

## Waterloo Integrated Station Development

# Groundwater Management Sub Plan

SMCSWSWL-JHG-SWL-EM-PLN-000006

### Document and Revision History

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Client	Sydney Metro City & Southwest

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## Glossary

Term	Explanation
CEMF	Construction Environmental Management Framework
CEMP	Construction Environmental Management Plan
CoA	Conditions of Approval
CSSI	Critical State Significance Infrastructure
DIA	Discharge Impact Assessment
DPE	Department of Planning Environment (previously Department of Planning, Industry & Environment)
EIS	Environmental Impact Statement
ER	Environmental Representative
ISD	Integrated Station Development
Minister, the	NSW Minister for Planning
OEH	Office of Environment and Heritage
RAP	Remediation Action Plan
REMMs	Revised Environmental Mitigation Measures
SMCSW	Sydney Metro City and Southwest
SSTV	Site Specific Trigger Value
SWTC	Scope of Work and Technical Criteria
TSE	Tunnel and Station Excavation Contractor
WTP	Water Treatment Plan

# 1 Introduction

## 1.1 Purpose

John Holland has prepared this Groundwater Management Sub-Plan (the Plan) to describe impacts on groundwater during the construction of the Waterloo Integrated Station Development (ISD).

This Plan forms part of the Construction Environmental Management Plan (CEMP) for Waterloo ISD. It has been prepared to address the relevant requirements of Sydney Metro's Construction Environmental Management Framework (CEMF), the Revised Environmental Mitigation Measures (REMMs), the Project Planning Approval, applicable legislation, and contractual requirements, including the Station Delivery Deed and Scope of Work and Technical Criteria (SWTC).

This Plan has been endorsed by the Environment Representative (ER) and submitted for approval to the Secretary of the Department of Planning and Environment (DPE) no later than one (1) month before commencement of Construction of the Waterloo ISD. Construction will not commence until the CEMP and sub-plans (including this Plan) have been approved.

## 1.2 Background

The Waterloo ISD is located within South Sydney local area in the suburb of Waterloo. The site is situated approximately 3 kilometres from the CBD on one city block bounded by Botany Road to the west, Raglan Street to the north, Cope Street to the east, and Wellington Street to the south.

This Plan builds on the groundwater assessment undertaken in the Environmental Impact Statement (EIS) and Submissions and Preferred Infrastructure Report.

Refer to Figure 1 for site location context.



**Figure 1: Waterloo ISD Site**

## 1.3 Overview of the Waterloo ISD Project

### 1.3.1 Permanent works

The Waterloo ISD works under the Project Planning Approval include the design and construction of the Waterloo Metro Station and associated infrastructure within the site. Section 2 of the CEMP provides a detailed description of the works to be completed. In addition to the station works the following will be completed:

- Local area works involving resurfacing or reconstruction of affected roads, footpaths, cycle ways etc
- Utility service works, including the undergrounding of low voltage powerlines, installation of new services to connect to the new facilities
- Property works to existing buildings that are affected by the project
- Retail works to the spaces in the Waterloo Station and precinct
- Enabling works for the over-station development.

The Waterloo ISD will include future over-station development, however the over-station development component is not subject to this Project Planning Approval and therefore does not form part of the scope for the Waterloo ISD as outlined in this CEMP or the Sydney Metro Staging Report.

### 1.3.2 Temporary works

**The proposed temporary works include:**

- Site compound, amenities and services establishment, use and demobilisation
- Hoarding, security fencing, handrails and gantry

- Vehicular accesses and diversions
- Piling and crane platforms
- Construction signage
- Traffic and pedestrian management devices
- Lighting
- Existing services protection
- Lay-down and storage areas
- Stockpile areas
- Scaffolding and access platforms
- Formwork and falsework systems and
- All other temporary works and measures required for the construction of the Works.

## 1.4 Objectives and Targets

In accordance with the CEMF the objectives of this Plan are:

- Reduce the potential for drawdown of surrounding groundwater resources
- Prevent the pollution of groundwater through appropriate controls
- Reduce the potential impacts on groundwater dependant ecosystems

In accordance with the Environmental Performance Outcomes as stated within the Sydney Metro City & Southwest Chatswood to Sydenham Submissions and Preferred Infrastructure Report, the performance targets include:

- The project would make good any impacts on groundwater users
- The project would avoid any damage to buildings from settlement.

## 1.5 Consultation

The Project Planning Approval Condition C3 requires the Groundwater Management Plan be prepared in consultation with the Department of Primary Industries (DPI) - Water.

Comments received from the stakeholders (along with John Holland's response) are detailed in Table 1 and Appendix B. Where appropriate, this Plan has been updated to address these comments.

**Table 1: Consultation Summary**

Condition	Document	Agency	Requirements and date submitted	Key Issues Raised	Section Reference
C3	Groundwater Management Plan	DPI-Water/Natural Resource Access Regulator	Initial consultation email sent 18/05/2020; Follow-up email on 1/06/2020 Addition email on 15/06/2020 Phone call on 16/06/2020	No comments received	n/a

Condition	Document	Agency	Requirements and date submitted	Key Issues Raised	Section Reference
			Phone call/voice mail 09/07/2020 Email follow-up 09/07/2020		

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Consultation records will be maintained for the project to detail any correspondence or ongoing consultation undertaken as part of the requirements of this Plan. These logs will be provided separately to this Plan and provided DPE for information.

## 2 Legal and Other Requirements

The legislation and planning instruments considered during development of this plan are outlined in Table 2.

**Table 2: Legislation and Planning Instruments**

Legislation	Description	Relevance to this Plan
Environmental Planning and Assessment Act 1979	This Act establishes a system of environmental planning and assessment of development proposals for the State.	The approval conditions and obligations are incorporated into this Plan
Protection of the Environment Operations Act 1997 (POEO Act)	Section 120 of the POEO Act states that it is illegal to pollute waters.	Pollution of waters includes foreign material being percolated into groundwater
Water Management Act 2000 (WM Act) Water Management (General) Regulation 2004	This Act and Regulation provide for the protection, conservation and ecologically sustainable development of water sources of the State and in particular to protect, enhance and restore water sources and their associated ecosystems.	This Act will have low relevance to the Project and will only be relevant if water is to be extracted. Sydney Metro projects assessed under Part 5.1 of the Environmental Planning and Assessment Act 1979 (EP&A Act) are exempt from obtaining water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91.
Contaminated Land Management Act	Section 58 provides a register of Contaminated Sites and a Record of Notices.  Ensures the risk to human health and environment is managed.	The register includes sites with the potential to impact on the groundwater around the Waterloo site.

The Plan addresses applicable requirements within the following documents:

- The Sydney Metro City and Southwest – Project Approval – Determination, dated 9<sup>th</sup> January 2017, and associated modifications
  - CSSI 7400 MOD 1 – Victoria Cross and Artarmon Substation (determined 18 October 2017)
  - CSSI 7400 MOD 4 – Sydenham Station and Metro Facility South (determined 13 December 2017)
  - CSSI 7400 MOD 2 – Central Walk (determined 21 December 2017)
  - CSSI 7400 MOD 3 – Martin Place Metro Station (determined 22 March 2018)
  - CSSI 7400 MOD 5 – Blues Point Acoustic Shed (determined 2 November 2018)
  - CSSI 7400 MOD6 – Administrative Changes (determined 21 February 2019)
  - CSSI 7400 MOD7 – Administrative Changes (determined 24 June 2020)



- CSSI 7400 MOD8 – Blues Point Access Site (determined 25 November 2020)
- CSSI 7400 MOD9 – Extension to standard construction hours (determined 30 June 2022)
- The Sydney Metro City and Southwest - Environmental Impact Statement, dated 3<sup>rd</sup> May 2016;
- Sydney Metro City and Southwest Heritage Interpretation Plan, dated 28<sup>th</sup> August 2018
- Sydney Metro City & Southwest - Chatswood to Sydenham Staging Report, Rev 6, dated 2<sup>nd</sup> July 2019;
- The Sydney Metro Construction Environmental Management Framework, EIS Appendix B dated August 2016;

## 2.1 Guidelines and Reports

Guidelines and standards relating to the management of groundwater include:

- Managing Urban Stormwater: Soils and Construction (Volume 1 of the Blue Book) (Landcom, 2004)
- Managing Urban Stormwater: Soils and Construction Volume 2 (Department of Environment and Climate Change, 2008a).
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018). Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at [www.waterquality.gov.au/anz-guidelines](http://www.waterquality.gov.au/anz-guidelines)
- Policy and guidelines for fish habitat conservation and management (NSW DPI, 2013)
- TSE Hydrogeological Interpretive Report 2018 (SMCSWTSE-JPS-TPW-GE-RPT-110003)
- Remediation Action Plan, Sydney Metro City & South West - Tunnel and Station Excavation Works Package, Proposed Waterloo Station, Botany Road and Cope Street, Waterloo, Prepared for John Holland CPB Ghella JV (April 2018)

### 3 Roles and Responsibilities

The roles and responsibilities of key Waterloo ISD personnel with respect to groundwater management are described in Table 3.

**Table 3: Roles and Responsibilities**

Role	Responsibilities
<b>Project Director</b>	<ul style="list-style-type: none"> <li>Managing the delivery of the Waterloo ISD including overseeing implementation of groundwater management measures</li> <li>Act as Contractor’s Representative</li> </ul>
<b>Environment &amp; Sustainability Manager</b>	<ul style="list-style-type: none"> <li>Oversee the implementation of all groundwater management initiatives</li> <li>Responsible for managing ongoing compliance with the CoA and environmental document requirements</li> </ul>
<b>Commercial Manager</b>	<ul style="list-style-type: none"> <li>Ensure that relevant groundwater management requirements are considered in procuring materials and services</li> </ul>
<b>Construction Manager Site Superintendent</b>	<ul style="list-style-type: none"> <li>Manage the delivery of the construction process, in relation to groundwater management in conjunction with the Environment &amp; Sustainability Manager</li> </ul>
<b>Sustainability Manager</b>	<ul style="list-style-type: none"> <li>Track and report water elements against sustainability targets</li> </ul>
<b>Environment Coordinator</b>	<ul style="list-style-type: none"> <li>Manage the on-ground application of groundwater management measures during construction</li> </ul>
<b>Independent Environmental Representative</b>	<ul style="list-style-type: none"> <li>Receive and respond to communications from the Secretary in relation to the environmental performance of the Critical State Significant Infrastructure (CSSI);</li> <li>Consider and inform the Secretary on matters specified in the terms of the planning approval;</li> <li>Consider and recommend any improvements that may be made to work practices to avoid or minimise adverse impact to the environment and to the community;</li> <li>Review all documents required to be prepared under the terms of the planning approval, ensure they address any requirements in or under the planning approval and if so, endorse them before submission to the Secretary (if required to be submitted to the Secretary) or before implementation (if not required to be submitted to the Secretary);</li> <li>Regularly monitor the implementation of all documents required by the terms of the planning approval for implementation in accordance with what is stated in the document and the terms of the planning approval;</li> <li>Review the Proponent’s notification of incidents in accordance with Condition A41 of this approval;</li> <li>As may be requested by the Secretary, help plan, attend or undertake Department audits of the CSSI, briefings, and site visits;</li> <li>Consider any minor amendments to be made to the CEMP, CEMP sub-plans and monitoring programs that comprise updating or are of an administrative nature, and are consistent with the terms of the planning approval and the CEMP, CEMP sub-plans and monitoring programs approved by the Secretary and, if satisfied such amendment is necessary, approve the amendment. This does not include any modifications to the terms of the planning approval;</li> <li>Perform the roles under CoA A24</li> <li>Must complete project induction covering John Holland environmental management system</li> </ul>
<b>Engineers</b>	<ul style="list-style-type: none"> <li>Responsible for the implementation of the Monitoring and Protection Procedure (SMCSWSWL-WSP-SWL-GE-REP-00004</li> </ul>

## 4 Existing Environment

### 4.1 Geological Context

The EIS identified for Waterloo Station that the alignment would underlie the high permeability Botany Sandbeds Aquifer. Waterloo Station would intersect Ashfield Shale and Hawkesbury Sandstone which is anticipated to have low to very low permeability. The salinity monitored at Waterloo during EIS investigations in Hawkesbury Sandstone was 287.1mg/L and 470.8mg/L measured at 16.5-22.5 metres below ground level, suggesting the groundwater is fresh at this location. The permeability of the Ashfield Shale and Hawkesbury Sandstone is low to very low and therefore the expected inflow into the station box is anticipated to be minor. Where groundwater inflow is observed it is expected to be transmitted through joints and fractures in the rock material.

### 4.2 Groundwater

The Waterloo station box has been excavated by the Sydney Metro Tunnel and Station Excavation Contractor (TSE). As part of these works a Hydrogeological Interpretive Report (TSE, 2018) provides an assessment of existing groundwater levels utilising hydrogeological models calibrated to existing groundwater monitoring data.

The Waterloo site has an upper and lower aquifer, groundwater levels in the upper aquifer (where present) occur 3 – 7 meters below ground levels. Given the shallow nature of the upper aquifer in the area, existing services and structures (e.g. utility pipes, building basements) have the potential to locally disrupt groundwater levels.

The lower aquifer is approximately 15m below ground level. Groundwater levels will also change with seasonal variation and rainfall as well as due to local construction activity and excavation.

The target change to groundwater levels at surrounding land uses as stated in the EIS is:

- <0.5m (fill / Aeolian sand),
- <2.0m (Ashfield Shale),
- <2.0m (residential in the vicinity) (Hawkesbury Sandstone)

The EIS notes that groundwater quality within Hawkesbury Sandstone is expected to be fresh to brackish with neutral pH and slightly elevated levels of iron and manganese. The concentration of dissolved metals and nutrients in Hawkesbury Sandstone, including residual soils, is expected to be naturally very low. Organic compounds are not naturally associated Hawkesbury Sandstone.

The EIS monitoring data identifies the salinity of groundwater in the Ashfield Shale ranges between 269 and 493 milligrams per litre as total dissolved solids and pH ranges between 4.9 and 5.1.

### 4.2.1 Groundwater users

There is limited groundwater use near the Waterloo Site due to the presence of low permeability shale, siltstone and sandstone. A search of the NSW Water Register was carried out during the preparation of the EIS to identify existing users and extraction rates. The search identified limited sites where there is an approval as basic rights to extract groundwater, and therefore do not need a Water Access Licence.

Two sites (located within the Botany Sands Groundwater Source hold Water Access Licences; both are located in the adjacent Botany Sands Groundwater Source. The remaining groundwater extraction sites do not hold a Water Supply Work Approval and therefore are assumed to be inactive and not taking groundwater. Table 5 provides a summary of the NSW Water Register search results (the study areas are within a 2 km radius of the Waterloo Site).

The potential impact of the works on existing groundwater users is considered to be negligible given the scope of the works does not involve the active use of groundwater; and the proximity of the site in relation to the location of the existing bores. Reference should be made to the Geotechnical Instrumentation and Monitoring Specification (SMCSWSWL-WSP-SWL-GE-REP-00004) for assessment of groundwater levels including consideration of potential impact and avoiding damage to buildings from settlement.

### 4.2.2 Groundwater dependent ecosystems

The EIS identifies the near-surface sediments at Waterloo Station lies within the Botany Sands Groundwater Source, within which resides the Botany Wetlands high priority groundwater dependent ecosystem, however, around 4 metres of aeolian sands at Waterloo Station would be isolated due to all project elements being ‘tanked’. The EIS concludes as there would be no hydraulic connection between the project and the Botany Sands Groundwater Source and thereby no impact to the Botany Wetlands groundwater dependent ecosystem.

## 4.3 Contamination

The area on and around the Waterloo site is highly developed including industrial, commercial, and residential land uses. The industrial uses include a range of potentially contaminating activities such as service stations and drycleaners and the stratigraphy of the site (unexcavated areas) generally consists of fill overlying residual soil with rock underneath.

As detailed in the Contaminated Sites Register and Record of Notices under Section 58 of the CLM Act, 11 registered sites are listed within 500 m of the Waterloo Station box that are either regulated or have been notified to the EPA are detailed in Table 4.

**Table 4: Registered Contaminated Sites (near Waterloo)**

Suburb	Notified site address	Notified site activity	Contamination status	Location in relation to the Waterloo ISD
Waterloo	2 John Street	Other industry	Regulation under CLM Act not required	About 200m south of Waterloo Station

The Remediation Action Plan (RAP) prepared for the Sydney Metro TSE Contractor provides detail of the level of groundwater contamination. Groundwater results for TRH, OCP and VOC did not report concentrations above the detectable laboratory limits except for two locations in the Western portion of the site. The RAP identifies the risk to future site users from water entering the station box structure would be expected to be minimal from the dermal or ingestion pathways due to the proposed tanking of the permanent station structure.

Section 6 outlines the management measures that have been installed by the TSE Contractor to prevent inflow of groundwater into the station box and reduce the likelihood of these contaminants entering groundwater seepage.

A Contaminated Land Management Strategy has been prepared and implemented for the Waterloo ISD which will enable a site audit statement to be prepared demonstrating the site is suitable for use.

**Table 5: Groundwater users and extraction**

Location	ID	Approval Type	Work Type	Estimated Extraction	Approx. Distance	Potential impact	Management measures
Redfern Park	GW071907	Water Supply Work	Bore	12 ML/y	440 m	Nil. Outside the 1.0 m predicted drawdown footprint.	N/A
Private Spear near Waterloo Station	GW106192	Basic Rights (Domestic)	Spearpoint	<1 ML/y	140 m	Minor drawdown predicted	Monitor well
Industrial Water Supply, Bourke Road	GW017342 GW017684	Water Supply Work, Inactive	Bore	N/A	N/A	Nil. Outside the 1.0 m predicted drawdown footprint.	N/A
Private Spear in Alexandria	GW111164	Basic Rights (Domestic)	Spearpoint	<1 ML/y	70 m	Minor drawdown predicted	Monitor well

## 5 Aspects and Impacts

The key aspects and potential impacts in relation to the management of groundwater are listed in Table 6. The aspects and impacts will be reviewed in accordance with Section 6.2 of the CEMP. This includes reviewing risks based on the construction activity and implementing appropriate management measures as outlined in Section 6 of this plan.

**Table 6: Aspects and potential impacts**

Aspect	Potential impacts	Potentially sensitive receivers
Groundwater drawdown	<ul style="list-style-type: none"> <li>Potential for changes to the groundwater system and influences on groundwater users</li> <li>Potential for settlement issues to neighbouring buildings</li> <li>There is potential for off-site impact around station where groundwater levels change outside of historic natural variation.</li> <li>Groundwater drawdown has the potential to impact on any existing users of groundwater resources and any groundwater dependent ecosystems that may be within the surrounding area</li> </ul>	<p>Other groundwater users</p> <p>Waterloo Congregational Church</p>
Dewatering of excavations from groundwater inflows and rainwater	<ul style="list-style-type: none"> <li>Water discharged that does not meet criteria</li> </ul>	Alexandra Canal
Modifications to natural hydrology or water quality	<ul style="list-style-type: none"> <li>Potential to cause localised pollution of stormwater systems and/or directly into groundwater if appropriate mitigation or management measures are not adopted</li> <li>Potential for groundwater drawdown resulting in settlement issues</li> </ul>	<p>Alexandra Canal</p> <p>Waterloo Congregational Church</p>
Contaminated Groundwater	<ul style="list-style-type: none"> <li>Potential for encountering contaminated groundwater</li> </ul>	<p>Site Workers</p> <p>Groundwater dependent ecosystems</p> <p>Other groundwater users</p> <p>Alexandra Canal</p>
Settlement impacts	<ul style="list-style-type: none"> <li>Groundwater movement (or settlement) can affect nearby buildings and other structures, movement can result from ground consolidation following the drawdown of groundwater (during construction and/or operation)</li> </ul>	Waterloo Congregational Church

## 6 Groundwater Management

### 6.1 Groundwater Drawdown

Groundwater drawdown has the potential to induce settlement and impact on structures in the vicinity of the site. The Waterloo Congregational Church is located adjacent to the site. As detailed in the Construction Heritage Management Plan (SMCSWSWL-JHG-SWL-EM-PLN-000004) this Victorian Gothic building constructed in 1883 is listed on the Sydney City LEP 2013 and has local significance. The church is constructed of rendered brick set in lime mortar on sandstone block foundations. The foundations are quite flexible but sit within a relatively high water table within the Botany Sands aquifer which may settle during dewatering. Given the nature of the building, groundwater drawdown induced settlement could potentially cause damage to the structure.

Management measures installed to mitigate effects of excavation work completed by the Sydney Metro TSE Contractor included the installation of ground anchors into the shoring immediately behind the church to limit settlement at the wall. A secant pile wall has been installed in the upper half of the station box to maintain the existing upper water table level and prevent drawdown of the water table. Bentonite was also inserted under the church during excavation to manage settlement.

The scope of work to be completed by Waterloo ISD is unlikely to have an impact on the Church as there is no requirement for bulk excavation or interaction with groundwater. Therefore, the existing management measures installed by the Sydney Metro TSE Contractor are expected to be effective at preventing any effects of drawdown on the water table and settlement.

Building condition surveys as required by Project Planning Approval E59 will be completed of buildings and structures in the vicinity of the Waterloo ISD to establish the condition prior to commencement of construction. Within three months of completion of construction, all property owners of buildings for which a building condition survey was completed in accordance with Planning Approval E59 will be offered a second survey as required by Planning Approval E60. As required by both conditions, copies of the building condition survey report will be provided to the owners of the buildings surveyed within one month of the survey being completed.

During Waterloo ISD construction, John Holland will monitor groundwater levels using the existing piezometers installed on the site by the Sydney Metro TSE Contractor as required by Project Planning Approval E61. The monitoring will be completed by the engineering team in accordance with the Geotechnical Instrumentation and Monitoring Specification (SMCSWSWL-WSP-SWL-GE-REP-00004) in the event that lowering of the water table is observed, further mitigation measures will be implemented, refer to Appendix B for a summary of the specification requirements.

### 6.2 Groundwater Inflow

Groundwater inflow or seepage, of approximately 20 kL/day, is expected due to discrete geological defects encountered in the excavation (e.g. open joints). Secant piles have been used to mitigate potential groundwater inflows from groundwater within the Botany Sands aquifer at



Waterloo. The secant pile wall is embedded in the underlying residual clay to isolate direct inflow from the Botany Sand aquifer into the station box.

As the station box is designed as a 'tanked' structure, to alleviate water pressure on the station box, a sump/s will be constructed at the base of the station excavation. The sump will manage the passive inflow of groundwater. Water collected in the sump will be pumped to the station surface and managed via the onsite water treatment plant (WTP) prior to discharge offsite. The water will be tested and where required treated to meet the requirements to maintain the NSW Water Quality Objectives as required by the Project Planning Approval Condition E107. Refer to Section 8 for details of monitoring. Note, an Environment Protection Licence (EPL) is not required as the Waterloo ISD scope of works are not classified as Scheduled Activities under the POEO Act 1997.

### 6.3 Contaminated Groundwater

The upper aquifer at Waterloo has been identified as an area with potential for elevated groundwater contamination due to historic land uses as identified in the RAP (TSE 2018). The secant pile walls and bedrock fracture grouting installed by Sydney Metro TSE Contractor are designed to minimise groundwater ingress from the upper aquifer within the Station Box. As a result, contaminated water ingress into the station box is expected to be minimal. The design of the station box incorporates a waterproof membrane to prevent groundwater ingress.

A Contaminated Land Management Strategy has been prepared which details the management requirements for validating the impact of groundwater ingress to the station box. A Site Audit Statement and Site Audit Report will be prepared in accordance with Project Planning Approval Condition E67 following the implementation of the strategy.

### 6.4 Groundwater Treatment

Waterloo ISD has an onsite WTP that will be used to treat site water prior to discharge offsite. Groundwater ingress from the lower aquifer and as a result of the 'tanked' structure, will be captured in sumps at the base of the station excavation where it will be pumped out via the WTP.

As identified in Section 4, the water quality is expected to be fresh to brackish with neutral pH and slightly elevated levels of iron and manganese. The WTP which involves media filtration will be utilised during construction to reduce iron and manganese concentrations prior to discharge.

John Holland will implement the following overarching measures relating to groundwater that is encountered:

- Water sampling and testing of groundwater ingress water will be undertaken during construction to determine and confirm the most suitable treatment processes to meet the required water quality standards for discharge. Sampling and testing will be undertaken on commencement of construction and at regular intervals or as activities change that influence groundwater conditions.
- All feasible and reasonable opportunities for groundwater reuse for construction purposes or recycling nearby will be utilised in the first instance. Should groundwater inflows and required

treatment volumes be surplus to onsite construction purposes, the treated water product would be discharged into stormwater drainage;

- Discharges of groundwater from the construction water treatment plant will be subject to hold points and be monitored to ensure compliance with the discharge parameters detailed in Appendix C;
- Separation of groundwater and surface water will occur where practical;

## 7 Training

All personnel working on the site will undertake the John Holland Waterloo ISD project induction, which will provide initial training on various environmental aspects including groundwater management.

Additional training will be provided to specific site personnel in groundwater management, including the requirements of the WTP.

## 8 Monitoring, Auditing and Reporting

### 8.1 Monitoring

The Sydney Metro Staging Report (v6.0) describes each of the construction stages (Section 3.2) and the applicability of the Project Planning Approval Conditions (Section 4). Appendix A of the Staging Report lists each Condition and the applicability to each construction stage. The Staging Report identifies the activities for all five ISD locations and is not specific to Waterloo ISD. The Staging Report 'ISD Stage' covers the activities listed below in Table 7, however, not all stages are relevant to Waterloo ISD or the scope is not covered by this sub-plan as it is not subject to the CSSI 15\_7400 approval. Based on a review of the applicability of the activities to the Waterloo ISD, it has been determined that no direct impact on groundwater is likely to occur as there is no bulk excavation or direct interaction with the aquifers. Therefore, it is considered that the construction monitoring program requirements of Project Planning Approval Condition C9 - C10 and C12 – C17 will not be required.

**Table 7: Staging Report ISD Activities and Applicability to Waterloo ISD**

Activity	Applicability to Waterloo ISD	Groundwater Impact
Excavation of remaining station shafts (to the extent not undertaken by TSE contractor),	<ul style="list-style-type: none"> <li>All excavation completed by TSE</li> <li>No excavation that would result in interaction with groundwater will be required by the Waterloo ISD works</li> </ul>	No impact
Station structure and fit-out (including mechanical and electrical works),	<ul style="list-style-type: none"> <li>Applicable to Waterloo ISD</li> </ul>	No impact
Development structure, and	<ul style="list-style-type: none"> <li>Not applicable to CSSI 15_7400 Approval</li> </ul>	No impact
Development fit-out (including mechanical and electrical works).	<ul style="list-style-type: none"> <li>Not applicable to CSSI 15_7400 Approval</li> </ul>	No impact

The following section details the onsite monitoring of the passive groundwater ingress that is a consequence of the tunnelling works.

Groundwater ingress will be collected in the site sumps or tanks and pumped to the surface for discharge via the WTP. Discharge of water (including groundwater) will be undertaken in accordance with the Soil and Water Management Procedure (SMCSWSWL-JHG-SWL-EM-PRO-000001).

Monitoring of groundwater will include:

- Visual observation of the station box groundwater sump will be undertaken by the Site Supervisor on a weekly basis or following a change in site conditions that may contribute to an increase in groundwater ingress e.g. significant rainfall, excavation that intersects with groundwater etc. Any change will be recorded by the Site Supervisor and further

investigation completed as required by the Soil and Water Management Procedure (SMCSWSWL-JHG-SWL-EM-PRO-00001).

- Weekly Environmental site inspections (to be undertaken by the Environment & Sustainability Manager / Coordinator, Site Supervisor and nominated Site and Project Engineers) to include review of groundwater management.
- Water quality sampling from the WTP for physical and chemical parameters to confirm NSW water quality objectives are being achieved as required by the Project Planning Approval Condition E107. Laboratory samples will be sent to a NATA accredited laboratory. Parameters will be confirmed during the commissioning of the WTP which will occur once access to the site is granted by Sydney Metro. Appendix C provides details of the preliminary parameters for the assessment of water quality.
- The WTP monitors pH and turbidity continuously. A manual sample of discharge water will be collected weekly to confirm the parameters established for the site are within the acceptable range. Following commissioning, laboratory samples of discharge water will be collected on a quarterly basis or when construction activities change that have the potential to impact on water quality. The results will be compared with the NSW water quality objectives established for the site, refer Appendix C. This analysis will confirm that the water discharged has not resulted in pollution of water as required by Section 120 of the POEO Act 1997
- Groundwater levels will be monitored using the existing piezometers installed on the site by the Sydney Metro TSE Contractor. The monitoring will determine any potential for damage to occur as a result of settlement and be completed by the engineering team in accordance with the Geotechnical Instrumentation and Monitoring Specification (SMCSWSWL-WSP-SWL-GE-REP-00004) which is summarised in Appendix B. In the event that lowering of the water table is observed, further mitigation measures will be implemented as outlined in Appendix B.
- Periodic joint Environment Inspections will be carried out and attended by representatives of the Environment and Sustainability Team, Environmental Representative, and representatives from Sydney Metro. In the event of unanticipated discovery of contaminated material, including asbestos, the Contamination & Asbestos Finds Procedure (SMCSWSWL-JHG-SWL-EM-PRO-000002) will be implemented.

Inspection reports will be prepared following site inspections to document any relevant observations.

## 8.2 Auditing

Auditing will be completed in accordance with Section 7 of the CEMP.

## 8.3 Reporting

Results and outcomes of inspections and auditing will be reported internally on a monthly basis. Six-monthly construction compliance reports will be prepared as detailed in the CEMP to report on compliance with the Project Planning Approval.

All compliance records and reports will be retained by John Holland.

In accordance with Project Planning Approval Condition E68 a copy of the Site Audit Statement and Site Audit Report will be submitted Sydney Metro for submission to DPE and City of Sydney Council no later than one (1) month before commencement of operation.

## 9 Review and Improvement

The Plan will be reviewed at least annually. John Holland will undertake the ongoing development, amendment and updating of the Plan to ensure it remains consistent with Project priorities, risk management, client requirements and objectives, taking into account:

- The status and progress of Waterloo ISD activities
- Changes in the design, delivery and operations processes and conditions
- Lessons learnt during delivery and operations
- Changes in other related Waterloo ISD Plans
- Requirements and matters not covered by the existing Waterloo ISD Plans
- Changes to Waterloo Plans as directed by Sydney Metro under the Station Delivery Deed.
- Where deemed appropriate in relation to items raised within inspections or audits

### 9.1 Review of Mitigation Measures

Where a review of groundwater management, based on inspection and audit results, indicates that current mitigation measures are not effective the Environment & Sustainability Manager will consult with the construction team in regards to additional mitigation measures. These additional mitigation measures may include additional controls or changed work practices.

### 9.2 Records

Typical records would consist of:

- Water quality sampling and laboratory results
- Weekly Environmental Inspection forms.
- Toolbox training records.

Records associated with this management plan will be maintained in accordance with Section 8 of the CEMP.

## 10 Enquires, Complaints and Incident Management

Environmental incidents and complaints are to be investigated, reported, documented, actioned and closed out as per the details provided in the Community Consultation Strategy and the CEMP.



## **Appendix A – Groundwater Management Measures and Compliance Matrix**

## Appendix A: Groundwater Management Measures and Compliance Matrix

Clause	Detail	Reference
<b>Construction Environmental Management Framework</b>		
7.1a	The following groundwater management objectives will apply to construction:	
	i. Reduce the potential for drawdown of surrounding groundwater resources;	Section 1.4
	ii. Prevent the pollution of groundwater through appropriate controls; and	Section 1.4
	iii. Reduce the potential impacts of groundwater dependent ecosystems.	Section 1.4
7.2a	The following content may be provided within other sub plans such as the Soil and Water Management Plan and Flora and Fauna Management Plan.	N/A
7.2b	Principal Contractors will develop and implement a Groundwater Management Plan for their scope of works. The Groundwater Management Plan will include as a minimum:	This Plan
	i. The groundwater mitigation measures as detailed in the environmental approval documentation;	Section 6
	ii. The requirements of any applicable licence conditions;	N/A
	iii. Details of proposed extraction, use and disposal of groundwater, and measures to mitigate potential impacts to groundwater sources, incorporating monitoring, impact trigger definition and response actions for all groundwater sources potentially impacted by the SSI;	Section 6.1
	iv. Evidence of consultation with the NSW Office of Water;	Section 1.5
	v. The responsibilities of key project personnel with respect to the implementation of the plan;	Section 3
	vi. Procedures for the treatment, testing and discharge of groundwater from the site;	Section 6.4 Soil and Water Management Procedure (SMCSWSWL-JHG-SWL-EM-PRO-000001)
	vii. Compliance record generation and management; and	Section 9.0
	viii. Details of groundwater monitoring if required.	Section 8.1
7.3a	Examples of groundwater mitigation measures include:	
	i. Implementing all feasible and reasonable measures to limit groundwater inflows to stations and crossovers; and	Section 6.0

Clause	Detail	Reference
	ii. Undertaking groundwater monitoring during construction (levels and quality) in areas identified as 'likely' and 'potential' groundwater dependent ecosystems.	Section 6.0
15.2a (ii)	Details of construction activities and their locations, which have the potential to impact on water courses, storage facilities, stormwater flows, and groundwater;	Section 1.3
15.2a (iii)	Surface water and ground water impact assessment criteria consistent with the principles of the Australian and New Zealand Environment Conservation Council (ANZECC) guidelines;	Section 6 Section 8
15.2a (iv)	Management measures to be used to minimise surface and groundwater impacts, including identification of water treatment measures and discharge points, details of how spoil and fill material required by the SSI will be sourced, handled, stockpiled, reused and managed; erosion and sediment control measures; salinity control measures and the consideration of flood events;	Section 6
15.2a (vi)	Management measures for contaminated material (soils, water and building materials) and a contingency plan to be implemented in the case of unanticipated discovery of contaminated material, including asbestos, during construction;	Section 6 Section 8.1
15.2a (vii)	A description of how the effectiveness of these actions and measures would be monitored during the proposed works, clearly indicating how often this monitoring would be undertaken, the locations where monitoring would take place, how the results of the monitoring would be recorded and reported, and, if any exceedance of the criteria is detected how any non-compliance can be rectified;	Section 9
15.2g	The following water resources management objectives will apply to the construction of the project: <ul style="list-style-type: none"> <li>i. Minimise demand for, and use of potable water;</li> <li>ii. Maximise opportunities for water re-use from captured stormwater, wastewater and groundwater;</li> <li>iii. Examples of measures to minimise potable water consumption include: <ul style="list-style-type: none"> <li>▪ Water efficient controls, fixtures and fittings in temporary facilities;</li> <li>▪ Collecting, treating and reusing water generated in tunnelling operations, concrete batching and casting facility processes;</li> <li>▪ Using recycled water or treated water from onsite sources in the formulation of concrete;</li> <li>▪ Harvesting and reusing rainwater from roofs of temporary facilities;</li> <li>▪ Using water from recycled water networks;</li> <li>▪ Collecting, treating and reusing groundwater and stormwater;</li> </ul> </li> </ul>	Section 6.1

Clause	Detail	Reference																											
	<ul style="list-style-type: none"> <li>▪ Using water efficient construction methods and equipment; and</li> <li>▪ Providing designated sealed areas for equipment wash down.</li> </ul>																												
<b>Project Planning Approval</b>																													
A9	Where the terms of this approval require consultation with identified parties, details of the consultation undertaken, matters raised by the parties, and how the matters were considered must accompany the strategies, plans, programs, reviews, audits, protocols and the like submitted to the Secretary.	Section 1.5																											
C3	<p>The following <b>CEMP sub-plans</b> must be prepared in consultation with the relevant government agencies identified for each <b>CEMP sub-plan</b> and be consistent with the <b>CEMF</b> and <b>CEMP</b> referred to in Condition C1.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Required CEMP sub-plan</th> <th colspan="2">Relevant government agencies to be consulted for each CEMP sub-plan</th> </tr> </thead> <tbody> <tr> <td>(a)</td> <td>Noise and vibration</td> <td>Relevant Council(s)</td> </tr> <tr> <td>(b)</td> <td>Biodiversity</td> <td>OEH and Relevant Council(s)</td> </tr> <tr> <td>(c)</td> <td>Air quality</td> <td>N/A</td> </tr> <tr> <td>(d)</td> <td>Soil and Water</td> <td>DPI Water, Relevant Council(s), OEH, SES, NSW Fire and Rescue</td> </tr> <tr> <td>(e)</td> <td>Groundwater</td> <td>DPI Water</td> </tr> <tr> <td>(f)</td> <td><del>Blasting</del></td> <td><del>N/A</del></td> </tr> <tr> <td>(g)</td> <td>Heritage</td> <td>Heritage Council (or its delegate) and Relevant Council(s)</td> </tr> <tr> <td>(h)</td> <td><del>Construction Traffic</del></td> <td><del>Relevant Road Authorities, RMS, Sydney Coordination Office</del></td> </tr> </tbody> </table>	Required CEMP sub-plan	Relevant government agencies to be consulted for each CEMP sub-plan		(a)	Noise and vibration	Relevant Council(s)	(b)	Biodiversity	OEH and Relevant Council(s)	(c)	Air quality	N/A	(d)	Soil and Water	DPI Water, Relevant Council(s), OEH, SES, NSW Fire and Rescue	(e)	Groundwater	DPI Water	(f)	<del>Blasting</del>	<del>N/A</del>	(g)	Heritage	Heritage Council (or its delegate) and Relevant Council(s)	(h)	<del>Construction Traffic</del>	<del>Relevant Road Authorities, RMS, Sydney Coordination Office</del>	Section 1.5
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(h)	<del>Construction Traffic</del>	<del>Relevant Road Authorities, RMS, Sydney Coordination Office</del>																											
C4	<p>The <b>CEMP sub-plans</b> must state how:</p> <p>(a) the environmental performance outcomes identified in the EIS as amended by the documents listed in A1 will be achieved;</p> <p>(b) the mitigation measures identified in the EIS as amended by documents listed in A1 will be implemented;</p> <p>(c) the relevant terms of this approval will be complied with; and</p> <p>(d) issues requiring management during construction, as identified through ongoing environmental risk analysis, will be managed.</p>	This Plan																											
C5	The CEMP sub-plans must be developed in consultation with relevant government agencies. Where an agency(ies) request(s) is not included, the Proponent must provide the Secretary justification as to why. Details of all information requested by an agency to be included in a CEMP sub-plan as a result of consultation and copies of all correspondence from those agencies, must be provided with the relevant CEMP sub-plan.	Section 1.5																											

Clause	Detail	Reference															
C6	Any of the CEMP sub-plans may be submitted to the Secretary along with, or subsequent to, the submission of the CEMP but in any event, no later than one (1) month before commencement of construction.	Section 1.1															
C8	Construction must not commence until the CEMP and all CEMP sub-plans have been approved by the Secretary. The CEMP and CEMP sub-plans, as approved by the Secretary, including any minor amendments approved by the ER (or AA in regards to the Noise and Vibration sub-plan), must be implemented for the duration of construction. Where the CSSI is being staged, construction of that stage is not to commence until the relevant CEMP and sub-plans have been approved by the Secretary.	Section 1.1															
C9	<p>The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies identified for each Construction Monitoring Program to compare actual performance of construction of the CSSI against predicted performance.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;"></th> <th style="width: 30%;">Monitoring Programs</th> <th style="width: 65%;">Relevant government agencies to be consulted for each Construction Monitoring Program</th> </tr> </thead> <tbody> <tr> <td>(a)</td> <td>Noise and Vibration</td> <td>EPA and Relevant Council(s)</td> </tr> <tr> <td>(b)</td> <td>Blasting</td> <td>EPA and Relevant Council(s)</td> </tr> <tr> <td>(c)</td> <td>Water Quality</td> <td>EPA and Relevant Council(s)</td> </tr> <tr> <td>(d)</td> <td>Groundwater</td> <td>DPI Water</td> </tr> </tbody> </table>		Monitoring Programs	Relevant government agencies to be consulted for each Construction Monitoring Program	(a)	Noise and Vibration	EPA and Relevant Council(s)	(b)	Blasting	EPA and Relevant Council(s)	(c)	Water Quality	EPA and Relevant Council(s)	(d)	Groundwater	DPI Water	Section 8.1
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(b)	Blasting	EPA and Relevant Council(s)															
(c)	Water Quality	EPA and Relevant Council(s)															
(d)	Groundwater	DPI Water															
C10	<p>Each Construction Monitoring Program must provide:</p> <ul style="list-style-type: none"> <li>(a) details of baseline data available;</li> <li>(b) details of baseline data to be obtained and when;</li> <li>(c) details of all monitoring of the project to be undertaken;</li> <li>(d) the parameters of the project to be monitored;</li> <li>(e) the frequency of monitoring to be undertaken;</li> <li>(f) the location of monitoring;</li> <li>(g) the reporting of monitoring results;</li> <li>(h) procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory; and</li> <li>(i) any consultation to be undertaken in relation to the monitoring programs.</li> </ul>	N/A Note: a construction monitoring program is not proposed based on the scope of work, refer Section 8.1															

Clause	Detail	Reference
E59	Before commencement of construction, all property owners of buildings identified as being at risk of damage must be offered a building condition survey. Where an offer is accepted a structural engineer must undertake the survey. The results of the surveys must be documented in a Building Condition Survey Report for each building surveyed. Copies of Building Condition Survey Reports must be provided to the owners of the buildings surveyed, and if agreed by the owner, the Relevant Council within three (3) weeks of completing the Survey Report and no later than one (1) month before the commencement of construction.	Section 6.1
E60	Within three (3) months of the completion of construction, all property owners of buildings for which a building condition survey was carried out in accordance with Condition E59 must be offered a second building condition survey. Where an offer is accepted, building condition surveys must be undertaken by a structural engineer. The results of the surveys must be documented in a Building Condition Survey Report for each building surveyed. Copies of Building Condition Survey Reports must be provided to the owners of the buildings surveyed within one (1) month of the survey being completed.	Section 6.1
E61	The Proponent must install appropriate equipment to monitor areas in proximity to construction sites and the tunnel route during construction and for a period of not less than six (6) months after settlement has stabilised with particular reference to risk areas identified in the building and infrastructure condition surveys required by conditions E59 and E60 and/or the geotechnical analysis as required. If monitoring during construction indicates exceedance of the criteria, then all construction affecting settlement must cease immediately and must not resume until fully rectified or a revised method of construction is established that will ensure protection of affected buildings.	Section 4.3 Section 6.3 Appendix B
E66	A <b>Site Contamination Report</b> , 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 <i>Contaminated Land Management Act 1997</i> (NSW).	Section 2.1
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 4.3 Section 6.3
E68	A copy of the Site Audit Statement and Site Audit Report must be submitted to the Secretary and Council for information no later than one (1) month before the commencement of operation.	Section 8.3

Clause	Detail	Reference
E70	The Unexpected Contaminated Land and Asbestos Finds Procedure must be implemented throughout construction.	Section 8.1
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 6.2 Appendix C
<b>Revised Environmental Management Measures</b>		
GWG1	<p>A detailed geotechnical model for the project would be developed and progressively updated during design and construction. The detailed geotechnical model would include:</p> <ul style="list-style-type: none"> <li>• Assessment of the potential for damage to structures, services, basements and other sub-surface elements through settlement or strain</li> <li>• Predicted changes to groundwater levels, including at nearby water supply works.</li> </ul> <p>Where building damage risk is rated as moderate or higher (as per the CIRIA 1996 risk-based criteria), a structural assessment of the affected buildings / structures would be carried out and specific measures implemented to address the risk of damage.</p> <p>With each progressive update of the geotechnical model the potential for exceedance of the following target changes to groundwater levels would be reviewed:</p> <ul style="list-style-type: none"> <li>• Less than 2.0 metres – general target</li> <li>• Less than 4.0 metres – where deep building foundations present</li> <li>• Less than 1.0 metre – residual soils</li> <li>• Less than 0.5 metre – residual soils (Blues Point) (fill/Aeolian sand).</li> </ul> <p>Where a significant exceedance of target changes to groundwater levels are predicted at surrounding land uses and nearby water supply works, an appropriate groundwater monitoring program would be developed and implemented. The program would aim to confirm no adverse impacts on groundwater levels or to appropriately manage any impacts. Monitoring at any specific location would be subject to the status of the water supply work and agreement with the landowner.</p> <p>The geotechnical model and groundwater monitoring program would be developed in consultation with the Department of Primary Industries (Water).</p>	Section 6.0 Appendix B Geotechnical Instrumentation and Monitoring Specification (SMCSWSWL-WSP-SWL-GE-REP-00004)

Clause	Detail	Reference
GWG2	Condition surveys of buildings and structures in the vicinity of the tunnel and excavations would be carried out prior to the commencement of excavation at each site.	Section 6.0
SCW1	Updated desktop contamination assessments would be carried out for Waterloo Station. 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.  In the event a RAP is required, these would be developed in accordance with Managing Land Contamination: SEPP 55 and a site auditor would be engaged.	Section 6.0
SCW4	Discharges from the construction water treatment plants would be monitored to ensure compliance with the discharge criteria in an environmental protection license issued to the project.	Section 6.2
From Section 11.3 of the Submissions and Preferred Infrastructure Report	<b>Water – Hydrology</b> Long term impacts on surface water and groundwater hydrology (including drawdown, flow rates and volumes) are minimised. The environmental values of nearby, connected and affected water sources, groundwater and dependent ecological systems including estuarine and marine water (if applicable) are maintained (where values are achieved) or improved and maintained (where values are not achieved).  Sustainable use of water resources.	Section 6.0



## Appendix B – Geotechnical instrumentation and monitoring specification summary

The geotechnical instrumentation and monitoring specification requirements are summarised in the following tables.

**Table 8: Monitoring frequency for applicable stage of construction**

Structure/ Instrument	Anchor destraining	Building construction	Removal
Optical survey targets on secant pile wall	<ul style="list-style-type: none"> <li>Continuous</li> </ul>	Monthly	Not less than six months after construction or when advised readings have stabilised <sup>(1)</sup>
Settlement monitoring points	<ul style="list-style-type: none"> <li>Daily</li> </ul>	Monthly	Not less than six months after construction or when advised readings have stabilised <sup>(1)</sup>
Visual Inspection	<ul style="list-style-type: none"> <li>Monthly or as required</li> </ul>	Monthly	N/A
Inclinometer	<ul style="list-style-type: none"> <li>Daily</li> </ul>	Monthly	Not less than six months after construction or when advised readings have stabilised <sup>(1)</sup>
Piezometer	<ul style="list-style-type: none"> <li>n/a</li> </ul>	Monthly	Not less than six months after construction or when advised readings have stabilised <sup>(1)</sup>

(1) Stabilised – at least three readings are required to establish a trend. Stabilised readings are within 5% of previous readings unless effected by seasonal movement independent of the construction works.

**Trigger levels will be determined based on the percentages of design values in Table 9.**

**Table 9: Trigger levels and actions**

Trigger level	Percentage of design value	Action
Green	<ul style="list-style-type: none"> <li>&lt;60%</li> </ul>	Monitoring, no other action
Amber	<ul style="list-style-type: none"> <li>60-100%</li> </ul>	Increase monitoring frequency, perform further assessment/inspection, initial remedial action if required
Red	<ul style="list-style-type: none"> <li>100%</li> </ul>	Stop work and action contingency measures

Trigger values will be determined following confirmation/review of:

- As installed locations
- Baseline readings (data provided by TSE Contractor)
- Any additional interpretation of numerical modelling.

The existing numerical system of as-installed instrumentation locations from the TSE stage are to be utilised, with the existing trigger values reviewed for currency, in conjunction with movement which has already occurred and numerical modelling.

Where monitoring indicates unusual behaviour, or trigger levels reach the Amber (warning) level, the following is to be conducted:

- Monitoring results are to be checked and re-monitored immediately to confirm readings.
- The frequency of monitoring instrumentation is to be increased (as advised by the project geotechnical consultant).
- Visual inspections are to be made by the Geotechnical Consultant.
- A review of trigger levels is to be made by the Designer Manager
- The displacement profile is to be reviewed by the Designer Manager to confirm that the structure in question is performing as expected. If displacement profiles do not conform with those calculated, or if construction sequencing or loading has varied from the design, then back-analysis of the construction work may be required to understand the behaviour and to refine the geotechnical model. In this instance, the refined model shall then be extended to provide prediction of the future performance because of subsequent construction activities. Any remedial options shall also be assessed and implemented as required.
- Remedial action shall be implemented by the Geotechnical Consultant where required.

Where monitoring indicates distress, or trigger levels reach the red (action) level, the following is to be conducted:

- Immediately stop construction activity within the area (and other similar areas) and clear personnel from areas that may be impacted by a failure until a review has been completed. Notify the Designer.
- Immediate visual inspection is to be conducted by the Design Manager and Geotechnical Consultant.
- The frequency of monitoring instrumentation is to be increased (as advised by the Design Manager).
- A review of trigger levels is to be made by the Design Manager.
- Immediate additional support is to be designed and installed (Geotechnical Consultant).

## Appendix C – Water Quality Monitoring Parameters

CSSI 15\_7400 Project Planning Condition E107 requires the project to meet the *NSW water quality objectives* where they are being achieved at the date of the approval (9 January 2017) and contribute towards achievement of the *NSW Water Quality Objectives* over time where they are not being achieved.

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 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.

The aspects of the NSW Water Quality objectives that Waterloo Station propose to meet include the parameters outlined in **Table 10**. The parameters are selected based on the site works and the existing groundwater environment. The TSE RAP for the Waterloo Station Box identified the existing groundwater contaminants of concern which is consistent with the EIS Phase 1 Contamination Investigation.

Following commissioning of the WTP, quarterly grab samples will be collected and analysed at a NATA accredited laboratory. Grab samples will also be collected for inlet and outlet water when construction activities change to confirm the criteria is being achieved.

To determine the receiving water quality criteria, the Australian and New Zealand Guideline for Fresh and Marine Water Quality (ANZECC 2000 guidelines) provides standardised criteria relevant to achieving the public health and environmental water quality for that water body (Cooks River). This has also been referenced in the EIS to determine the impact of the Project on the receiving water body.

John Holland has prepared a discharge impact assessment (DIA) report (SMCSWSWL-JHG-SWL-EM-REP-000004) which includes a review of the available water quality data, determines appropriate site specific trigger values (SSTV) for water discharge and provides management actions when criteria is triggered.

The site specific data can be referenced to determine compliance with the POEO Act Section 120 pollution of water requirement.

**Table 10: Assessment Criteria for water discharged from the WTP (extract from DIA)**

Parameter	Units	Alexandra Canal Ambient	Selected Trigger Values
<b>Field Data</b>			
pH	pH Units	7.8	7.0-8.5
EC	µS/cm	7510	980-14460
TSS	mg/L	9.7	15.2
<b>Heavy Metals</b>			
Arsenic (filtered)	mg/l	0.0015	0.03
Cadmium (filtered)	mg/l	<0.0002	0.036
Chromium (filtered)	mg/l	0.00125	0.085
Copper (filtered)	mg/l	0.004	0.008
Iron (filtered)	mg/l	0.125	0.3
Lead (filtered)	mg/l	<0.001	0.012
Manganese (filtered)	mg/l	0.03	0.08
Mercury (filtered)	mg/l	<0.0001	0.0014
Nickel (filtered)	mg/l	<0.001	0.56
Zinc (filtered)	mg/l	0.045	0.08
<b>Organic Compounds</b>			
Toluene	mg/l	<0.001	0.33
1,2,4 trimethylbenzene	mg/l	<0.001	0.001
2-butanone (MEK)	mg/l	<0.001	0.001
2-propanone (acetone)	mg/l	<0.001	0.001
4-methyl-2-pentanone (MBEK)	mg/l	<0.001	0.001
TRH C6-C9	mg/l	<0.02	0.02
TRH C10-C14	mg/l	<0.05	0.05
TRH C15-C28	mg/l	<0.1	0.1
TRH C29-C36	mg/l	<0.1	0.1

In the event that results are above the trigger levels in Table 10 the process outlined below and included in Section 3.5 of the DIA will be followed.

1. review the construction activities on site to determine the causes of trigger (i.e. construction related or existing groundwater condition);
2. audit the WTP, in particular the filter system (s), and undertake maintenance if required;
3. increase the water quality monitoring of the water discharged at Alexandra Canal;
4. increase the water quality monitoring pre- and post- treatment for analysis to identify if the treatment is efficient (i.e. what compounds are removed or not);
5. provide the data to the Water Quality Consultant for interpretation if required;
6. if the selected trigger value is continuously exceeded conduct a review of discharge data and water quality data from Alexandra Canal and the WTP with the Water Quality Consultant;
7. if the SSTV is exceeded, follow incident reporting procedure; and
8. if required, organise for liquid water pumping and disposal to the nearest industrial water treatment facility.