESIX Watpac on 16 September 2021, the project was no longer required to operate under an EPL. BESIX Watpac engaged WSP to produce a Water Discharge Impact Assessment (WDIA) to assess the fitness for purpose of the WTP for treating ground and surface water collected as part of BESIX Watpac's construction activities and to ensure that *NSW Water Quality Objectives* are being maintained in accordance with CoA E107 and Section 120 of the POEO Act. Section 2 of the WDIA sets out the regulatory obligations which BESIX Watpac must comply with when operating the WTP. A Water Quality Monitoring Program (WQMP) has been prepared to outline the type and frequency of water quality monitoring to be undertaken, based on the recommendations made in the WDIA and the process to be followed if a water quality exceedance event occurs.

BESIX Watpac has engaged Aquatic Engineering Australia (AEA) to undertake the ongoing maintenance of the WTP. AEA is the incumbent WTP installer and maintenance contractor who has been responsible for the installation and maintenance of numerous water treatment plants established by TSE as part of the Project.

The Barangaroo WTP is a coagulation/ flocculation clarification type WTP. The process for coagulation/ flocculation clarification follows with further detailed provided in the AEA operation and maintenance manual which has been included in Appendix A:

- Pre-treatment (water collection and initial solids removal;
- Coagulation (pH control and oxidant dosing);
- Flocculation (including removal of emulsified oil);
- Clarification (sludge to sludge holding tank and filter press); and,
- Post pH correction and media filtration.

The WTP has an internal automatic water quality monitoring system which checks turbidity and pH, including a secondary back up, which monitors water and transmits results to an online portal where they can be viewed in real time. Water is not discharged from the WTP until discharge parameters are correct. The outlet from the WTP compromises single 675mm diameter pipes which discharge by gravity into Nawi Cove adjacent to Duke's Pier which is part of Sydney Harbour. Refer to figures 4 and 5 for discharge location of WTP.

The regulatory obligations which BESIX Watpac must comply with regarding the WTP for the management of water discharging to Sydney Harbour are addressed in detail in Section 2 of the WDIA and include:

- Section 120 of the POEO Act;

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

  Note— An offence against subsection (1) committed by a corporation is an offence attracting special executive liability for a director or other person involved in the management of the corporation—see section 169.

  (2) In this section— pollute waters includes cause or permit any waters to be polluted.

CoA E107 states: "*The CSSI must be constructed and operated so as to maintain the NSW Water Quality Objectives where they are being achieved as at the date of this approval, and contribute towards achievement of the NSW Water Quality Objectives over time where they are not being achieved as at the*

date of this approval, unless an EPL in force in respect of the CSSI contains different requirements in relation to the NSW Water Quality Objectives, in which case those requirements must be complied with".

The NSW Water Quality Objectives are the agreed environmental values and long-term goals for NSW's surface waters. They set out:

- The community's values and uses for our rivers, creeks, estuaries and lakes (i.e. healthy aquatic life, water suitable for recreational activities like swimming and boating, and drinking water); and
- A range of water quality indicators to help us assess whether the current condition of our waterways supports those values and uses.

The Objectives are consistent with the agreed national framework for assessing water quality set out in the Australian and New Zealand Guideline for Fresh and Marine Water Quality (ANZECC 2000 Guidelines). These guidelines provide an agreed framework to assess water quality in terms of suitability for a range of environmental values (including human uses). The Water Quality Objectives provide environmental values for NSW waters and the ANZECC 2000 Guidelines provide the technical guidance to assess the water quality needed to protect those values. To determine the receiving water quality criteria, the ANZECC 2000 guidelines provide standardised criteria relevant to achieving the public health and environmental water quality for the water body (Sydney Harbour Lower Estuary). Appendix A of the WQMP identifies the water quality parameters to be monitored against the NSW Water Quality and ANZECC 2000 guidelines.

7.4 Water Treatment Plant Relocation

The WTP will be required to be relocated to enable the condenser water pipe work to be installed between the seawater plant room in the Headland Park Cutaway and the chiller plant room in the shark's fin area of the station. The methodology of relocating the WTP will include the installation of a temporary WTP with the same treatment performance, that will be commissioned and remain in place until the existing WTP is relocated. The location of the TWTP and the relocated WTP are shown in Figure 6.

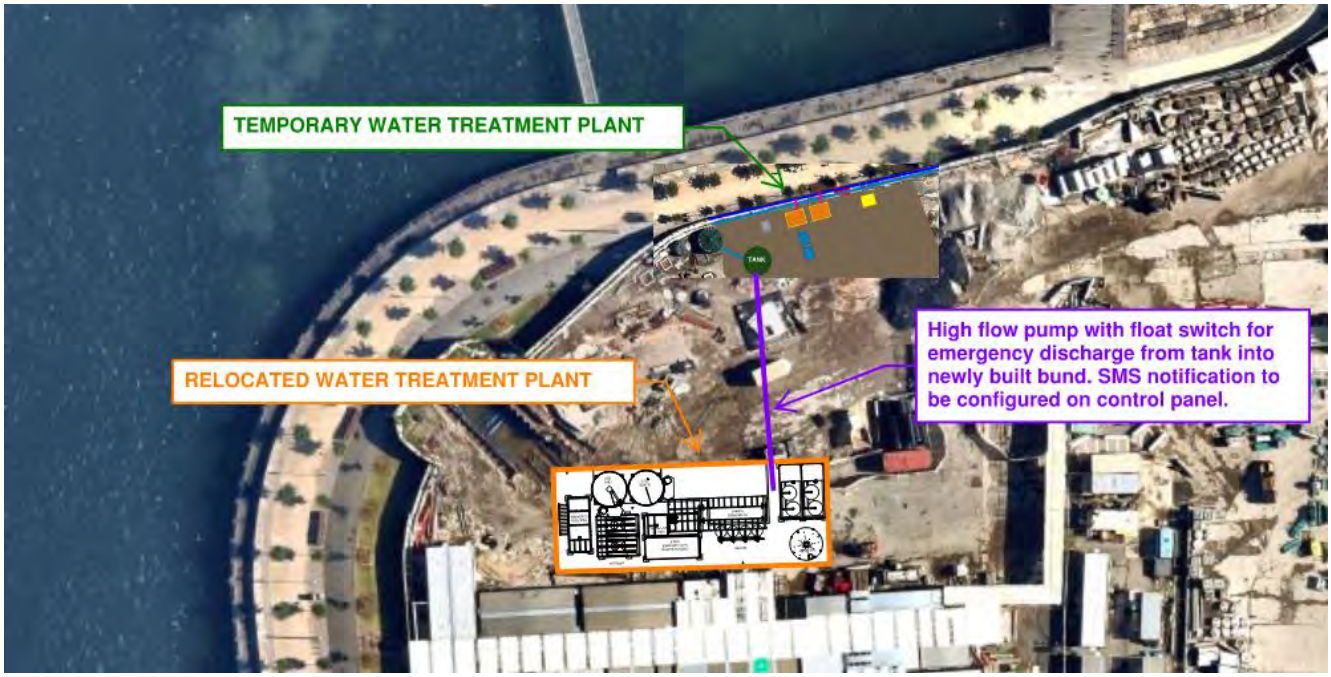
The discharge location for the temporary WTP will remain unchanged and will discharge into the existing pit and 675mm diameter stormwater pipe that discharges adjacent to Duke's Pier. The velocity of this discharge has been amended from 15 l/s to 7 l/s as an addendum to the WDIA at the advice of WSP to mitigate disturbance of sediment on the seabed floor.

The relocated WTP will also discharge into the same pit and 675mm diameter stormwater outlet point adjacent to Duke's Pier at 7 l/s. However, this discharge location will change to the permanent stormwater outlet that discharges from pit H01-02 through the seawall and into Sydney Harbour. This change in discharge will not occur until the existing twin 1050mm diameter stormwater outlet pipes that were installed by INSW's contractor in 2014 have been cleaned out of marine sediment and growth.

The commissioning of the TWTP will include the sampling and testing of the treated water from the TWTP in accordance with the Temporary Water Treatment Plant – Water Quality Testing Program, which is an addendum to the WQMP. Once the water has been treated and sampled it will be pumped to the WTP where it will be treated again and discharged. This testing regime will continue for 7 days to allow for sufficient test results to be returned and confirm that the TWTP is treating the water in accordance with parameters in the WDIA.

The commissioning of the relocated WTP will follow the same process as the commissioning of the TWTP. The relocated WTP will be commissioned, and the treated water will be sampled and tested in accordance with the TWTP Water Monitoring Program. Once the water has been treated and sampled it will be pumped to the TWTP where it will be treated again and discharged. This testing regime will continue for 7 days to allow for sufficient test results to be returned and confirm that the relocated WTP is treating the water in accordance with WDIA.

Figure 6 Location of the Temporary WTP and the Relocated WTP



7.5 Water Discharge Impact Assessment (WDIA)

BESIX Watpac has engaged WSP in the role of environmental engineer to undertake a Water Discharge Impact Assessment (WDIA) for the discharge of water from the WTP to validate the requirements of CoA E107 to maintain the *NSW Water Quality Objectives* and determine if modification or improvements to the performance of the WTP need to be considered to treat surface and groundwater collected by BESIX Watpac during their construction activities.

A summary of the key findings made by the WDIA and recommendations which BESIX Watpac will adopt are as follows:

- The 15 L/s treatment capacity of the WTP is adequate under both typical and worst-case flow condition scenarios;
- Discharge when operated by the TSE Contractor generally achieved the ANZECC (2000) guidelines trigger values for 95% species protection of aquatic ecosystems for toxicants, with the exception of ammonia, cyanide, copper and zinc;
- The marine environment at the outlet of the WTP where water discharges into Sydney Harbour should be considered to be a *highly disturbed system* based on the ANZECC (2000) ecological condition;
- For a *highly disturbed system* the ANZECC (2000) 80% or 90% species protection for toxicants is acceptable;
- Given the WTP is generally achieving ANZECC (2000) 95% species protection of aquatic ecosystems these trigger values will be adopted for toxicants other than ammonia, copper cyanide and zinc;
- Copper, cyanide and zinc will be monitored against the 80% species criteria;
- An Environmental Protection License (EPL) will no longer be in place for BESIX Watpac's use for discharge from the WTP. Whilst BESIX Watpac are not required to operate in accordance with the TSE EPL discharge from the WTP will continue to be tested, prior to discharge off site, for the same turbidity and pH parameters as were nominated in the TSE EPL; and,

- An addendum to the WDIA has been prepared to address dewatering from the western civil pit shown in Figure 1 back to Sydney Harbour, bypassing the WTP as described in Section 5.2.2.

An addendum to the WDIA has been prepared to address the change in the discharge location to what was assumed in the WDIA to where it is currently being discharged adjacent to Duke's Pier. The addendum also amends the discharge capacity from 15 L/s to 7 L/s at the Duke's Pier discharge location but maintains the 15 L/s discharge capacity at the assumed discharge location, being the outlet pipes of the H01-02 pit.

Based on the recommendations made in the WDIA, BESIX Watpac will continue to operate the WTP in its current configuration and adopt the monitoring frequency, locations and monitoring parameters recommended by the WDIA and as outlined in the WQMP.

Monitoring undertaken by BESIX Watpac up to the date of this report has shown that discharge from the WTP has generally met the requirements of the WQMP and recommendations made in the WDIA. Where exceedances have occurred an investigation has been undertaken to establish the cause.

7.6 Water Quality Monitoring

The Sydney Metro City and Southwest Chatswood to Sydenham Staging Report Revision 7 (Staging Report) sets out the planning approval requirements relevant to each project site. The Staging Report 'switches on' Construction Monitoring Program requirement CoA C9(a) only for the Barangaroo Station project (Noise and Vibration). According to the Staging Report, Construction Monitoring Program requirements CoAs C9(c) & (d) to CoA C17 are not applicable to the Barangaroo Station project in relation to water quality and groundwater monitoring programs.

Notwithstanding this, a Water Quality Monitoring Program (WQMP) has been produced to monitor the impact of BESIX Watpac's construction activities on groundwater and surface water in the vicinity of the site and to monitor the effectiveness of mitigation measures implemented to meet the requirements of CoA E107 and Section120 of the POEO Act. The WTMP sets out a program of monitoring to be undertaken to check the quality of water, which is being discharged from the WTP, and within Sydney Harbour, to meet the recommendation made in the WDIA and to maintain the NSW Water Quality Objectives in accordance with CoA E107.

Water quality monitoring records will be issued in a Construction Water Quality Monitoring Report (CWQMR) which will be issued on a quarterly basis.

BESIX Watpac will continue to utilise water quality monitoring locations BN-3 and SW_B_01 as the locations for monitoring water quality associated with BESIX Watpac's construction activities. These are the existing monitoring locations utilised by the TSE Contractor and are shown below in Figure 7. Water quality monitoring will be undertaken at these locations monthly. Additionally, groundwater will be monitored at monitoring locations GW-1 on B3 and GW-2 on B6 on a quarterly basis.

7.5.1 Water Quality Monitoring – Western Civil Pit

Water quality monitoring has been undertaken within the western civil pit, and harbour adjacent, on a periodic basis to check the water quality in the pit is of similar quality to the harbour to justify bypassing the WTP. This monitoring data has informed the amendment to the WDIA in support of this activity.

It is anticipated that the construction of the western civil pit will take 10 days to complete. The pit will need to be de-watered into Sydney Harbour each day (dewatering event) for a duration of 8 hours.

The following water quality monitoring will be undertaken:

- Those parameters which the WDIA nominates as needing to be monitored prior to discharge (TSS, pH and no visible oil and grease) will be monitored in real-time with hand apparatus during each de-watering event. Each parameter will be checked daily prior to dewatering commencing and hourly whilst de-watering is taking place;

- Water quality in the Western civil pit will be checked for compliance with those parameters nominated in Appendix A of the WQMP prior to discharge off site commencing for the first dewatering event. A water quality sample will also be taken at the discharge point shown in Figure 76 below and at the control location SW-B-01; and,
- The above process will be repeated at the conclusion of all dewatering activities. Expedited results will be requested from the independent laboratory undertaken the testing to ascertain as quickly as possible if any exceedances have occurred in the water discharged into the harbour.

The results of all water quality undertaken associated with the construction of the Western civil pit will be presented in a water quality monitoring report and submitted to Sydney Metro and the ER.

If at any stage during the dewatering process tested water is found to be unsuitable for discharge into the harbour then dewatering will immediately be ceased and the pit allowed to refill.

Water will be pumped from the western civil pit into settlement tanks prior to it being pumped into the harbour to ensure that turbidity is within discharge parameters.

Figure 7 Water Quality Monitoring Locations

7.7 Water Mitigation Measures

The following water mitigation measures will be implemented:

- Clean water will be diverted around disturbed site area, stockpiles and contaminated areas;
- Control measures will be installed downstream of works, stockpiles and other disturbed areas;
- Dangerous goods and hazardous materials storage will be within bunded areas with a capacity of 110 per cent of the maximum single stored volume;
- Spill kits will be provided on site and a spill management procedure followed in the event of a spill
- The WTP will be correctly maintained by AEA;
- All accumulated water shall be checked and treated to ensure that *NSW Water Quality Objectives* are met prior to re-use or discharge from the site as required by Condition of Approval (CoA) E107 and as outlined in the WDIA;
- All discharge from the WTP will be monitored to ensure compliance with the discharge criteria and monitoring program as outlined in the WQMP with monitoring reports issued in the CWQMR;
- A hold point will be put in place (as required by *Table 1.4 Preliminary Register of Hold Points* of the CEMF) where water will be tested to verify compliance and not discharged unless discharge requirements are met;
- Any rainwater or surface water flowing into the site, including from the Linewide contractor laydown areas, will be collected and pumped to the WTP for treatment prior to discharge, unless part of the western pit dewatering activity addressed in the addendum to the WDIA; and,
- Water pumped from areas where Linewide are working on the site, to the WTP, will be done so under a pre-pump inspection record.

8 Environmental Planning and Flooding

Uncontrolled overland flow of water or unmanaged stormwater could potentially lead to flooding and environmental impact to the project and the adjacent waterway. The environmental impact and mitigation measures are outlined below in Table 5.

Table 5 Flood impact and migration measures

Environmental Aspect	Potential Impact	Mitigation Measure
Rainfall in excavated areas/zones	• Rainfall falling into trenches or onto the station lid (low point) has the potential to cause flooding in these areas and in the station and adjoining tunnel network if this is not appropriately managed	• Detail construction planning including the development and implementation of ESCPs . • Review of the stormwater quantity inputs that are treated by the WTP to confirm capacity of the plant and if detention tanks are required.
Flooding during extreme rainfall from adjacent roads and stormwater systems	• Overland flows/flooding from adjacent surface areas such as Hickson Road, High Street, and the existing hardstand area on Block 7. • It is important to note that worksites may not be experiencing rain at the time of the incident as water could be from discharge into the stormwater system • The sumps and holding tank in the station will not have sufficient capacity for flood waters in extreme storm events (i.e. the Probably Maximum Flood (PMF) event).	• Temporary civil engineer to review rainfall quantities and temporary pumping needed to mitigate flooding effects and ensure capacities of pumps can accommodate rainfall • Design and installation of waterproofed hobs to penetrations in the station box lid at surface level. All hobs to be constructed to the PMF level, or if not achievable then a risks assessment to be conducted • Temporary works civil connections for the Hickson Road demolition will be designed with the temporary civil works engineer and approved by Sydney Metro and METRON prior to undertaking the works.

Environmental Aspect	Potential Impact	Mitigation Measure
Localised flow paths causing nuisance flooding on the worksite	• Nuisance flooding as result of localised overland flow paths could make the worksite un-trafficable in areas of excavation for workers.	• Diversion drains and swales will be implemented in the ESCPs

9 Spill Response Management

Spill prevention measures and monitoring will be adopted as outlined below and in accordance with the BESIX Watpac Spill Response Management Procedure (F.8).

9.1 Spill Mitigation Measures

- Dangerous goods and hazardous chemicals including fuel to be stored within bunded areas with a capacity of 110% of the maximum single stored volume;
- Chemicals and fuel to be labelled and stored in bunded areas in accordance with the safety data sheet (SDS);
- Spill kit and fire response equipment to be located where chemical and fuel using plant or equipment is stored or operated and outlined in Environmental Control Maps (ECMs);
- All hazardous chemicals are to be stored and managed in accordance with the NSW *Work Health and Safety Regulation 2017*, the NSW Code of Practice for Managing Risks of Hazardous Chemicals in the Workplace 2019, and the NSW Code of Practice for Labelling of Workplace Hazardous Chemicals 2019; and,
- Spill kits will be provided on Site

9.2 Storage and Handling – Hazardous Chemicals

Hazardous chemicals, must be stored and handled strictly in accordance with:

- All relevant Australian Standards and legislation;
- For liquids, a minimum bund volume of requirement of 110% of the volume of the largest single stored volume within the bund;
- *Storage and Handling Liquids: Environmental Protection – Participants Manual* (Department of Environment and Climate Change, May 2007); and,
- The *Environmental Compliance Report: Liquid Chemical Storage, Handling and Spill Management – Part B Review of Best Practice and Regulation* (Department of Environment and Conservation (NSW), 2005).

10 Record Management

Records will be maintained by the project Planning and Environment Manager and Environmental Co-ordinator and transmitted to Sydney Metro / ER via TeamBinder for compliance tracking purposes, as follows:

- Copies of current ESCPs for all active construction sites and areas;
- Records of soil and water inspections undertaken;
- Records of testing (monitoring program results) of any water prior to discharge and quality of water discharged in the CWQMR;

- Records of the release of the hold point to discharge water from the construction site to the receiving environment;
- Records of the treatment of contaminated material in accordance with the SMPSAQ;
- Records of the treatment of acid sulfate soils in accordance with the ASSMP;
- Copies of waste classification reports;
- Copies of all trucking and tipping dockets for spoil that is tipped at landfill;
- Discharge under the COS will be recorded in a Controlled Overflow Strategy Summary Report (COSSR);
- Material Tracking Register; and,
- Water Quality Monitoring Reports.