



Groundwater Management Plan

A sub plan of
Operational
Environmental
Management Plan.

Information

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Compliance table

Table 0-1 Compliance Table

Reference number	Requirement	Document reference
CSSI 7400 – D3 (Operational Environmental Management Plan – OEMP)	Where an OEMP is required, the Proponent must include the following OEMP sub-plan in the OEMP: Groundwater Management .	This Plan.
CSSI 7400 – D4	Each OEMP sub-plan must include the requirements set out in Condition D2(a), (b) and (c).	Sections 4 and 5.
CSSI 7400 – D2	An OEMP is not required for the CSSI if the Proponent has an Environmental Management System or equivalent agreed with the Secretary and can demonstrate that: (a) the EIS performance outcomes, commitments, mitigation measures and approval requirements can be achieved; (b) issues identified through ongoing risk analysis can be managed; and (c) procedures are in place to rectify non-compliances identified through auditing, incident management or otherwise during operation.	Sections 4 and 5.
CSSI 7400 – D5	OEMP sub-plans must be developed in consultation with the relevant agencies identified in Condition D3. Where an agency request is not included, justification must be provided to the Secretary. Consultation requests and correspondence must accompany the relevant sub-plan.	Section 2.
CSSI 7400 – D6	The OEMP sub-plans must be submitted to the Secretary as part of the OEMP.	Section 1.2.
CSSI 7400 – E107	The CSSI must be constructed and operated to maintain the NSW Water Quality Objectives where they are being achieved and contribute towards their achievement where they are not, unless an applicable EPL imposes different requirements.	Section 4.2.2.1.
SSI 8256 – Sydenham to Bankstown		
SSI 8256 – Part D, Operational Environmental Management	Approval requirement: The applicable operational environmental management condition number and approved wording must be verified against the latest consolidated SSI 8256 approval before this Plan is issued. SSI 8256 is addressed through the overarching OEMP; this row does not imply that SSI 8256 requires a separate groundwater sub-plan where no such express requirement applies. Application to this Plan: MTS will manage the Sydenham to Bankstown operational interface through the OEMP and this Plan where operational assets, maintenance activities, groundwater or drainage pathways are relevant to the corridor.	Sections 1.2, 1.3 and 3.2; applicable controls in Sections 4 and 5.
SSI 8256 – REMM FHW11	Source commitment: REMM FHW11 is a Revised Environmental Mitigation Measure, not a Condition of Approval. Its exact approved wording and applicability to operation must be verified against the final SSI 8256 environmental assessment documentation and commitments register before this Plan is issued. Application to this Plan: Subject to that verification, MTS will assess and document the operational interface where maintenance or modification of cuttings, track drainage, culverts, substation sites or other surface rail assets could affect groundwater seepage, drainage performance or discharge pathways, including connections to CSSI 7400 assets. The relevant asset, responsible operational owner, inspection and maintenance requirements, discharge pathway, escalation trigger and implementation evidence are to be recorded.	Sections 1.3, 4.2, 4.3 and 5.1, subject to verification of applicability.

SSI 8256 verification note: Before issue, the SSI 8256 entries in Table 0-1 must be checked against the latest consolidated approval, and final environmental assessment commitments register. The applicable Part D OEMP condition number and

approved wording, and the exact wording and operational applicability of REMM FHW11, must be confirmed. Any MTS-specific interpretation must remain identified separately from the source requirement.

1 Introduction

1.1 Overview and context

Metro Trains Sydney Pty Ltd (MTS) has prepared this Operational Groundwater Management Sub Plan (OGMP or Plan) to assess and manage groundwater-related risks during operation of the Sydney Metro City & Southwest network from Chatswood to Bankstown. The Plan applies to both the Chatswood to Sydenham component approved under CSSI 7400 and the Sydenham to Bankstown (Southwest) component approved under SSI 8256. It establishes a consistent operational groundwater management framework for both corridors while recognising that the statutory requirements, environmental assessment commitments and approval conditions applying to each component remain distinct.

This Plan outlines the operational environmental management measures applied across the Chatswood to Sydenham and Sydenham to Bankstown corridors to manage groundwater inflow, seepage, drainage, groundwater quality, treatment and discharge, asset integrity and groundwater-related maintenance risks, as detailed in Sections 4 and 5.

1.2 Plan purpose

This Plan forms part of the Operational Environmental Management Plan (OEMP) for the Sydney Metro City & Southwest network. For the Chatswood to Sydenham component, it addresses the Conditions of Approval for CSSI 7400, as modified by CSSI 7400 MODs 1 to 9, including the requirement to prepare an OGMP prior to commencement of operation to the satisfaction of the Secretary of the Department of Planning, Housing and Infrastructure (DPHI) and Department of Primary Industries – Water (DPI Water). For the Sydenham to Bankstown component, the Plan supports implementation of the applicable operational environmental management requirements, commitments and Revised Environmental Mitigation Measures under SSI 8256 where groundwater, seepage, drainage, water quality, discharge pathways, asset maintenance or interfaces with CSSI 7400 infrastructure are relevant. The controls in this Plan apply across both corridors according to the applicable approval, asset characteristics and operational risk.

1.3 Background

For the purposes of this Plan, the Sydney Metro City & Southwest operational network extends from Chatswood to Bankstown and comprises two connected components: Chatswood to Sydenham, approved under CSSI 7400, and Sydenham to Bankstown, approved under SSI 8256. The alignment passes through the local government areas of Willoughby, North Sydney, Sydney, Inner West and Canterbury-Bankstown. The two corridors have different groundwater settings: Chatswood to Sydenham is predominantly a tunnelled railway with deep stations, shafts, dive structures and operational water treatment plants, while Sydenham to Bankstown is predominantly an at-grade brownfield railway where groundwater interaction is generally associated with shallow groundwater, cuttings, track drainage, culverts, substations, station precincts and operational excavations. Key operational components of the Chatswood to Sydenham corridor include:

- About 15.5 kilometres of twin rail tunnels (two tunnels located side-by-side) between Mowbray Road, Chatswood and Bedwin Road, Marrickville. The tunnel corridor extends about 30 metres either side of each tunnel centre line and around all stations.
- About 250 metres of above ground metro tracks between Chatswood Station and the northern dive structure.
- A northern dive structure (about 400 metres in length) and tunnel portal south of Chatswood Station and north of Mowbray Road, Chatswood.
- A southern dive structure (about 400 metres in length) and tunnel portal north of Sydenham Station and south of Bedwin Road, Marrickville.
- Metro stations at Crows Nest, Victoria Cross, Barangaroo, Martin Place, Pitt Street (Gadigal) and Waterloo, as well as underground platforms at Central Station and above ground platforms at Sydenham Station.
- Underground pedestrian links and connections to other modes of transport (such as the suburban rail network) and surrounding land uses.

- Services within each of the stations, including mechanical and fresh air ventilation equipment and electrical power substations.
- A permanent power supply from Surry Hills to Gadigal Station.
- A substation (for traction power supply at Artarmon).
- A services facility (for traction power supply and an operational water treatment plant) adjacent to the southern dive structure.

The Sydenham to Bankstown (Southwest) corridor extends from Sydenham Station to Bankstown Station and is predominantly an at-grade, brownfield surface railway. It includes metro stations and associated operational infrastructure at Marrickville, Dulwich Hill, Hurlstone Park, Canterbury, Campsie, Belmore, Lakemba, Wiley Park, Punchbowl and Bankstown, together with track, cuttings, embankments, retaining structures, bridges, culverts, substations, signalling and communications equipment, station precinct assets, maintenance access points and track drainage systems. Groundwater interaction along the Southwest corridor is expected to be localised and primarily associated with shallow groundwater and perched water, seepage into cuttings and retaining structures, the condition and capacity of track drainage and culverts, excavation or dewatering for operational maintenance and renewal works, and locations where Southwest drainage connects to or may affect Chatswood to Sydenham assets. These interfaces are subject to the risk assessment, inspection, maintenance, incident, monitoring and corrective-action requirements of this Plan where applicable.

The City & Southwest network was assessed and approved in two connected components under Part 5.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The Chatswood to Sydenham component was assessed through its Environmental Impact Statement (EIS), Submissions and Preferred Infrastructure Report (SPIR) and associated technical studies, including Technical Paper 7 – Groundwater, and was approved as Critical State Significant Infrastructure under CSSI 7400. The Sydenham to Bankstown component was assessed separately through its EIS, Submissions Report, Preferred Infrastructure Report, applicable technical studies, conditions and Revised Environmental Mitigation Measures and was approved as State Significant Infrastructure under SSI 8256. Collectively, the applicable environmental assessment documents for both approvals are referred to in this Plan as the Environmental Assessment Documentation (EAD). Requirements and commitments must be traced to and implemented under the approval from which they arise; however, MTS will coordinate controls where assets, drainage pathways, maintenance activities, incidents or environmental risks cross or connect the two approval corridors.

The Chatswood to Sydenham component was approved by the Minister for Planning on 9 January 2017 under CSSI 7400 and has subsequently been modified as listed below. The Sydenham to Bankstown component was approved separately under SSI 8256. Unlike the predominantly tunnelled Chatswood to Sydenham component, the Sydenham to Bankstown corridor is an existing at-grade and brownfield railway; accordingly, its operational groundwater considerations are principally associated with local cuttings, shallow excavations, substations, track drainage and interfaces with connected CSSI 7400 assets rather than deep tunnel inflows. Relevant SSI 8256 commitments and Revised Environmental Mitigation Measures are to be applied where they relate to those operational interfaces. The CSSI 7400 modifications are:

- MOD 1 – Victoria Cross and Artarmon Substation (approved 18 October 2017)
- MOD 2 – Central Walk (approved 21 December 2017)
- MOD 3 – Martin Place Metro Station (approved 22 March 2018)
- MOD 4 – Sydenham Station and Metro Facility South (approved 13 December 2017)
- MOD 5 – Blues Point Acoustic Shed (approved 2 November 2018)
- MOD 6 – Administrative Changes (approved 21 February 2019)
- MOD 7 – Administrative Changes (approved 24 June 2020)
- MOD 8 – Blues Point Access Site (approved 25 November 2020)
- MOD 9 – Extension to standard construction hours (approved 30 June 2022).

The operational phase commenced in August 2024. During construction, a number of individual Construction Groundwater Management Plans, Environmental Monitoring Reports and Water Quality Monitoring Programs were

prepared and implemented by individual construction contractors, as well as completion of groundwater modelling. As well as the EAD, a number of other key documents have been used to develop this Plan, as follows:

- Aurecon GHD Joint Venture (AGJV) (2018), Hydrogeological Inflow Assessment, Ref: SMCSFCSM-LOR-SMC-GE-REP-000202, July 2018.
- PSM (2018). Sydney Metro City & Southwest – TSE, Hydrogeological Interpretive Report, Ref: SMCSWTSE-JPS-TPW-GE-RPT-110003-01, October 2018.
- TSE (2020) Annual Groundwater Monitoring Report, Project: Sydney Metro City & Southwest – TSE Works, Document No: SMCSWTSE-JCG-TPW-EM-RPT-097433, August 2020.
- John Holland (2022). Waterloo Integrated Station Development, Groundwater Management Sub Plan, Ref: SMCSWSWL-JHG-SWL-EM-PLN-000006 Rev 3, August 2022.
- Besix Watpac (2022). Barangaroo Station Water Quality Monitoring Program, Ref: SMCSWSBR-BWC-SBR-EM-PLN-000302, October 2022.
- Laing O'Rourke (2023). Sydney Metro City and Southwest – Central Station Main Works Project, Construction Groundwater Management Plan (CGWMP), Rev 12, August 2023.
- Lendlease (2023). Construction Groundwater Management Plan, Sydney Metro Martin Plan Station – Integrated Station Development, Rev 11.1, August 2023.
- AW Edwards (2024). Sydney City & Southwest Metro – Crows Nest Station, Construction Groundwater Management Plan, Ref: SMCSWSCN-AWE-SCN-AN-PLN-0000024, January 2024.
- CPB Contractors (2024) Construction Environmental Management Plan (CEMP), Ref: SWCSWSPS-CPB-ALL-EM-PLN-000001, April 2024.
- Sydney Metro City & Southwest, Victoria Cross Integrated Station Development, Construction Groundwater Management Plan, Rev J, March 2024.

1.4 Plan scope and objectives

This Plan addresses groundwater aspects associated with the Operation and Maintenance phase of the Project (O&M).

The key objective of the OGMP is to ensure that the environmental assessment documentation, mitigation measures, Conditions of Approval, Revised Environmental Mitigation Measures and licence or permit requirements relevant to groundwater are described, scheduled and assigned responsibly.

Each requirement is to be traceable to its source documentation, including the CSSI 7400 environmental assessment documentation, CoA and commitments for Chatswood to Sydenham; the SSI 8256 environmental assessment documentation, CoA and REMMs for Sydenham to Bankstown; EPL 21247; and the legislation and other requirements described in Section 3.1 of this Plan, as outlined in:

- The EAD prepared for the Project
- CSSI 7400 Approval
- NSW EPA (Environmental Protection Authority) Environment Protection Licence (EPL# 21247)
- All relevant legislation and other requirements described in Section 3.1 of this Plan.

2 Consultation

In accordance with CSSI 7400 CoA D3 for the Chatswood to Sydenham component, the OGMP must be prepared in consultation with the relevant government agencies and stakeholders. Any consultation required under SSI 8256 for the Sydenham to Bankstown component is to be identified and documented separately against the applicable SSI 8256 condition or commitment. The status of consultation with these parties and a summary of key issues raised is presented in Table 2-1. See the full correspondence in Appendix D.

Table 2-1: Consultation details

Agency	Key issues raised	MTS update	Status
DPI Water (Department of Climate Change, Energy, the Environment and Water; DCCEEW)	The proponent should include groundwater monitoring at deep designed drained structures listed in the operational groundwater management plan (OGMP) for a minimum of three (3) years after operations commence.	MTS does not propose operational monitoring at deep designed drained structures, consistent with the lack of groundwater monitoring undertaken during construction and/or achievement of stable groundwater conditions during construction. Refer Section 4.2.1.2.	Closed
DPI Water (DCCEEW)	The proponent should update the hydrogeology conceptualisation for the Ashfield shale in the background section of the OGMP to: • Align the statement regarding the quality of groundwater from Ashfield shale with accepted parameters. • Detail the potential evidential causes for any variation observed in the parameter values for the Ashfield shale groundwater quality	This comment is considered closed based on updates to Section 4.1.3 of this Plan, based on information available at this time.	Closed
DPI Water (DCCEEW)	The proponent should update the OGMP to clarify: • Why the construction groundwater inflow rates are	Table 4.7 has been updated with the model-predicted groundwater inflow (seepage) rates during the operational	Closed

Agency	Key issues raised	MTS update	Status
	being used as the target for the operational phase, whilst it is described “tunnels, station boxes, shaft and dive structures have been designed to minimise groundwater inflow” and hence lower inflow rates would be expected. The predicted groundwater inflow at the tanked Waterloo station.	phase for the station sites, including Waterloo (currently drained but to be tanked). These inflow (seepage) rates are generally lower than predicted under construction and drained conditions (as per the EIS) and which were referenced in a previous version of this Plan.	
DPI Water (DCCEEW)	The proponent should re-evaluate the groundwater modelling impacts against actual monitored drawdown data once three years of post-construction groundwater monitoring is obtained.	MTS has updated this OGMP to provide discussion and supporting evidence as to why a groundwater monitoring program is not required during operation. Refer Section 4.2.1.2.	Closed
DPI Water (DCCEEW)	Letter on 6 August 2024 – The proponent must ensure that they hold sufficient water entitlement on a Water Access Licence (WAL) to account for the maximum predicted water take prior to take occurring unless an exemption can apply.	Section 3.1 updated to include reference to a WAL being required. The model-predicted groundwater inflow rates have been revised in Table 4.7 and provide an estimate of the predicted water take during operations. MTS will continue to engage with DCCEEW to seek a resolution to the challenges currently faced by the water regulations, and this item will be closed once a resolution has been met.	Closed
DPHI	Comment 3.1 – Table 2: Consultation Details does not adequately respond to or close out the issues raised by DCCEEW, particularly with respect to groundwater monitoring at deep designed structures during operation. These monitoring programs, must be referenced and discussed in the Groundwater Management Plan and must be implemented in time for first passenger services.	MTS has updated this OGMP to include discussion and supporting evidence as to why a groundwater monitoring program is not required during operation. Refer Section 4.2.1.2.	Closed
DPHI	Comment 3.3 – Consideration of approval requirements under the Water Management Act 2000 and <i>Water Management (General) Regulation 2025</i> is required in relation to groundwater collection, treatment and disposal at Barangaroo Station and the Marrickville Dive site.	See Section 3.1 for the current approval and exemption requirements under the <i>Water Management Act 2000</i>, <i>Water Management (General) Regulation 2025</i> and <i>Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023</i>. Refer to the approved EPL (21247) for treatment and disposal requirements from Marrickville Dive site / structure. MTS prepared a new Operational WDIA and finalised the WQMP for the	Open – in progress

Agency	Key issues raised	MTS update	Status
		Barangaroo WTP on the 20 December 2024, after conclusion of the Tunnel and Station Excavation Contractor (TSE) works. An application to include the WTP on the MTS EPL has been lodged with the NSW EPA	

3 Statutory requirements

3.1 Legal and other obligations

The legislation and planning instruments considered during development of this Plan are listed below:

- *Environmental Planning and Assessment Act 1979* (EP&A Act)
- Environmental Planning and Assessment Regulation 2021 (EP&A Regulation), as amended
- *Water Management Act 2000*
- Water Management (General) Regulation 2025 (as amended)
- *Protection of the Environment Operations Act 1997* (POEO Act)
- Protection of the Environment Operations (General) Regulation 2022 (POEO General Regulation), as amended
- Environment Protection and Biodiversity Conservation Act 1999 (Cth), as amended
- *Work Health and Safety Act 2011* and *Work Health and Safety Regulation 2025* (NSW), as amended, insofar as they apply to hazardous chemicals used, stored and handled at operational facilities
- *Contaminated Land Management Act 1997*.

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

- *NSW Aquifer Interference Policy* (NSW Office of Water, 2012)
- Guidelines for groundwater quality protection in Australia: National Water Quality Management Strategy (Australian Government, 2013), together with current ANZG groundwater application guidance
- *NSW Groundwater Strategy* (NSW Government, 2022), including the current strategic framework for protecting groundwater-dependent ecosystems
- Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023 (as amended)
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Governments and Australian state and territory governments, 2018, updated online). The former ANZECC/ARMCANZ (2000) guidelines are used only where a legacy value is expressly retained by an approval, licence, WDIA or WQMP.
- *Groundwater Toolkit for State Significant Projects* (NSW DCCEEW, 2025), including the guideline and technical guidance for groundwater impacts and risks, water licensing requirements and supporting data

Groundwater capture from drained operational structures constitutes a take of water that must be assessed under the *Water Management Act 2000*, the *Water Management (General) Regulation 2025* (as amended) and the *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023* (as amended). Before relying on an exemption, MTS must confirm that the current exemption wording applies to the relevant entity, activity, asset and period of take. Where an exemption does not apply, sufficient entitlement on a Water Access Licence and any required water supply work or aquifer interference approval must be obtained before the take occurs. Groundwater

collected from the alignment is conveyed to the applicable WTP for treatment and controlled discharge in accordance with the relevant EPL, WDIA, WQMP and planning approval requirements.

The discharge water quality requirements for the Marrickville WTP were determined in consultation with the NSW EPA during detailed design and are specified in EPL 21247. The Barangaroo WTP operates separately under the approved Barangaroo WDIA and WQMP while the application to add the facility as a licensed discharge point under EPL 21247 remains under EPA assessment. Until the licence variation is determined, the interim discharge criteria and operational controls described in Section 4.2.2.1 apply. Refer to the Water Discharge Impact Assessment – Barangaroo Station (SMCSWTS2-MTS-SBR-EM-PLN-004532).

In addition, as part of the construction process and commissioning of the Marrickville Water Treatment Plant, Systems Connect completed Marrickville Water Treatment Plant Proof of Performance Monitoring (13/06/2024) prior handover under their EPL #21423 to meet the requirements of Condition E4 of the License (SMCSWLWC-SYC-DSY-EM-REP-022425).

MTS will not apply for a Water Access Licence at this time, as the current wording of the Water Management (General) Regulation 2025 contains a drafting error that prevents the intended transport-infrastructure exemption from operating as intended for MTS. This anomaly relates to Sydney Metro not being included in the list of exempt rail and light rail infrastructure systems, with no apparent reason other than the regulator's advice that this was a drafting error requiring correction. MTS will continue to engage with DCCEW and the Natural Resources Access Regulator to resolve the regulatory issue.

In the interim, MTS will maintain a documented legal assessment identifying the relevant provision, the drafting issue, the activities and groundwater volumes covered, regulator correspondence and the evidence supporting this position. The assessment will be reviewed following any legislative amendment, material change in groundwater take, change in asset ownership or operational responsibility, or further regulator advice. Metered or otherwise validated inflow volumes will be retained to demonstrate the quantity of water treated and to support any future entitlement or approval calculation.

The *Water Management Act 2000* requires potential aquifer interference impacts to be assessed against the applicable minimal-harm considerations and the rules of the relevant water sharing plan. Treatment and discharge of captured groundwater does not, of itself, remove the requirement to hold a water entitlement or approval where one is legally required. MTS will therefore: maintain the current legal assessment and regulator correspondence; reconcile validated groundwater take against the operational water balance and any exemption, entitlement or approval limit; investigate material increases in take; and obtain or vary the necessary authorisation before operating outside the confirmed legal basis.

The *Protection of the Environment Operations (General) Regulation 2022* replaced the 2009 Regulation and applies to the administration of EPL 21247 and the pollution incident response framework. Relevant operational requirements include payment of indexed licence and application fees where applicable; calculation and retention of information required for any assessable pollutant load; compliance with licence monitoring, record-keeping and publication requirements; and preparation, implementation and testing of the Pollution Incident Response Management Plan (PIRMP). The PIRMP must be tested at least annually and within one month after a pollution incident for which the plan is implemented, with test records retained. MTS will review this Plan, the legal obligations register, PIRMP, WQMPs and WTP procedures following a licence variation or relevant legislative amendment and will apply the more stringent requirement where an EPL condition, planning approval or statutory requirement differs.

3.2 Development Consent Conditions

The City & Southwest operational network is governed by two connected planning approvals. The Chatswood to Sydenham component was approved under CSSI 7400, and the Sydenham to Bankstown component was approved under SSI 8256. Throughout this Plan, each Condition of Approval is cited as "CSSI 7400 CoA [condition number]" or "SSI 8256 CoA [condition number]", and each Revised Environmental Mitigation Measure is cited as "CSSI 7400 REMM [identifier]" or "SSI 8256 REMM [identifier]", as applicable. The conditions and commitments relevant to this Plan, including the applicable operational environmental management requirements and SSI 8256 REMM FHW11, and the locations where they are addressed are mapped in Table 0-1.

3.3 Revised environmental performance outcomes

Operational desired performance outcomes associated with groundwater management are listed in the Chatswood to Sydenham SPIR prepared under CSSI 7400 and detailed in Table 3-1. Any corresponding environmental performance outcome or REMM applicable to the Sydenham to Bankstown component must be identified separately as an SSI 8256 requirement.

Table 3-1: Operational desired performance outcomes associated with groundwater

Desired performance outcome	Environmental performance outcome	Document reference
Water – hydrology 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.	The Project would make good any impacts on groundwater users.	Section 4.3

3.4 Roles and responsibilities

Key roles and responsibilities applicable to this Plan are presented in Table 3-2. The Environment & Sustainability Lead is accountable for environmental governance, regulatory compliance, planning approvals, environmental risk management, stakeholder engagement, monitoring assurance and incident escalation. Routine monitoring, inspections, record entry, training administration and corrective-action tracking may be delivered by suitably competent personnel under the Lead's oversight. Further details regarding roles, delegated authorities and responsibilities are outlined in Section 5.1 of the OEMP.

Table 3-1: Roles and Responsibilities

Roles	Responsibilities
Environment & Sustainability Lead	- Obtain all required approvals to facilitate O&M of the Project, including but not limited to the EPL. - Undertake environmental risk assessment and revisit this through the life of the project through continual review and improvement processes within the MTS Integrated Management System (IMS). - Key point of contact for environmental and planning approvals and sustainability stakeholders, including but not limited to DPIE, EPA, Infrastructure Sustainability Council of Australia (ISCA). - Be an emergency contact and available to be contacted by EPA, DPIE and The Sydney Metro Authority Representatives on a 24-hour basis. - Notify MTS, OpCo2 and agencies as required in response to environmental incidents and potential incidents. - Identify and maintain a register of relevant legal, MTS IMS requirements, contractual and other requirements. - Obtain all necessary approvals prior to commencing relevant works. - Ensure the project induction includes appropriate training regarding the requirements of this OEMP, the EPL and any other key obligations. - Ensure identified risks are analysed and evaluated according to agreed criteria. Regularly review identified risks and controls and maintain a risk register.

Roles	Responsibilities
	- Ensure regular inspections, observations, monitoring, and audits are conducted to check the effectiveness of controls and that compliance is maintained. - Review subcontractors' performance and compliance with MTS environmental and sustainability requirements. - Enter and close out all environmental incidents in the O&M Phase Reporting System. - Identify and implement corrective and preventative actions after incidents and share lessons learned within the MTS team or other projects, as applicable.
Head of Safety, Quality, Risk & Environment	- Be an emergency contact and available to be contacted by EPA, Department of Planning, Industry and Environment (DPIE) and The Sydney Metro Authority Representatives on a 24-hour basis. - Provide environmental oversight, direction, and leadership regarding the environmental and sustainability management of the Project. - Support the CEO-MTS on MTS operations and the management of stakeholders including, The Sydney Metro Authority, EPA and other State and Federal government bodies and other government agencies. - Review the Project's management systems and key management plans to ensure and maintain compliance with the requirements of the MTS IMS, CoA, and EPL. - Ensure environmental incidents are managed and reported (to DPIE, EPA and Parent Companies) in accordance with the planning approval and EPL requirements.
General Manager (GM) Safety, Quality, Risk & Environment	O&M related investigations, compliance inspections, and data and trend analysis to mitigate safety and environmental risks. - Maintain MTS compliance with relevant environmental standards, and legal and regulatory requirements. - Support the Head of Safety, Quality, Risk & Environment with the delivery of key O&M milestones in alignment with MTS legal and regulatory requirements, business objectives, and key performance indicators. - Ensure preventative and corrective actions requested are completed within appropriate timeframes through efficient monitoring. - Expected to operate reasonably independently, in accordance with MTS's policies; quality, safety and environmental management systems; processes and relevant legislation.
GM Engineering & Maintenance Delivery	Responsible for establishing and executing O&M asset management strategy and asset management plan in adherence to the OEMP.
Head of Asset Management	Expected to operate reasonably independently in accordance with MTS's policies, IMS, processes, Safety Management System, and relevant legislation.
Infrastructure Engineering Manager	Expected to operate reasonably independently in accordance with MTS's policies. Safety, Quality, Risk and Environment (SQRE) management system, processes, and relevant legislations.
Infrastructure Delivery Manager	Expected to operate reasonably independently in accordance with MTS's policies. SQRE management system, processes, and relevant legislations.
Head of Strategy, Corporate Relations & Communications	Providing the delivery of internal and external communication (media, government, and stakeholder relations).

Roles	Responsibilities
Learning & Development Manager	Work with Environment & Sustainability Lead to develop training packages addressing environmental risk.
	Develop and implement the training delivery schedule for the O&M Phase, including environmental and sustainability aspects
	Operate reasonably independently, in accordance with MTS's policies; quality, safety and environmental management systems; processes and relevant legislation.

3.5 Training

All employees, contractors and utility staff working on the Project will undergo site induction training, in accordance with the Training Management Plan and Section 5.2 of the OEMP. The site induction training will provide initial training on various environmental aspects, including groundwater management issues/measures.

Records will be kept of all personnel undertaking the site induction training, including the contents the training, date, and name of trainer/s.

Targeted training or specific training will also be provided to personnel with a key role in groundwater management, if required.

4 Implementation

4.1 Existing environment

4.1.1 Geological context

The City & Southwest Project area traverses regional geological units identified by the *Sydney 1:100,000 Geological Sheet 9130* (Herbert, 1983), as detailed in Table 4-1. For the Chatswood to Sydenham component under CSSI 7400, the tunnels primarily transition through Hawkesbury Sandstone with some sections of Ashfield Shale and Mittagong Formation. For a small part of the Sydney Harbour crossing, the tunnels pass through fluvial/marine clayey-silty and clayey-sandy sediments.

The Sydenham to Bankstown component under SSI 8256 is predominantly an existing at-grade rail corridor. Its near-surface geological setting is generally characterised by anthropogenic fill and residual soils over Wianamatta Group rocks, principally Ashfield Shale, with local alluvial deposits associated with drainage lines and lower-lying areas. Accordingly, Southwest groundwater interaction is expected to be shallow and localised, rather than associated with deep tunnel excavation.

Table 4-1: Regional geology along the Project alignment

Geological unit	Description
Fill	Reclaimed areas generally adjacent to Sydney Harbour and some parklands
Holocene alluvium	Normally consolidated sediments
Pleistocene alluvium	Over-consolidated sediments (often sandy clays)
Residual soil	Derived from completely weathered siltstone and sandstone
Ashfield Shale	Black to dark-grey shale and laminite
Mittagong Formation	Interbedded shale, laminate, and medium-grained quartz sandstone
Hawkesbury Sandstone	Medium to coarse-grained quartz sandstone

The geological context for each Project element is described in Table 4-2. In contrast to alluvium, the permeability of shale, siltstone and sandstone is generally low to very low, with the majority of groundwater flow transmitted through joints and fractures, rather than via the porous nature of the material.

Table 4-2: Geological context for each Project element

Project element	Geological context
Chatswood dive structure	Residual soils and fill with underlying Ashfield Shale. Hawkesbury Sandstone is below the level of the dive structure.
Marrickville dive structure	Variable depths of fill, alluvium, residual soils and then Ashfield Shale.
Crows Nest Station	Fill, residual soils, Ashfield Shale, Mittagong Formation and then Hawkesbury Sandstone.
Victoria Cross Station	Hawkesbury Sandstone.
Barangaroo Station	Extensive near surface fill and Hawkesbury Sandstone.
Martin Place Station	Fill, residual soil and Hawkesbury Sandstone.
Gadigal Station	Fill, residual soil, Mittagong Formation and Hawkesbury Sandstone.
Central Station	Fill, residual soil, Ashfield Shale, Mittagong Formation and Hawkesbury Sandstone.
Waterloo Station	Fill, alluvium, residual soils, Ashfield Shale, and Hawkesbury Sandstone.
Artarmon substation	Ashfield Shale, Mittagong Formation and Hawkesbury Sandstone.
SSI 8256 – Sydenham to Bankstown stations	
The following station contexts relate to the predominantly at-grade Southwest corridor. They describe the expected near-surface geological setting for operational groundwater management and must be read with the SSI 8256 environmental assessment documentation, as-built records and site-specific geotechnical and contamination information.	
Marrickville Station	Existing rail formation comprising variable anthropogenic fill and residual soils over weathered Ashfield Shale. Local alluvial or reworked materials may occur near drainage lines and previously modified ground. Groundwater interaction is expected to be associated primarily with perched water in fill, shallow seepage and track or station drainage.
Dulwich Hill Station	Variable rail and urban fill over residual soils and weathered Ashfield Shale, with local alluvial influence associated with the Cooks River catchment and former drainage pathways. Shallow or perched groundwater may affect pits, services, retaining structures and track drainage.
Hurlstone Park Station	Existing rail fill and residual soils over weathered Ashfield Shale, with local alluvial deposits and shallow groundwater influence associated with the nearby Cooks River corridor and low-lying drainage areas. Seepage may occur at cuttings, retaining structures, pits and drainage assets.
Canterbury Station	Anthropogenic fill, alluvial soils and residual soils over weathered Ashfield Shale. The station's proximity to the Cooks River and local floodplain and drainage features may result in shallow groundwater, perched water and variable soil moisture conditions affecting station, track and drainage infrastructure.
Campsie Station	Existing rail and urban fill over residual soils and weathered Ashfield Shale, with possible local alluvial or reworked deposits along former drainage lines. Groundwater interaction is expected to be localised to shallow excavations, services, pits, retaining structures and track drainage.
Belmore Station	Variable anthropogenic fill and residual soils over weathered Ashfield Shale. Localised perched groundwater may occur within fill or along the soil-rock interface, particularly near drainage infrastructure, service trenches, retaining structures and low points in the rail formation.
Lakemba Station	Existing rail fill and urban fill over residual soils and weathered Ashfield Shale, with local variation associated with historical development and drainage modification. Shallow seepage or perched water may affect pits, services, track drainage and retaining structures.
Wiley Park Station	Anthropogenic fill and residual soils over weathered Ashfield Shale, with possible local alluvial or reworked material associated with drainage pathways within the broader Salt Pan Creek catchment. Groundwater interaction is

Project element	Geological context
	expected to be shallow and localised around drainage assets, pits and excavations.
Punchbowl Station	Existing rail and urban fill over residual soils and weathered Ashfield Shale, with local alluvial influence and shallow groundwater conditions associated with low-lying drainage pathways in the Salt Pan Creek catchment. Seepage may affect station pits, services, retaining structures and track drainage.
Bankstown Station	Variable anthropogenic fill, residual soils and weathered Ashfield Shale, with local alluvial or reworked deposits associated with historical drainage and substantial urban development. Localised shallow or perched groundwater may be encountered around station structures, services, retaining structures, pits and drainage infrastructure.

4.1.2 Groundwater levels

For the Chatswood to Sydenham component, groundwater along most of the alignment is generally between 10 metres and 30 metres below ground level, with local shallow groundwater within residual soils anticipated at approximately two to five metres below ground level. Along the Sydenham to Bankstown corridor, groundwater conditions are expected to be more variable and locally controlled by topography, fill, weathered shale, former drainage lines, culverts and stormwater infrastructure. Shallow or perched groundwater may occur within fill, alluvium and weathered bedrock, particularly in low-lying areas, cuttings and near drainage crossings. The groundwater level at a Southwest asset must therefore be confirmed from available investigation and construction records, observed seepage, nearby monitoring information or targeted investigation before intrusive maintenance, excavation or dewatering.

4.1.3 Groundwater quality

As per the Sydney Metro Chatswood to Sydenham EIS, salinity of groundwater in the Ashfield Shale was identified to be fresh (in the range 269 to 493 milligrams per litre (mg/L) as total dissolved solids (TDS)), and pH was slightly acidic (between 4.9 and 5.1). This is discussed further below.

As outlined in the EIS, the salinity of groundwater from the Mittagong Formation was identified to be fresh (range between 265 to 350 mg/L as TDS), with slightly acidic pH (between 4.7 and 5.6). Salinity in the Hawkesbury Sandstone groundwater was identified as being fresh (range between 147 to 574 mg/L as TDS), with near-neutral pH (range between 5.2 and 6.8).

The concentration of dissolved metals and nutrients in the Ashfield Shale, Mittagong Formation and Hawkesbury Sandstone, including residual soils, was expected to be naturally very low. Organic compounds are not naturally associated with Ashfield Shale, Mittagong Formation or Hawkesbury Sandstone.

Ashfield and Bringelly shales (Late Triassic Wianamatta Group), though primarily aquitards, do include scattered zones of fracture porosity within the weathered bedrock and groundwater is generally saline, typically in the range of 5,000 to 50,000 mg/L (McNally, 2009). The low salinity groundwater in the Ashfield Shale, compared to the expected brackish to saline quality, is considered to indicate an influx of fresh water such as rainfall or leakage from water supply pipes, adjacent irrigation, or possible leakage from the underlying formations (containing fresher groundwater). The Ashfield Shale comprises black to dark grey shale and laminate of four variably thick sub-units. The thickness of the unit ranges between less than one metre and 50 metres. At some locations, the shale may become carbonaceous, with variable silt and clay particles present. The unit is laminated, although it retains bedding planes at some locations. Based on these observations, there is the potential the fresher groundwater in the Ashfield Shale may be associated with areas of more open fracture permeability or higher delamination, resulting in higher through flow of fresh water and variation in the salinity of groundwater from the Ashfield Shale. Further reasons for the variation in Ashfield Shale groundwater could be the depth of extraction, fracture density, proximity to recharge zones and anthropogenic influences such as urban runoff.

With respect to pH, the groundwater within the Ashfield Shale was identified to be more acidic than the expected range, with monitoring during construction confirming the generally acidic nature of groundwater in the area, with the exception of Gadigal / Pitt Street Station where pH was measured between 7.2 and 8.5 (noting this was associated with Mittagong Formation and Hawkesbury Sandstone). The accepted pH range for discharge in accordance with the EPL#21247 is 7.0 to 8.5, therefore treatment prior to discharge is expected to be required to neutralise the water, and align other parameters with the discharge criteria, if exceeded (i.e. metals).

In regard to the Sydenham to Bankstown, groundwater-quality descriptions above are derived principally from the CSSI 7400 Chatswood to Sydenham EIS and must not be assumed to characterise the entire SSI 8256 corridor. Along Sydenham to Bankstown, groundwater quality may be influenced by historical railway activities, imported fill, adjacent commercial and industrial land uses, urban runoff, leaking services, former drainage alignments and naturally saline or mineralised groundwater within shale. Potential parameters of concern may include pH, electrical conductivity and salinity, suspended solids, nutrients, metals, petroleum hydrocarbons, polycyclic aromatic hydrocarbons and other site-specific contaminants. Before groundwater from a Southwest maintenance activity is pumped, reused or discharged, its quality and the receiving pathway must be assessed and managed under the applicable EPL, discharge approval, pollution incident controls and site-specific procedures.

4.1.4 Groundwater users and extraction

There is limited groundwater use near the Chatswood to Sydenham alignment due to the presence of low-permeability shale, siltstone and sandstone. The groundwater users identified in the CSSI 7400 EIS are at sufficient distance from the deep drained Project elements, and no material operational change in groundwater levels at those water-supply works is anticipated. Table 4-3 summarises the groundwater users identified for the Chatswood to Sydenham assessment.

For the Sydenham to Bankstown component, the predominantly at-grade railway is not expected to cause continuous regional groundwater drawdown; however, registered groundwater works, domestic bores, groundwater-dependent values and other sensitive receptors must be checked against current records before any maintenance activity involving excavation, temporary dewatering or a new permanent drained structure. Where an activity could affect a groundwater user, the potential radius of influence, duration and volume of take must be assessed and appropriate make-good, monitoring or approval requirements established before the activity proceeds.

Table 4-3: Groundwater users and extraction (from EIS)

Location	Bore ID	Approval type	Work type	Status	Estimated extraction*
Chatswood Oval	GW107757	Water Supply	Bore (intended purpose – recreation)	Unknown	N/A
	GW029731	Water Supply	Bore (intended purpose – recreation)	Unknown	N/A
St Leonards TAFE	GW072478	Basic Rights	Bore (intended purpose – domestic)	Functioning	N/A
Private Well near St Leonards Station	GW108224	Water Supply Basic Rights	Bore (intended purpose – domestic)	Functioning	<1 ML/y
Shore School	GW107764	Unknown	Bore	Unknown	<1 ML/y
Redfern Park	GW071907	Water Supply Works	Bore (intended purpose – recreation)	Functioning	12 ML/y
Private Spear near Waterloo Station	GW106192	Water Supply	Spearpoint (intended purpose – domestic)	Functioning	<1 ML/y
Industrial Water Supply, Bourke Road	GW017342 GW017684	Commercial	Bore (intended purpose – industrial)	Unknown	N/A
Ersleville Oval	GW110351	Water Supply Works	Bore (intended purpose – recreation)	Unknown	10 ML/y
Private Spear in Alexandria	GW111164	Water Supply	Spearpoint (intended purpose – domestic)	Functioning	<1 ML/y

Location	Bore ID	Approval type	Work type	Status	Estimated extraction*
SSI 8256 – Sydenham to Bankstown corridor	Not identified in the reviewed SSI 8256 assessment material	To be verified against current NSW groundwater records	Potential groundwater supply works or other registered groundwater works within the local influence of proposed dewatering or a new permanent drained structure	No corridor-wide operational groundwater-user impact is predicted for the predominantly at-grade railway. Current status must be verified before relevant works.	Not available
Marrickville to Bankstown station precincts and rail corridor	The reviewed SSI 8256 material does not provide a verified station-by-station bore schedule.	Before excavation, temporary dewatering or installation of a new permanent drained structure, Metro must check current NSW groundwater bore and entitlement records and review the applicable station precinct assessment, geotechnical information and asset-handover documentation.	The review must identify any groundwater supply work, domestic or commercial bore, groundwater-dependent value or other sensitive receptor within the potential radius of influence.	Where a groundwater user may be affected, Metro are to assess the predicted drawdown, duration and volume of take and establish any required monitoring, make-good, approval or notification measures before pumping commences.	Extraction volumes are to be confirmed from current entitlement records or direct consultation with the registered user; they must not be inferred from the older CSSI 7400 dataset.

*Note: The CSSI 7400 values above are based on 2016 data. The SSI 8256 entries are based on the Sydney Metro City & Southwest – Sydenham to Bankstown Upgrade Environmental Impact Statement, Technical Paper 8 – Hydrology, Flooding and Water Quality (Transport for NSW, August 2017). The reviewed SSI 8256 assessment information does not provide a verified station-by-station groundwater-user schedule or extraction volumes for the Sydenham to Bankstown corridor. Current NSW groundwater records and relevant handover information must therefore be checked before an activity capable of causing groundwater drawdown is undertaken. N/A = not available.

4.1.5 Groundwater inflows

Groundwater inflow in existing drained tunnels in Sydney, as outlined in the CSSI 7400 Chatswood to Sydenham EIS, is summarised in Table 4-4. This indicates that long-term inflow into drained tunnels is generally in the order of one litre per second per kilometre and provides a reference for deep drained elements of the Chatswood to Sydenham component. Further discussion of modelled groundwater inflows for those elements is provided in Section 4.2.1. The Sydenham to Bankstown corridor does not include equivalent deep bored tunnels or station caverns. Routine groundwater inflow is therefore expected to be localised seepage into cuttings, retaining structures, pits, service chambers, substation compounds and track drainage systems, together with temporary inflow during operational excavation or asset renewal. Such water may include a stormwater component and must not automatically be classified as groundwater. A material new or increasing seepage flow, persistent wet area, loss of drainage capacity, evidence of erosion or instability, or the need for sustained pumping must trigger inspection, source assessment, flow estimation, water-quality screening and corrective action. Where dewatering is proposed, the activity must be assessed against the legal and approval requirements in Section 3.1 before pumping commences.

Table 4-4: Measured inflows to existing Sydney tunnels

Project tunnel	Length (km)	Diameter (m)	Maximum rock cover (m)	Dominant rock type	Measured inflow (L/s/km)
Northside storage	20	6	90	Hawkesbury Sandstone	0.9
Epping to Chatswood Rail Line	13	7.2 (twin)	60	Hawkesbury Sandstone	0.9
M5 East	3.9	8 (twin)	4 to 60	Hawkesbury Sandstone	0.8

Project tunnel	Length (km)	Diameter (m)	Maximum rock cover (m)	Dominant rock type	Measured inflow (L/s/km)
Eastern Distributor	1.7	12 (double deck)	40	Hawkesbury Sandstone	1.0
MetroGrid	3.5	2	10 to 40	Narrabeen Group	0.8
Cross City Tunnel	2.1	8 (twin)	53	Hawkesbury Sandstone	<3
Lane Cove Tunnel	3.6	9 (twin)	60	Hawkesbury Sandstone	<3
SSI 8256 – Sydenham to Bankstown corridor	N/A – predominantly at-grade surface railway	N/A – no equivalent deep tunnel	N/A	Anthropogenic fill and residual soils over weathered Ashfield Shale, with local alluvial deposits near drainage lines and low-lying areas	No corridor-wide tunnel inflow rate is available. Operational inflow is localised seepage to cuttings, retaining structures, pits, service chambers and track drainage and must be established from asset-specific observations, flow estimates and maintenance records.

Source: Transport for NSW (2017), Sydney Metro City & Southwest – Sydenham to Bankstown Upgrade Environmental Impact Statement, Technical Paper 8 – Hydrology, Flooding and Water Quality. The SSI 8256 assessment does not provide a corridor-wide measured groundwater inflow rate comparable to the L/s/km tunnel data above. N/A = not applicable.

Southwest operational baseline. Because the Sydenham to Bankstown component is an existing surface railway and does not have a single corridor-wide groundwater model equivalent to the CSSI 7400 tunnel model, operational decisions must use asset-specific evidence. Relevant evidence includes SSI 8256 environmental assessment and construction records, geotechnical and contamination investigations, drainage and culvert inspections, asset condition data, observed seepage, maintenance records and any available groundwater monitoring. This information will be used to establish local baselines, identify changes from normal conditions and determine whether monitoring, maintenance, dewatering assessment, treatment, discharge controls or incident escalation is required.

4.2 Impacts and risks

4.2.1 Identified impacts

The Project is not anticipated to trigger significant impacts to groundwater due to the majority of the project elements being tanked, as detailed in Table 4-5. Tanked structures entail waterproofing membrane combined with permanent/concrete lining while drained structures do not include waterproofing and would be perpetually dewatered where sited below the water table.

As outlined in Section 3.1, the Project does not exceed the Groundwater Related Minimum Harm Criteria Assessment (NSW Office of Water, 2012).

Table 4-5: Project elements and groundwater management approach

Project element	Groundwater management approach
Rail tunnels	Tanked
Cross-passages	Tanked
Chatswood dive structure	Drained

Project element	Groundwater management approach
Marrickville dive structure	Drained
Crows Nest Station	Drained
Victoria Cross Station	Tanked
Barangaroo Station	Designed to be tanked, currently drained (see Section 4.2.1.2)
Martin Place Station	Tanked
Gadigal Station	Tanked
Central Station	Drained
Waterloo Station	Tanked
Crows Nest Station Shaft	Drained
Victoria Cross Station Shaft	Drained
Barangaroo Station Shaft	Tanked
Martin Place Station Shaft	Drained
Gadigal Station Shaft	Drained
Central Station Shaft	Drained
Waterloo Station Shaft	Tanked
Artarmon Substation	Tanked
Artarmon Substation Shaft	Drained
SSI 8256 – Sydenham to Bankstown corridor	
Marrickville, Dulwich Hill, Hurlstone Park, Canterbury, Campsie, Belmore, Lakemba, Wiley Park, Punchbowl and Bankstown stations	Predominantly at-grade structures. Manage localised shallow or perched groundwater through station drainage, pits and sumps. Inspect for abnormal seepage, persistent dampness, blocked drainage, erosion or deterioration. Any new below-ground structure must be assessed and documented as tanked or drained using its as-built design and operational requirements.
Cuttings and retaining structures	Drained surface assets unless the approved as-built design identifies a tanked component. Maintain subsoil drains, weepholes and discharge pathways; inspect for increased seepage, staining, erosion, instability, cracking or loss of drainage capacity; and investigate material changes from the asset-specific baseline.
Track formation, cess drains and subsoil drainage	Drained. Maintain free drainage and separation of groundwater seepage from contaminated or uncontrolled discharges where practicable. Inspect for persistent wet formation, fouling, ponding, blocked outlets, erosion and loss of track support. Abnormal or sustained inflow must be assessed for source, flow, water quality and required corrective action.
Culverts and drainage crossings	Drained. Maintain hydraulic capacity, structural condition and clear inlet and outlet pathways. Inspect for groundwater seepage, sediment accumulation, scour, leakage, joint defects and interaction with surface-water flows. Works that alter a culvert or drainage level must assess potential groundwater mounding, drawdown and changed discharge pathways.
Southwest substations, service compounds, pits and service chambers	Manage in accordance with the verified as-built waterproofing and drainage design. Below-ground pits and chambers may be tanked or drained. Inspect for water

Project element	Groundwater management approach
	ingress, corrosion, contamination, pump or drainage failure and loss of containment; maintain sumps, pumps and alarms where provided; and investigate any sustained pumping requirement.
Temporary maintenance excavations and dewatering	Temporary drained condition only where approved. Before pumping, assess the expected groundwater take, radius of influence, nearby users and sensitive receptors, water quality, treatment and discharge pathway, monitoring needs and statutory authorisations. Reinstate the permanent drainage or waterproofing design when work is complete.

Source: Transport for NSW (2017), Sydney Metro City & Southwest – Sydenham to Bankstown Upgrade Environmental Impact Statement, Technical Paper 8 – Hydrology, Flooding and Water Quality, read with current as-built, asset-handover, drainage, geotechnical and maintenance records. Because the SSI 8256 corridor is predominantly at grade, the tanked or drained classification must be confirmed for each below-ground asset rather than applied at corridor level.

In summary, the drained structures (Project elements) in the long term include:

- Chatswood dive structure
- Marrickville dive structure
- Crows Nest Station, and associated Crows Nest Station shaft
- Central Station and associated Central Station shaft
- Victoria Cross Station shaft (but not the Victoria Cross Station)
- Martin Place Station shaft (but not Martin Place Station)
- Gadigal Station shaft (but not Gadigal Station)
- Artarmon Substation shaft.

4.2.1.1 Groundwater levels

Changes to groundwater levels at surrounding land uses was identified during the EIS as being “limited to negligible,” as the majority of Project elements are tanked (designed to inhibit the inflow of groundwater). There is no change expected to groundwater levels associated with tanked elements.

Groundwater users in the vicinity of the Project are of sufficient distance from drained elements and therefore there are no anticipated changes in groundwater level at the water supply works (as outlined in Section 4.1.4) due to the Project. Target changes to groundwater level at surrounding land uses (as per the EIS) are shown in the table below (table 4.6 Target change to groundwater level at surrounding land uses (as per EIS).

Note that the Target change for Barangaroo Station is not currently accurate, due to the Southern Wall at the station not being waterproofed at the time of the start of operation (see Section 4.2.1.2 for more information).

Table 4-6: Target change to groundwater level at surrounding land uses (as per EIS)

Location	Design	Target change (metres)
Chatswood dive site (northern)	Piled retained wall, drained	<0.5 (residual soil), <2.0 (Ashfield Shale)
	Tunnels with segmental lining	<4.0 (assuming deep foundations), otherwise <2.0
Artarmon substation	Shaft (assumed drained)	<0.5 (residential in the vicinity)
Crows Nest Station	Drained station shaft	<1.0 (residual soil), <2.0 (Ashfield Shale and Mittagong Formation)
	Drained station	<2.0 (Mittagong Formation)
	Tunnels with segmental lining	<2.0 (Hawkesbury Sandstone)
Victoria Cross Station	Drained station shaft	<1.0 (residual soil), <4.0 (assuming deep foundations), otherwise <2.0
	Tanked station cavern	<1.0 (residual soil), <4.0 (assuming deep foundations), otherwise <2.0
	Tunnels with segmental lining	<1.0 (residual soil), <4.0 (assuming deep foundations), otherwise <2.0
Harbour crossing	Tunnels with segmental lining	N/A (no change presented since, by design, groundwater inflow must be negligible)
Barangaroo Station	Tanked station shaft	<1.0 (residual soil), <2.0 (Hawkesbury Sandstone)
	Tanked station cavern (not currently achieved)	<2.0 (residential in the vicinity)
	Tunnels with segmental lining	<2.0 (residential in the vicinity)
Martin Place Station	Drained station shaft	<1.0 (residual soil), <4.0 (assuming deep foundations), otherwise <2.0
	Tanked station cavern	<4.0 (assuming deep foundations), otherwise <2.0
	Tunnels with segmental lining	<4.0 (assuming deep foundations), otherwise <2.0
Gadigal Station	Drained station shaft	<1.0 (residual soil), <2.0 (Mittagong Formation), <40.0 (assuming deep foundations), otherwise <2.0 (Hawkesbury Sandstone)
	Tanked station cavern	<4.0 (assuming deep foundations), otherwise <2.0
	Tunnels with segmental lining	<4.0 (assuming deep foundations), otherwise <2.0
Central Station	Drained station shaft	<1.0 (residual soil), <2.0 (residential in the vicinity) (Mittagong Formation, Hawkesbury Sandstone)
	Drained station cavern	<2.0 (residential in the vicinity)
	Tunnels with segmental lining	<2.0 (residential in the vicinity)
Waterloo Station	Tanked station cavern*	<0.5 (fill / aeolian sand), <2.0 (Ashfield Shale), <2.0 (residential in the vicinity) (Hawkesbury Sandstone)
Marrickville dive site (southern)	Piled retained wall, drained	<0.5 (residual soil), <2.0 (due to stormwater channel)

* Waterloo station shaft is also tanked

4.2.1.2 Groundwater level monitoring

Based on review of construction level monitoring information, MTS does not propose groundwater monitoring during operations.

Table 4-7 provides a summary of the evidence to support no further groundwater level or quality monitoring during operations. The table focuses on the project elements that are drained, as outlined in Section 4.2.1.

References utilised in the table are listed as follows:

- PSM (2018). Sydney Metro City & Southwest – TSE, Hydrogeological Interpretive Report, Ref: SMCSWTSE-JPS-TPW-GE-RPT-110003-01, October 2018.
- TSE (2020) Annual Groundwater Monitoring Report, Project: Sydney Metro City & Southwest – TSE Works, Document No: SMCSWTSE-JCG-TPW-EM-RPT-097433, August 2020.
- AGJV (2023) Central Station Main Works Final Groundwater Monitoring report (October 2022 to May 2023), Ref: SMCSWCSM-DJV-EW-00-REP-GE-000239, August 2023.
- Lendlease (2023) Sydney Metro Martin Place Integrated Station Development Groundwater Monitoring Report January – June 2023 Rev 1, September 2023.
- AW Edwards (2024) Construction Monitoring Report April 2023-September 2023, Sydney City & Southwest Metro – Crows Nest, Ref: SMCSWSCM-AWE-SCN-EM-REP-003385, February 2024.
- Lendlease (2024) Victoria Cross Integrated Station Development Groundwater Monitoring Report July-December 2023 Rev 1, March 2024.
- CPB Contractors (2024) Construction Environmental Management Plan (CEMP) Pitt Street Integrated Station Development, Ref: SWCSWSPS-CPB-ALL-EM-PLN-000001, April 2024.
- PRA (2024) Groundwater and Vapour Intrusion Assessment Barangaroo Metro Station Development V4, ref: PRJ-000558, June 2024.

Table 4-7 Construction Groundwater Level Monitoring Summary

Item	Drained Structure	Construction Monitoring Undertaken	Groundwater Level Status at End of Construction	Comments	Outcome
1	Chatswood Dive Structure	Levels to February 2020	Above final level predicted in model (TSE, 2020).	Annual monitoring report (TSE, 2020) indicates data from February 2020 showed groundwater levels recovering above the final predicted groundwater level. Groundwater monitoring was not conducted once the Linewide contractor took over site management.	Operational level monitoring not required - groundwater levels stable and monitoring not conducted since 2020.
2	Marrickville Dive Structure	None - levels to August 2017	Unknown	The groundwater monitoring bore was destroyed in 2017 (pre-construction), and no further groundwater level monitoring was conducted near the Marrickville Dive Structure. Groundwater levels to 2017 were above the predicted drawdown (>10 m) and exhibited minor fluctuations only.	Operational level monitoring not required - groundwater levels stable pre-2017 and monitoring not conducted since that time.
3	Artarmon Substation Shaft	One manual reading (May 2020)	Unknown	The groundwater bores near Artarmon were monitored in 2017, and one manual reading was collected in 2020. Although the manual reading identified a groundwater level below the predicted drawdown, the level was similar to the 2017 monitored level. Groundwater monitoring was not conducted once the Linewide contractor took over site management.	Operational level monitoring not required – monitoring has not been conducted since 2020.
4	Gadigal Station Shaft	None - as per CEMP (CPB Contractors, 2024), levels to February 2018	Groundwater levels assumed stable based on model predictions	The groundwater model (PSM, 2018) predicted steady-state groundwater levels would be reached within 12 months after construction. Monitoring of groundwater levels was not considered necessary in the CEMP (CPB, 2024) due to no groundwater users being identified in the zone of drawdown and no high priority dependent ecosystems (limited groundwater interaction). The adits and station platform were tanked, so no groundwater was expected to enter those structures.	Operational level monitoring not required – groundwater monitoring not conducted during construction.

Item	Drained Structure	Construction Monitoring Undertaken	Groundwater Level Status at End of Construction	Comments	Outcome
				Baseline groundwater monitoring was conducted from October 2017 to February 2018, with levels remaining steady and above the predicted drawdown from construction. The bore was damaged after the February 2018 monitoring round.	
5	Martin Place Station Shaft	Levels to December 2020	Groundwater levels stable	Groundwater levels stable post construction (TSE, 2020) based on level logger readings to June 2019, and a manual gauging event in May 2020.	Operational level monitoring not required – monitoring has not been conducted since 2020
6	Victoria Cross Station Shaft	Levels to March 2021	Groundwater levels stable.	Groundwater levels stable (Lendlease, 2024), construction level monitoring discontinued after March 2021.	Operational level monitoring not required – monitoring has not been conducted since 2021
7	Central Station / Shaft	Levels and quality to end of construction (May 2023)	Groundwater levels stable, vapour intrusion risk low and acceptable based on final groundwater monitoring report (AGJV, 2023)	Groundwater levels stable, minor fluctuations in groundwater levels in the vicinity of this station attributed to rainfall recharge. Groundwater drawdown during construction did not pose geotechnical risk (AGJV, 2023),	Operational level or quality monitoring not required – monitoring not conducted since May 2023.
8	Crows Nest Station / Shaft	Levels to end of construction (February 2024)	Groundwater levels stable	Final monitoring report indicated groundwater levels not impacted by construction of the project (AW Edwards, 2024).	Operational level monitoring not required – monitoring not conducted since February 2024.



Item	Drained Structure	Construction Monitoring Undertaken	Groundwater Level Status at End of Construction	Comments	Outcome
9	Barangaroo (southern wall currently drained)	No level monitoring undertaken	Unknown	The southern wall is currently drained but will be tanked in the future when the southern entrance is built. Groundwater level monitoring was not undertaken during construction works. A vapour intrusion risk assessment was undertaken, with risk considered low and acceptable to site users (PRA, 2024).	Operational level or quality monitoring not required – groundwater levels expected to have largely recovered since construction works, and the majority of the station has been tanked.
10	Waterloo Station/Shaft	Levels to end of TSE (April 2020)	Unknown	At the end of the TSE works, groundwater levels were stable or recovering and are anticipated to have stabilised / recovered across the Waterloo well network since tanking of the structure (station and shaft).	Operational level or quality monitoring not required – groundwater levels expected to have largely recovered / stabilised since tanking of the station and shaft.

4.2.1.3 Groundwater inflows

The Project's tunnels, station boxes, shaft, and dive structures have been designed to minimise groundwater inflow.

Table 4-8 provides a breakdown of the groundwater inflow (seepage) rates for each Project element, based on the predicted operational seepage rates from the groundwater model (Pells Sullivan Meynink; PSM, 2018). The model predicted groundwater inflow rates in Table 4-8 are for a) 12 months post construction and b) once steady state groundwater conditions are achieved. Steady state time frames vary based on the water table setting and distance to recharge sources for the specific station sites.

Table 4-8: Predicted seepage rates along the Project alignment (from PSM, 2018)

Project Element)	Seepage Rate (kL/day)	
	12 months after construction	Steady-State
Marrickville dive structure	29	17
Chatswood dive structure	29	25
Waterloo~	0 (operational tanked design) 161 (drained-case model only)	0 (operational tanked design) 147 (drained-case model only)
Barangaroo		
- Station^	57	NA
- Cavern^	242	NA
Crows Nest	104	74
Pitt Street / Gadigal		
- Station Cavern*	0	0
- South Shaft	6	6
- North Shaft	7	7
Martin Place		
- Station Cavern*	0	0
- South Shaft	9	9
- North Shaft	14	13
Victoria Cross		
- Station Cavern*	0	0
- South Shaft	14	11
- North Shaft	19	18

~Waterloo Station and shaft are fully tanked for operation. The 161 kL/day (12-month) and 147 kL/day (steady-state) values are PSM model outputs for a hypothetical drained condition and are retained for traceability only; they are not included as operational seepage in the water balance. The operational design allowance is 0 kL/day, excluding abnormal leakage or a loss of waterproofing integrity.

*Tanked Project element

^Designed to be tanked, currently drained

Central Station was not included in the groundwater modelling and inflow seepage assessment (PSM, 2019). The inflow modelling for Central Station was detailed in the Hydrogeological Inflow Assessment report (Aurecon GHD Joint Venture; AGJV, 2018), with 0.1 L/s (equating to 8.64 KL/day) modelled as the lower predicted inflow rate for this station.

Barangaroo Station is intended to be fully tanked; however, the southern wall remains unwaterproofed pending completion of the southern entrance by the adjoining Aqualand development, for which no confirmed completion date is available. Until waterproofing is completed and verified, Barangaroo must be managed as a partially drained operational structure with ongoing groundwater and Harbour-influenced ingress directed to the Barangaroo WTP. The current drained condition, the associated treatment demand and the discharge pathway must remain in the operational water balance rather than being treated as a short-term construction condition.

Barangaroo interim management triggers and escalation thresholds. The following thresholds apply while the southern wall remains unwaterproofed. The operating baseline is the rolling 30-day median, excluding verified rainfall-response events, and must be established from validated flow, level and plant-operating data.

Table 4-9: Barangaroo interim management triggers and escalation thresholds

Escalation level	Trigger threshold	Required response and timeframe	Escalation
Level 1 – Alert	Any one of the following: - Daily inflow exceeds the baseline by $\geq 20\%$ for three consecutive days, or a single-day increase of $\geq 40\%$. - Sump level reaches $\geq 60\%$ of usable storage depth, pump duty exceeds 70% of available capacity for more than two hours, or treatment throughput exceeds 70% of verified capacity. - Influent quality shows a $\geq 25\%$ increase from baseline for salinity, cyanide or another WQMP indicator, while remaining within treatment capability and discharge criteria. - Minor new seepage, dampness, seal deterioration or leakage is observed without active flow or structural distress. - Aqualand advises a program or interface change that may affect access, drainage or waterproofing.	Within 24 hours: verify instrument data; inspect the southern wall, sumps, pumps and WTP; review rainfall, tide and construction/interface activities; increase operational checks to daily; and record the event in the environmental and asset systems. Return to routine status only after seven consecutive days below the Alert threshold.	WTP Operator / Site Supervisor to notify the Environment & Sustainability Lead and Infrastructure Engineering Manager within one business day.
Level 2 – Action	Any one of the following: - Daily inflow exceeds the baseline by $\geq 50\%$ for 24 hours, an Alert threshold persists for more than seven days, or the monthly water balance exceeds the adopted operational allowance by $\geq 20\%$. - Sump level reaches $\geq 75\%$ of usable storage depth, pump duty exceeds 85% of available capacity for more than one hour, treatment throughput exceeds 85% of verified capacity, or duty/standby redundancy is unavailable for more than two hours.	Immediately cease discharge where compliance cannot be assured and recirculate or contain water. Within four hours, undertake operational and environmental assessment. Within 24 hours, implement temporary containment or additional treatment, collect confirmatory samples and commence source investigation. Within two business days, issue a corrective-action plan with accountable owners and due dates and update the operational water balance.	Environment & Sustainability Lead to notify the Head of Safety, Quality, Risk & Environment, Head of Asset Management and relevant operations manager within four hours. Notify Sydney Metro and Aqualand within one business day where the interface is relevant.

Escalation level	Trigger threshold	Required response and timeframe	Escalation
	- Influent quality exceeds a WQMP investigation level; treated water reaches $\geq 80\%$ of an EPL or WQMP limit; or two consecutive results show a worsening trend. - Active leakage, a new flow path, material seal failure, cracking, movement or deterioration is confirmed. - An Aqualand delay exceeds three months against the last formally advised milestone, or interface works create a credible increase in ingress risk.		
Level 3 – Critical / Incident	Any one of the following: - Uncontrolled inflow, overtopping, flooding, loss of containment, or inflow/treatment demand at or above 100% of verified capacity. - Sump level reaches $\geq 90\%$ of usable storage depth, both duty and standby pumping are unavailable, or predicted time to overflow is less than two hours. - Actual or likely exceedance of an EPL limit, unauthorised discharge, bypass of treatment, or treated-water quality cannot be demonstrated before discharge. - Major structural defect, rapid leakage increase, failure of temporary works or seals, or a condition presenting a risk to station safety or service continuity. - Aqualand interface works cause damage, loss of access to critical controls, or an immediate threat to waterproofing or drainage integrity.	Immediate response: stop or isolate discharge where safe; activate emergency pumping, storage and incident controls; protect passengers, workers and receiving waters; deploy maintenance and engineering response; preserve monitoring records and samples; and manage the event under the PIRMP and Incident Management Framework. Regulatory notifications must be made within the timeframes prescribed by the EPL, POEO Act, planning approval and incident procedures. A formal investigation and recovery plan is required before normal discharge or operations resume.	Immediate notification to the Head and GM Safety, Quality, Risk & Environment, GM Engineering & Maintenance Delivery and the Network Operations escalation chain. Notify NSW EPA, DPHI, Sydney Metro, emergency services and Aqualand where required by the applicable incident and interface procedures.

Threshold validation: Percentage-based thresholds are interim controls and must be converted to site-specific flow rates, sump elevations, pump runtimes, storage volumes and treatment capacities using commissioned Barangaroo WTP data. Where the EPL, approved WQMP, WDIA, OEM requirements or alarm set-points impose a lower or more conservative threshold, that requirement prevails. Thresholds must be reviewed after three months of representative operation, following a material plant or interface change, and after any Level 2 or Level 3 event. The interim controls may only be retired after the southern wall

waterproofing is completed, tested and formally handed over, and a post-completion review confirms that ingress has reduced to the tanked-design expectation.

For the operational water balance, Waterloo Station and shaft are treated as fully tanked and therefore contribute no routine groundwater seepage. The 161 kL/day and 147 kL/day values in Table 4-8 represent a hypothetical drained-case model and are not operational inflows. Routine groundwater inflow is expected principally from the structures identified as drained in Table 4-5, including Crows Nest and Central Stations, associated drained shafts and the dive structures. Any sustained inflow at Waterloo would be treated as abnormal leakage and investigated as a potential loss of waterproofing integrity.

4.2.1.4 Ground movement or settlement.

As the tunnels and the majority of other Project elements are tanked, long-term settlement effects associated with groundwater drawdown has not been anticipated at most locations.

Most of the Project alignment falls within the three millimetre ground movement contour and has been considered to have a negligible ground movement risk, with superficial damage to buildings unlikely. Small areas at station sites and dive sites are within the ten millimetre contour and may require future building strain and structural assessment to address settlement related risks.

Ground movement associated with groundwater drawdown is considered to be minimal during operation, as most of the predicted ground movement has already occurred during construction.

4.2.1.5 Groundwater quality

For operation, water-quality objectives and ecological protection levels are to be selected and applied using the current online *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018, updated online), together with site-specific receiving-water information and the requirements of the applicable EPL, WDIA and WQMP. A value from ANZECC/ARMCANZ (2000), including a 90% species-protection value, is used only where it is expressly retained in an approval or regulatory instrument or has been adopted through an approved site-specific assessment.

There is a current Environment Protection Licence (EPL #21247) that manages water treated and discharged through the Marrickville WTP. Water is sourced from sumps and drained structures along the project alignment, which is pumped to the Marrickville plant through permanent stormwater infrastructure. The EPL covers frequency of monitoring, monitoring points and interim water quality levels that cannot be exceeded prior to discharge into existing stormwater infrastructure (Alexandra Canal at Tempe).

4.2.1.6 Interaction between surface water and groundwater

From the Chatswood dive site to Sydney Harbour, the Project alignment generally coincides with the topographic ridgeline. Aside from local shallow water tables within residual soils, the groundwater level with the Mittagong Formation and Hawkesbury Sandstone is expected to be encountered at depth. Therefore, other than very localised perched water interactions, no interaction between surface water and groundwater have been anticipated, as outlined in the EIS.

For the Sydney Harbour crossing, segmental lining of the metro tunnels has been designed to prevent interaction between surface water and groundwater.

Between the Sydney Harbour crossing and Central Station, the alignment is essentially north south and parallel to the topographic ridgeline after slewing eastward from Barangaroo Station to Martin Place. Interaction between surface water and groundwater has not been anticipated at Martin Place, Gadigal and Central Stations. Barangaroo Station is anticipated to have an operational Water Treatment Plant pumping groundwater into surface water bodies after the Sydney Metro consistency assessment has been completed after the beginning of first passenger services on CSW.

The Marrickville dive site is located adjacent to an existing lined stormwater channel, which is a proposed discharge location for the Marrickville Water Treatment Plant i.e. this represents an operational “interaction” between groundwater and surface water at this location.

4.2.1.7 Groundwater dependent ecosystems

No high priority groundwater dependent ecosystems have been identified in the vicinity of the Project, as per the EIS.

4.2.1.8 Cumulative groundwater impacts

As the majority of tunnels and structures are tanked to prevent groundwater ingress, limited additional effect will arise from future construction projects that may arise in the local area, except for Barangaroo Station and the current temporary Aqualand development and construction (see Section 4.2.1.2)

4.2.2 Potential operational risks

Potential operational risks associated with groundwater include:

- Minimal groundwater inflow, as the tunnels, station boxes, shafts, and dive structures are either tanked or have been designed to minimise groundwater inflow. Actual ongoing inflows are anticipated to be lower than the estimated maximum presented in the EAD and are outlined in Table 4-7.
- Ingress of contaminated water from tunnels and cross passages and un-tanked station boxes, in places due to both point and diffuse sources of contamination exterior to the alignment.
- Changes to groundwater levels and influences on surrounding groundwater users, noting further changes in groundwater levels are likely to be minor during operational phase compared to during construction and groundwater levels have already stabilised during construction (refer Section 4.2.1.2).
- Settlement or damage to the tunnel, resulting in additional groundwater inflow and drawdown.
- Potential affect to nearby buildings or other structures as a result of ground movement or settlement (ground consolidations following the drawdown of groundwater). Groundwater drawdown is expected to be minimal during operations, as most drawdown has already occurred during construction.
- Potential aquifer damming could occur where the underground infrastructure restricts groundwater flow through an aquifer, resulting in changes to groundwater levels upstream (mounding) and downstream (lowering). However, the extensive nature of the aquifer units along the Project alignment would likely only lead to very minor change over short distances (metres). Given the absence of groundwater users and interests in close proximity to the Project, it is anticipated that any associated risk is negligible.
- Spills or leaks of petroleum hydrocarbon as a result of the operation of the rolling stock.
- Impacts to surface water quality as a result of the discharge of untreated groundwater, WTP failure or unauthorised discharge.
- Risk of higher than expected levels of cyanide in groundwater being discharged off the Barangaroo site after treatment.

4.2.2.1 Operational water treatment plants

With the exception of Barangaroo Station, until it is tanked, groundwater inflow during operation will be captured along the Project alignment and pumped to the operational WTP located adjacent the Marrickville dive structure for treatment before discharge into the stormwater network. Treated water will then flow approximately 1.2 kilometres through the existing stormwater networks before out-falling into the degraded estuarine aquatic environment of Alexandra Canal at Tempe.

Discharges of treated water from the Marrickville WTP will be monitored to ensure compliance with the Project discharge criteria, in accordance with the EPL# 21247. Treated water quality will be sampled prior to controlled discharges to confirm that the EPL's discharge criteria for water quality are met.

A Water Discharge Impact Assessment (WDIA) has been prepared for the operational Water Treatment Plant for the Marrickville Water Treatment Plant, dated September 2023. The WDIA anticipates the quality of groundwater entering the tunnels and being pumped to the WTP will be altered due to dilution, attenuation and microbial activity, such that no single groundwater investigation location or series of groundwater monitoring bores is likely to give a complete picture of specific water quality likely to be received at the WTP (Environmental Earth Sciences; EES, 2023).

The Barangaroo station site was historically used for commercial-industrial purposes, with a gasworks previously located in the vicinity of the station's current location. Previous groundwater assessments to the south of the site before construction (METRON, 2021) identified primary contaminants including volatile hydrocarbons, ammonia and phenol which may volatilise into air resulting in a vapour intrusion inhalation risk that may potentially impact

station users and workers. After an audit of the site, the auditor deemed that the vapour intrusion modelling scenarios, contaminants of potential concern, adopted toxicity reference values for inhalation pathway and acceptable levels of risk as defined in the *Vapour Intrusion Assessment report* (METRON, 2021) and *Douglas Partners Validation Report* (Ramboll Australia, 2021) are reasonable and acceptable. Further details are outlined in the Besix Watpac Pty Ltd *Barangaroo Groundwater and Vapour Intrusion Assessment*.

The Barangaroo Water Treatment Plant has been designed and constructed to be operated separately to the main Marrickville WTP. For Barangaroo WTP, water discharge is into Sydney Harbour. Due to the higher-than-expected levels of cyanide identified during construction groundwater monitoring, MTS cannot use the existing Construction WDIA and WQMP for the Barangaroo WTP as they do not account for the increase in cyanide. Therefore, MTS has prepared a new Operational WDIA and WQMP for the Barangaroo WTP (dated 20 December 2024), and after the consistency assessment has been completed with Sydney Metro. The low risk of volatile hydrocarbons, ammonia and phenol will also be addressed in the WQMP and WDIA to ensure MTS monitor the risk annually to ensure levels are not increasing.

With the completion of the Barangaroo WQMP and WDIA MTS have lodged an application with the NSW EPA to incorporate the Barangaroo WTP into the current EPL. As of the 20 December 2024, MTS has taken over the operation of WTP and implement their own operators to manage the plant moving forward.

The application to vary EPL 21247 to include the Barangaroo WTP remains under EPA assessment. MTS completed the EPA-directed eight-week water sampling program and submitted the results in January 2026; the EPA confirmed that the monitoring results were satisfactory. A revised WDIA was completed in May 2026 and submitted to support the variation application. Following its review, the EPA requested a final MTS submission addressing the timing and scope of WTP modifications needed to manage elevated nitrogen concentrations; this process is expected to be completed by November 2026.

Barangaroo is not currently a licensed discharge point under EPL 21247, and no Barangaroo-specific concentration limits have yet been incorporated into the licence. Pending determination, MTS will operate the WTP under CSSI 7400 Condition E107, the approved WDIA and WQMP, and the POEO Act, using the applicable ANZECC and ANZG default guideline values, including the 95% species-protection values identified by the EPA, as interim discharge criteria. Operational controls include treatment and verification of effluent quality before discharge; monitoring of influent, treated effluent and the receiving environment for the EPA-specified analyte suite; controlled discharge only when the adopted criteria are met; recirculation, additional treatment or containment where compliance cannot be demonstrated; routine inspection and maintenance of pumps, storage, dosing and treatment systems; retention and reporting of monitoring records; and escalation under the PIRMP and Incident Management Framework for any actual or likely non-compliant or uncontrolled discharge. Once the EPA determines the variation, the licensed monitoring points, pollutant limits, sampling frequencies and reporting conditions will replace the interim criteria and be incorporated into this Plan, the WQMP and operating procedures.

Potential sources of groundwater contamination along the Project alignment which would contribute to the water quality sent to the operational WTP, as identified in the OEMP, are described in Table 4-10.

Table 4-10: Potential groundwater contamination sources (adapted from EIS)

Location	Description	Management
Barangaroo	Groundwater contamination was identified in the vicinity of Barangaroo Station as a result of the operation of a historical gasworks facility. Higher than anticipated cyanide levels have been identified in during construction, as outlined in the groundwater monitoring reports. Risk of volatile hydrocarbons, ammonia, and phenol to volatilise into air resulting in a vapour intrusion inhalation risk that may potentially impact station users and workers (noting this has not been closed out by site audit).	The Barangaroo Station site will be fully tanked to reduce groundwater ingress when the Aqualand development has been completed, and the risk of ongoing contaminated groundwater inflow is considered to be low. MTS' operational WDIA and WQMP (completed by Q4 2024) will allocate new testing levels and processes for the higher-than-expected cyanide concentrations in the groundwater. These plans will also outline groundwater monitoring (as it relates to vapour intrusion) for volatile hydrocarbons, ammonia and phenol, with cessation of monitoring if physical works occur that reduce or eliminate groundwater ingress to the station box (i.e. fully tanking the station box) to align with the

Location	Description	Management
		expectations in the Vapour Intrusion Assessment Report (METRON, 2021), thereby removing the risk of vapour intrusion.
Central Station	Groundwater contamination was identified in the vicinity of Central Station in association with the historical operation of three gasworks facilities and general railway operation.	Contamination to groundwater has been delineated and managed to support construction and therefore ongoing operation of the Project.
Waterloo Station	Groundwater contamination was identified at Waterloo Station, potentially due to historic industrial use of the site but also likely due to off-site sources and potential migration due to the elevated porosity and permeability of the nearby Botany Sands stratigraphy.	The Waterloo Station site design is fully tanked to mitigate significant groundwater ingress, and as such the risk posed by contamination is considered to be low during operation.
Marrickville Dive Site	Low-level concentrations of organic analytes in groundwater were reported in Site Audit Report (SAR), including volatile organic compounds (VOCs) of cis-1,2-dichloroethene, tetrachloroethylene (PCE) and trichloroethene (TCE), ammonia, dissolved methane, and Total Recoverable Hydrocarbons TRH (C6 - C10) (F1). VOC impact was likely associated with diffuse long-term industrial contamination in the surrounding area, including a former dry cleaner that was formally regulated by NSW EPA. Several potential sources of ammonia and methane were identified including former brick pits within the immediate and surrounding areas, and more distal sources at former landfills at Sydney Park and Tempe, as well as potentially associated with swampy soils (rich in organic matter) and possible leaks in aged sewerage infrastructure nearby to this site.	Significant groundwater contamination was not present at this site, therefore further investigation or remediation of groundwater was not required for the purposes of construction or operation.

4.3 Management measures

This section describes the overall approach to managing and mitigating risks or potential impacts associated with groundwater during operation of the Project. Management measures are outlined in

Table 4-11.

Table 4-11: Management Measures

ID	Management Measure	Timing	Responsibility	Reference or Source
GW01	Impacts on groundwater users within the draw-down radius of influence from operational activities associated with the Project will be made good.	If impact is observed, on a case-by-case basis.	Head of Safety, Quality, Risk and Environment	Environmental Performance Outcome (SPIR) OEMP
GW02	Inflowing groundwater from the tunnel and stations will be monitored, captured, and treated at the operational WTP prior to discharge.	During operation	Site Supervisor Environment & Sustainability Lead	EPL
GW03	Discharges from operational WTP will be monitored to assess compliance with the EPL discharge criteria.	During operation	Environment & Sustainability Lead	EPL and Water Discharge Permit. WDIA and WQMP for Barangaroo
GW04	The set of pumps and pipes to capture groundwater inflow into tunnels and stations for further treatment at the operational	During operation	Site Supervisor Head of Asset Management	Periodic inspection

ID	Management Measure	Timing	Responsibility	Reference or Source
	Water Treatment Plant will be monitored and maintained.			
GW05	Hazardous chemicals required for operation will be stored and managed in accordance with the <i>Work Health and Safety Regulation 2025</i> and the <i>Managing risks of hazardous chemicals in the workplace Code of Practice</i> (SafeWork NSW, December 2022), including applicable requirements for safety data sheets, labelling, placarding, manifests, emergency plans, segregation, containment and notification.	During operation	Environment & Sustainability Lead	<i>Work Health and Safety Regulation 2025</i> <i>Managing risks of hazardous chemicals in the workplace Code of Practice</i> (SafeWork NSW, December 2022) Environmental Aspects Maps Site Environmental Plan Rail Operating Manual (Hazardous Goods)
GW06	Spill kits will be available and accessible in storage areas for use in works locations if required.	During operation	Environment & Sustainability Lead	Spill Management Procedure
SCW7	Discharges from the tunnel water treatment plant would be monitored to ensure compliance with the discharge criteria determined in consultation with the NSW Environment Protection Authority.	During operation	Environment & Sustainability Lead	Groundwater Management Plan EPL WDIA and WQMP for Barangaroo

5 Monitoring and review

5.1 Monitoring requirements

Table 5-1 details monitoring actions that will be undertaken during operation associated with groundwater management.

Table 5-1: Summary of monitoring requirements associated with groundwater management

Monitoring details	Frequency	Procedure	Responsibility
Water Quality Water quality monitoring of groundwater flowing to the WTPs, and prior to WTP discharge to confirm if the EPL discharge criteria has been met. If water discharge criteria have not been met, additional sampling will be undertaken, and water will be recirculated to the WTP for further treatment.	Monthly, or as otherwise outlined in the EPL	Water Quality Monitoring Program	Environment & Sustainability Lead
Contingency Contingency groundwater monitoring will be undertaken if triggered by a significant groundwater discharge increase or	If triggered	Contingency Groundwater Monitoring and Management Procedure	Environment & Sustainability Lead

Monitoring details	Frequency	Procedure	Responsibility
seepage is identified that is significantly different to anticipated.		(to be prepared on a case-by-case basis)	

The monitoring requirements in this section incorporate the operational WDIA and WQMP for the Barangaroo WTP. These requirements must be reviewed and updated following determination of the application to vary EPL 21247 and whenever the WDIA, WQMP, treatment process, discharge criteria or monitoring program changes.

5.2 Environmental auditing

Environmental audits will be undertaken in accordance with the indicative audit schedule provided in Table 15 of the OEMP, which includes an environmental audit, a sustainability audit, and an operation performance audit. All environmental audits will be carried out in accordance with Section 8.2 of the OEMP.

5.3 Review and improvement

Review and improvement of this Plan will be undertaken in accordance with the applicable CSSI 7400 Conditions of Approval for the Chatswood to Sydenham component, the applicable SSI 8256 Conditions of Approval and REMMs for the Sydenham to Bankstown component, the Quality Management Plan and Section 9 of the OEMP. Continuous improvement will be achieved through ongoing evaluation of environmental management performance and the effectiveness of this Plan against environmental policies, objectives and targets.

5.4 Incidents

In the event of an environmental incident or unpredicted impacts relating to groundwater during operation of the Project, it is the responsibility of all personnel to report the incident or the event immediately to the Environment & Sustainability Lead and the Head of Safety, Quality, Risk & Environment.

All environmental incidents are to be reported and managed in accordance with the Pollution Incident Response Management Plan (PIRMP) and the Incident Management Framework (IMF). Incidents are classified based on the incidents severity as shown in the IMF.

All incidents will be managed and reported according to Section 7 of the OEMP.

5.5 Complaints

All groundwater related complaints will be handled in accordance with Section 4.4 of the OEMP and the Stakeholder Community Involvement Plan (SCIP).

5.6 Non-compliance, non-conformances, and corrective actions

All non-compliances, non-conformances and resulting corrective actions associated with groundwater management will be managed in accordance with Section 8.4 of the OEMP.

6 Relevant documentation

6.1 References

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Governments and Australian state and territory governments, 2018, updated online).
- Aurecon GHD Joint Venture (2018). Central Station Main Works, Hydrogeological Inflow Assessment, Ref: SMCSFCSM-LOR-SMC-GE-REP-000202, July 2018.*
- AW Edwards (2024). Sydney City & Southwest Metro – Crows Nest Station, Construction Groundwater Management Plan, Ref: SMCSWSCN-AWE-SCN-AN-PLN-0000024, January 2024.*
- Besix Watpac (2022). Barangaroo Station Water Quality Monitoring Program, Ref: SMCSWSBR-BWC-SBR-EM-PLN-000302, October 2022.*
- EES (2023). Water Discharge Impact Assessment for Operational Water Treatment Plan, Sydney Metro City and Southwest Linewide Works, Ref: 122075 Version 4, September 2023.*
- Herbert, C (1983). Sydney 1:100 000 Geological Sheet 9130, 1st edition. Geological Survey of New South Wales, Sydney.*
- John Holland (2022). Waterloo Integrated Station Development, Groundwater Management Sub Plan, Ref: SMCSWSWL-JHG-SWL-EM-PLN-000006 Rev 3, August 2022.*
- Laing O'Rourke (2023). Sydney Metro City and Southwest – Central Station Main Works Project, Construction Groundwater Management Plan (CGWMP), Rev 12, August 2023.*
- Lendlease (2023). Construction Groundwater Management Plan, Sydney Metro Martin Plan Station – Integrated Station Development, Rev 11.1, August 2023.*
- McNally, G (2009). Shale, salinity, and groundwater in Western Sydney. Australian Geomechanics.*
- MTS (2024). Operational Environmental Management Plan, Sydney Metro City & Southwest, Ref: SMCSWTS2-MTS-CSW-EM-PLN-002697, August 2024.*
- NSW Aquifer Interference Policy* (NSW Office of Water, 2012)
- NSW Groundwater Strategy* (NSW Government, 2022).
- Groundwater Toolkit for State Significant Projects* (NSW Department of Climate Change, Energy, the Environment and Water, 2025).
- Guidelines for groundwater quality protection in Australia: National Water Quality Management Strategy* (Australian Government, 2013).
- Environmental Planning and Assessment Regulation 2021* (NSW), as amended.
- Water Management (General) Regulation 2025* (NSW), as amended.
- Protection of the Environment Operations (General) Regulation 2022* (NSW), as amended.
- Work Health and Safety Regulation 2025* (NSW), as amended.
- PSM (2018). Sydney Metro City & Southwest – TSE, Hydrogeological Interpretive Report, Ref: SMCSWTSE-JPS-TPW-GE-RPT-110003-01, October 2018.*
- Managing risks of hazardous chemicals in the workplace Code of Practice* (SafeWork NSW, December 2022).
- Sydney 1:100,000 Geological Sheet 9130* (Herbert, 1983)
- Sydney Metro City & Southwest, Victoria Cross Integrated Station Development, Construction Groundwater Management Plan, Rev J, March 2024.*
- Transport for NSW (2017). Sydney Metro City & Southwest – Sydenham to Bankstown Upgrade Environmental Impact Statement, Technical Paper 8 – Hydrology, Flooding and Water Quality, August 2017.*
- Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023* (NSW Government, as amended).

A

APPENDIX

Appendix A. Document control

Appendix A1. Document information

Document Number:	SMCSWTS2-MTS-1NL-EM-PLN-002712
Version:	07
Issue Date:	13/10/2026
Network	City & Southwest

Appendix A2. Approval Record

Function	Position	Name	Signature	Date
Prepared by:	Environment & Sustainability Lead	David Wilson		14/10/2026
Reviewed by	A/Head of Safety, Quality, Risk & Environment	Vishal Singh	 Vishal Singh (14/10/2026 12:31:15 GMT+11)	14/10/2026
Approved by:	Interim General Manager, Safety, Quality, Risk & Environment	Helen Wilkinson	 Hwilkinson (14/10/2026 12:39:02 GMT+11)	14/10/2026
Approved by:	General Manager, Engineering & Maintenance Delivery	Michael Leah	 Michael Leah (16/10/2026 09:46:11 GMT+11)	16/10/2026
Approved by:	MTS Chief Executive Officer	Oliver Bratton	 Oliver Bratton (16/10/2026 10:57:11 GMT+11)	16/10/2026
Authorised by:	Contract Associate Director - M1 Metro Northwest & Bankstown Line	Peter Ifandoudas		16/10/2026
Approved by:	NRT Chief Executive Officer	Phil Dark		16/10/2026

Appendix A3. Amendment Record

Date	Rev	Amendment description	By
14/05/2024	01	Initial release.	Peter Scioscia
28/06/2024	02	Updated plan as per external consultation comments for final submission to DPHI.	Peter Scioscia

Date	Rev	Amendment description	By
28/07/2024	03	Updated plan as per DPHI's comments	Peter Scioscia
10/09/2024	04	Update plan to address DPI Water and DPHI comments	Peter Scioscia
10/11/2024	05	Update plan to address DPI Water and DPHI comments	Peter Scioscia
11/12/2024	05	Update plan to address DPI Water and DPHI comments	David Wilson
04/08/2026	06	Update Plan to address South West region and change of signatories. Updated document references. Extra content in section 3.1.	David Wilson / Peter Simcic
29/09/2026	07	Update plan to address feedback from Metro and ER (DPHI representative). - Now covers both CSSI 7400 and SSI 8256. - Updates to section 3.1. - Section 4.1 added detailed groundwater context for the ten Sydenham–Bankstown stations. - Added SSI 8256 groundwater-user entries. - Table 45 operational groundwater requirements for Southwest stations. - Table 48 update on Waterloo operational treatment. - Update to Section 4.2 for Barangaroo interim management. - Update to Section 4.2 for water-quality criteria. - Update EPA variation status in Section 4.2 for Section 4.2 – Barangaroo EPL status and discharge controls. - Changes to Section 3.4, Table 32, Tables 4.10 and 5.1. - Update to Section 5 monitoring and review. - Added references: SSI 8256 Hydrology, Flooding and Water Quality technical paper and the newer groundwater legislation, policy and guidance sources supporting the expanded Southwest, water-licensing and water-quality content.	David Wilson
13/10/2026	07	Notification in section 5.4 Incidents changed to E&S Lead.	Peter Simcic

B

APPENDIX

Appendix B. List of terms

Acronym	Definition
BS	Barangaroo Station
C&SW	City & Southwest
Development Consent	- CSSI 7400 – NSW Minister of Planning, January 2017 - MOD 1 – Victoria Cross and Artarmon Substation (determined 18 October 2017) - MOD 2 – Central Walk (determined 21 December 2017) - MOD 3 – Martin Place Metro Station (determined 22 March 2018) - MOD 4 – Sydenham Station and Metro Facility South (determined 13 December 2017) - MOD 5 – Blues Point Acoustic Shed (determined 2 November 2018) - MOD 6 – Administrative Changes (determined 21 February 2019) - MOD 7 – Administrative Changes (determined 24 June 2020) - MOD 8 – Blues Point Access Site (determined 25 November 2020) - MOD 9 – Extension to standard construction hours (determined 30 June 2022).
CoA(s)	Condition(s) of Approval
CSSI	Critical State Significant Infrastructure
DIA	Discharge Impact Assessment
DPE	NSW Department of Planning and Environmental (formerly DPIE)
DPIE	Department of Planning, Industry and Environment (new DPE)
DPI Water	NSW Department
EIS	Environmental Impact Statement
EMS	Environmental Management System
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EP&A Regulation	<i>Environmental Planning and Assessment Regulation</i>
EPA	NSW Environment Protection Authority
EPL	Environmental Protection Licence
EAD	Environmental Assessment Documentation
OGMP	Operational Groundwater Management Sub Plan
IMF	Incident Management Framework
IMS	Integrated Management System
ISCA	Infrastructure Sustainability Council of Australia
LGA	Local Government Area
MTS	Metro Trains Sydney Pty Ltd
OEMP	Operational Environmental Management Plan
OpCo / OpCo2	NRT Group

Acronym	Definition
O&M	Operation and Maintenance
PIRMP	Pollution Incident Response Management Plan
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
REMMs	Revised Environmental Mitigation Measures
SAR	Site Audit Report
SCIP	Stakeholder Community Involvement Plan
SPIR	Submissions and Preferred Infrastructure Report
SQRE	Safety, Quality, Risk and Environment
SMCSW	Sydney Metro City & Southwest
WTP	Water Treatment Plant

C

APPENDIX

Appendix C. Related documents

Note: some documents will be closely interconnected and will need to be reviewed when this one is changed. Those will be marked yes in the review column below. Others are simply related content that supplement the material in this document.

Document Number	Document Title	Review
SMCSWTS2-MTS-CSW-EM-PLN-002107	Carbon and Energy Management Plan	Yes
SMCSWLWC-SYC-DSY-EM-REP-022425	EPL 21423 Condition E4 Marrickville Water Treatment Plant Proof of Performance Monitoring Sydney Metro City & Southwest – Line-wide Works	No
NWRLOTS-NRT-ADM-EM-PRO-720473-01	Fauna Handling Procedure	Yes
SMCSWTS2-MTS-1NL-EM-PLN-002711	Flooding and Hydrology Plan	Yes
NWRLOTS-NRT-PRD-PM-PLN-000874	Flora & Fauna Management Plan	Yes
SMCSWTS2-MTS-CSW-HE-PLN-002100	Heritage Management Plan	No
SMCSWTS2-MTS-CSW-PM-PLN-002143	Human Resource Plan	No
SMCSWTS2-MTS-eCSW-PM-PLN-002145	Incident Management Plan	No
NWRLOTS-NRT-SWD-FA-POL-723353	MTS Procurement Policy	No
NWRLOTS-NRT-ADM-EM-PRO-720474-01	Noise & Vibration Monitoring Procedure	No
SMCSWTS2-MTS-CSW-EM-PLN-002106	Noise and Vibration Management Plan	Yes
SMCSWTS2-MTS-CSW-EM-PLN-002697	Operational Environmental Management Plan	Yes
SMCSWTS2-MTS-CSW-EM-PLN-002105	Operations Phase Environment and Sustainability Plan	Yes
NWRLOTS-NRT-ADM-EN-PLN-720416	Pollution Incident Response Management Plan	Yes
SMCSWTS2-MTS-CSW-PM-PLN-002156	Quality Management Plan	No
SMCSWTS2-MTS-CSW-PM-PLN-002158	Risk Management Plan	No
NWRLOTS-NRT-SWD-AM-PLN-723029	Severe Weather Conditions Response Plan	No
NWRLOTS-NRT-SWD-RS-FRW-720717	SMS Element 17: Procurement and Contract Management	No
NWRLOTS-NRT-ADM-EM-PRO-720472-01	Spill Management Procedure	Yes
SMCSWTS2-MTS-CSW-PM-PLN-002162	Stakeholder and Community Involvement Plan	No
SMCSWTS2-MTS-CSW-TF-PLN-002803	Traffic and Transport Management Plan	No
NWRLOTS-NRT-ADM-PM-PLN-721415	Training Management Plan	No
NWRLOTS-NRT-ADM-EM-PRO-720476-01	Unexpected Contaminated Finds Procedure	Yes
NWRLOTS-NRT-ADM-EM-PRO-720475-01	Unexpected Heritage Finds Procedure	No
NWRLOTS-NRT-ADM-EM-PRO-720471-01	Waste Resource Management Procedure	Yes
SMCSWTS2-MTS-SBR-EM-PLN-004532	Water Discharge Impact Assessment – Barangaroo Station	Yes
NWRLOTS-NRT-ADM-EM-PRO-720478-01	Water Quality Monitoring Program	Yes
NWRLOTS-NRT-ADM-EM-PRO-720479-01	Weed Management Procedure	Yes

D

APPENDIX

Appendix D. External Consultation Comments

Department of Climate Change, Energy, the Environment and Water



Our ref: OUT24/7684

Peter Scioscia
Metro Trains Sydney
Email: Peter.Scioscia@metrotrains-sydney.com.au

6 June 2024

Subject: Sydney Metro Chatswood to Sydenham Project (SSI 7400-PA-528) – Flooding and Hydrology Sub-Plan and Groundwater Management Sub-Plan

Dear Peter Scioscia

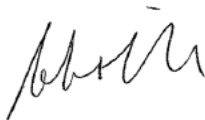
I refer to your request for advice dated 27 May 2024 to the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) Water Group about the above matter.

The NSW DCCEEW Water Group has reviewed the two sub-plans and considers the groundwater management plan requires additional information and clarification to address issues regarding monitoring and impact verification, hydrogeology conceptualisation and inflow rates. No comments are provided for the flooding and hydrology sub-plan.

Please see Attachment A for detailed comments.

Should you have any further queries in relation to this submission please do not hesitate to contact DCCEEW Water Assessments water.assessments@dpie.nsw.gov.au.

Yours sincerely



Rob Brownbill
Manager, Water Assessments, Knowledge Division
Department of Climate Change, Energy, the Environment and Water

Department of Climate Change, Energy, the Environment and Water



Attachment A

Detailed advice to Metro Trains Sydney regarding the Sydney Metro Chatswood to Sydenham (SSI-7400) – Groundwater Management Sub-Plan

1.0 Groundwater monitoring, hydrogeology and impacts

1.1 Recommendation – Prior to approval

The proponent should include groundwater monitoring at deep designed drained structures listed in the operational groundwater management plan (OGMP) for a minimum of three (3) years after operations commence.

Explanation

This recommendation was included in former Departmental responses (OUT16/25030 and OUT16/45163) submitted on review of the EIS and RTS for this project. This is still a valid recommendation and is considered a minimum requirement for ongoing validation of the impacts predicted by the initial project modelling, especially at locations where there are designed drained components to the whole project.

Ongoing and cumulative drawdown and groundwater inflow will persist indefinitely at designed drained stations and station shafts (Chatswood dive structure, Artarmon substation Shaft, Crows Nest Station, Crows Nest Station Shaft, Victoria Cross Station Shaft, Martin Place Station Shaft, Gadigal Station Shaft (formerly Pitt St Station), Central Station Shaft, Central Station cavern, Marrickville dive structure.) In addition, where there are deep adjoining basements the drawdown is predicted to be higher than the minimum impact criteria of the NSW Aquifer Interference Policy (2012).

Hence groundwater monitoring at drained structures listed in the operational groundwater management plan is recommended to be continued post construction to verify the continued modelled drawdown depths and extents are not exceeded and users not effected.

1.2 Recommendation – Prior to approval

The proponent should update the hydrogeology conceptualisation for the Ashfield shale in the background section of the OGMP to:

- align the statement regarding the quality of groundwater from Ashfield shale with accepted parameters.
- detail the potential evidential causes for any variation observed in the parameter values for the Ashfield shale groundwater quality.

Explanation

The OGMP includes the statement "Groundwater is expected to be fresh within Ashfield Shale" This is in error as it is reliably and widely recognised that "Ashfield and Bringelly shales (Late Triassic Wianamatta Group), though primarily aquitards, do include scattered zones of fracture porosity within the weathered bedrock and groundwater is generally saline,



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typically in the range of 5,000 to 50,000 mg/L" (McNally, 2009). Low salinity groundwater in the Ashfield shale would indicate an influx of fresh water – rainfall or leakage from water supply pipes, adjacent irrigation, or possible mounding from the underlying formations. Further, the Ashfield shale at those monitoring locations where there is fresher groundwater may have a more open fracture permeability or higher delamination resulting in higher through flow of fresher water.

1.3 Recommendation – Prior to approval

The proponent should update the OGMP to clarify:

- why the construction groundwater inflow rates are being used as the target for the operational phase, whilst it is described that “tunnels, station boxes, shaft and dive structures have been designed to minimise groundwater inflow” and hence lower inflow rates would be expected.
- the predicted groundwater inflow at the tanked Waterloo station.

Explanation

The inflow rates provided in the OGMP for the drained structures are the same as that presented for the construction phase of the project. However, a decrease in the operational phase inflows to the drained structures would be expected as “tunnels, station boxes, shaft and dive structures have been designed to minimise groundwater inflow” and are believed to have been presented as lower inflow rates in the technical groundwater modelling for the detailed design phase of the project. It is not clear why the construction inflow rates were included as the targeted inflow in this OGMP other than to be overly conservative. It is also noted that with the higher inflow rates presented, the predicted drawdown extent from the drained structures may extend beyond what is anticipated from the original modelling. Hence an ongoing groundwater monitoring program is recommended for a minimum of three years post construction.

The proponent states in section 4.2.1.2 of the OGMP that “Not all station boxes will contribute to the total groundwater inflow, with the Barangaroo and Waterloo station boxes being designed as tanked structures to mitigate groundwater ingress.” However, Waterloo station is included in Table 4-7 detailing the predicted groundwater inflow rates.

1.4 Recommendation – Post approval

The proponent should re-evaluate the groundwater modelling impacts against actual monitored drawdown data once three years of post-construction groundwater monitoring is obtained.

Explanation

Re-evaluation of modelled impacts against actual monitored drawdown once 3 years of post-construction groundwater monitoring is obtained will assist to verify and validate the continued drawdown depths and extents have not exceeded those modelled for the operational phase of the SydMetroC2S project. This is specifically for the designed drained structures to ensure that users have not been affected. This will also validate and verify

Department of Climate Change, Energy, the Environment and Water



predicted operational outcomes and enable a reassessment of the groundwater monitoring program.

End Attachment A

Appendix D1. Evidence of Consultation and Status

Evidence of Consultation

Actions 



Attach Evidence

Below is a list of any consultation you have initiated through the portal. Once the public authority responds it will be automatically attached as evidence. Once each of the public authorities has responded, click "Continue". Please attach any other evidence of consultation not captured by the portal by attaching it below.

Public Authority Response Summary

DPE Water [\(PAE-71324499\)](#)

Status
Closed

Due Date
Wednesday, 26 June 2024

Department of Climate Change, Energy, the Environment and Water
[\(PAE-71324502\)](#)

Status
Pending Withdrawal

Due Date
Wednesday, 26 June 2024

No response received



Appendix D2. MTS email to stakeholders to confirm closure of comments

RE: Metro Trains Sydney - Sydney Metro City Southwest Groundwater Management Plan Consultation



Peter Scioscia

To  'water.assessments@dpie.nsw.gov.au';  Patricia Borges

  Reply  Reply All  Forward  

Mon 24/06/2024 4:24 PM

 SMCSWTS2-MTS-1NL-EM-PLN-002712 - Groundwater Management Plan.pdf 1 MB ▾

Hi,

Please see attached for our updated Groundwater Management Plan with your comments considered (See section 2).

If we could ask that you review the plan and get back to us by COB Wednesday the 26th of June with any further comments you may have, or your written approval that we have addressed your concerns.

Thanks very much for taking the time to review the plan.

Regards,

Peter Scioscia
Environment and Sustainability Advisor
Metro Trains Sydney
47 Tallawong Road
Tallawong NSW 2762
PO Box 3839
Rouse Hill Village 2155
M: 0492 233 352
E: Peter.Scioscia@metrotrains-sydney.com.au



Appendix D3. DCCEEWS email confirming their acknowledgement of MTS' commitment to closing out their comments

RE: Metro Trains Sydney - Sydney Metro City Southwest Groundwa...



DPIE Water Assessments Ma

To  Peter Scioscia

Cc  DPIE Water Assessments Mailbox



Mon 10:00 AM

 You forwarded this message on 12/08/2024 10:20 AM.

Hi Peter,

Thankyou for your email and final version of the Groundwater Management Plan. DCCEEWS Water is supportive of the commitment to create and implement the Groundwater Monitoring Program in Q3 2024. Regarding the commencement of first passenger services, DCCEEWS Water has no comment and suggests DPHI Planning be consulted.

Regards

Tim

Tim Baker

Senior Project Officer

Water Assessments

Department of Climate Change, Energy, the Environment and Water

RE: Metro Trains Sydney - Sydney Metro City Southwest Groundwater Management Plan Comments Review



Tim Baker <tim.baker@dpie.nsw.gov.au>
To:  David Wilson

  Reply  Reply All  Forward  

Wed 27/11/2024 11:49 AM

 You replied to this message on 27/11/2024 11:50 AM.

Hi David,

Thanks for providing the updated document. The change is satisfactory and DCCEEW Water have no further comments.

Regards
Tim

Tim Baker
Senior Project Officer
Water Assessments
[Department of Climate Change, Energy, the Environment and Water](#)

From: David Wilson <david.wilson@metrotrains-sydney.com.au>
Sent: Wednesday, 27 November 2024 11:40 AM
To: Tim Baker <tim.baker@dpie.nsw.gov.au>
Subject: FW: Metro Trains Sydney - Sydney Metro City Southwest Groundwater Management Plan Comments Review
Importance: High

Good morning, Tim

Please can you review the attached tracked changes that incorporates Waterloo Station , and advise if this will allow this document to be finalised,

Many thanks

David Wilson
Environmental & Sustainability Advisor
Metro Trains Sydney
47 Tallawong Road
Rouse Hill NSW 2155

M : 0448 113 709
T : (02) 9854 4595
E : david.wilson@metrotrains-sydney.com.au



SMCSWTS2-MTS-1NL-EM-PLN-002712 - Groundwater Management Plan rev07

Final Audit Report

2026-10-16

Created:	2026-10-13
By:	Sarah Murray (sarah.murray@metrotrains-sydney.com.au)
Status:	Signed
Transaction ID:	CBJCHBCAABAAbylhYfola0qvcTYnePVM91wjzpQQZpZ0

"SMCSWTS2-MTS-1NL-EM-PLN-002712 - Groundwater Management Plan rev07" History

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-  Document emailed to David Wilson (david.wilson@metrotrains-sydney.com.au) for signature
2026-10-13 - 23:14:51 GMT
-  Email viewed by David Wilson (david.wilson@metrotrains-sydney.com.au)
2026-10-13 - 23:36:53 GMT
-  Document e-signed by David Wilson (david.wilson@metrotrains-sydney.com.au)
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-  Document emailed to Vishal Singh (vishal.singh@metrotrains-sydney.com.au) for signature
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-  Email viewed by helen.wilkinson@metrotrains-sydney.com.au
2026-10-14 - 01:38:24 GMT
-  Signer helen.wilkinson@metrotrains-sydney.com.au entered name at signing as Hwilkinson
2026-10-14 - 01:39:00 GMT

-  Document e-signed by Hwilkinson (helen.wilkinson@metrotrains-sydney.com.au)
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-  Document emailed to Michael Leah (michael.leah@metrotrains-sydney.com.au) for signature
2026-10-14 - 01:39:05 GMT
-  Email viewed by Michael Leah (michael.leah@metrotrains-sydney.com.au)
2026-10-15 - 22:45:41 GMT
-  Document e-signed by Michael Leah (michael.leah@metrotrains-sydney.com.au)
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-  Email viewed by oliver.bratton@metrotrains-sydney.com.au
2026-10-15 - 23:56:15 GMT
-  Signer oliver.bratton@metrotrains-sydney.com.au entered name at signing as Oliver Bratton
2026-10-15 - 23:57:09 GMT
-  Document e-signed by Oliver Bratton (oliver.bratton@metrotrains-sydney.com.au)
Signature Date: 2026-10-15 - 23:57:11 GMT - Time Source: server - Signature appearance selected: TYPE
-  Document emailed to Peter Ifandoudas (peter.ifandoudas@nrt.com.au) for signature
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