

Water Reuse Strategy

Sydney Metro Western Sydney Airport Station Boxes and Tunnelling Works

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Table of contents

Part A: Overview	4
1. Introduction	4
1.1. Purpose and application	4
1.2. Project description	4
1.3. Scope	6
1.4. Project requirements.....	6
1.4.1. General and Particular Specifications	6
1.4.2. Particular Specification	7
1.4.3. Project Environmental Protection Licence.....	8
1.4.4. Infrastructure Sustainability targets	8
1.5. Objectives and targets	8
1.6. Plan Structure	9
1.6.1. Interactions with other Project Plans	9
2. Project Water Sources	10
3. Consideration to suitability	11
4. Evaluation and selection of preferred water options	12
4.1. Mains supply potable water.....	12
4.2. Surface water capture.....	12
4.3. Rainwater harvesting	12
4.4. Treated tunnel water.....	13
4.5. Recirculation of production water	13
5. Measuring and Reporting.....	15
6. Evaluation and improvement.....	16
6.1. Availability Review and update of the Strategy.....	16
6.1.1. Strategy Availability	16
6.1.2. Review and update of the Strategy	16

Table of tables

Table 1: CoA E102 requirements	6
Table 2: General specification related to water consumption	6
Table 3: Particular specification water consumption related requirements	7
Table 5: Indicative IS targets.....	8
Table 6: Project Plan Interfacing	9
Table 7: Consideration to suitability.....	11
Table 8: Estimated rainwater harvest quantities for construction.....	12
Table 9: Estimated treated tunnel water quantities for dust suppression	13



Table of figures

Figure 1: Overview of the Project	5
Figure 2: Water Use and Sourcing Hierarchy	10



Definitions

BAU	Business as Usual
CEMP	Construction Environmental Management Plan
CoA	Condition of approval
CPB	CPB Contractors Pty Ltd
EMS	Environmental Management System
ER	Environmental Representative
EP&A Act	Environmental Planning and Assessment Act 1979
IC	Independent Certifier
ISCA	Infrastructure Sustainability Council of Australia
IS Rating	Infrastructure Sustainability Rating
ISP	Independent Sustainability Professional
MCA	Multi Criteria Analysis
SDG	United Nations Sustainable Development Goals
SMS	CPB Contractors Sustainability Management System
LGA	Local Government Area
Project	Sydney Metro Western Sydney Airport
REMM	Revised Environmental Mitigation Measure
SBT Works	Station Boxes and Tunnelling Works
TBM	Tunnel boring machine
WSI	Western Sydney International



Part A: Overview

1. Introduction

1.1. Purpose and application

The purpose of this Water Reuse Strategy is to describe how the CPB Contractors Ghella Joint Venture (CPBG JV) will consider and apply the sustainable water use practices during the delivery of the Station Boxes and Tunnelling Works (SBT Works) of the Sydney Metro Western Sydney Airport (the Project) within NSW.

In doing so, this Strategy addresses the relevant requirements of the Project Planning Approval, applicable legislation, and contractual requirements, including the Project Deed and Specifications.

1.2. Project description

The Project forms part of the broader Sydney Metro network. It involves the construction and operation of a new 23km new metro rail line that extends from the existing Sydney Trains suburban T1 Western Line (at St Marys) in the north and the Aerotropolis (at Bringelly) in the south. The alignment includes tunnels and civil structures, including a viaduct, bridges, and surface and open-cut troughs between the two tunnel sections (Figure 1).

The Project will be delivered through several works packages including the Station Boxes and Tunnelling Works (SBT Works), which includes the design and construction of:

- Two sections of twin tunnels with a total combined length of approximately 9.8km, plus associated portal structures, one from Orchard Hills to St Marys and the other under Western Sydney International (WSI) airport to the new Aerotropolis Station in New South Wales (NSW).
- Excavations at either end to enable trains to turn back and stub tunnels to enable future extensions.
- Station box excavations with temporary ground support for four stations at St Marys, Orchard Hills, Airport Terminal and Aerotropolis.
- Excavations for two intermediate service facilities, one in each of the tunnel sections at Claremont and Bringelly.



**SYDNEY METRO - WESTERN SYDNEY AIRPORT
STATION BOXES AND TUNNELLING WORKS**

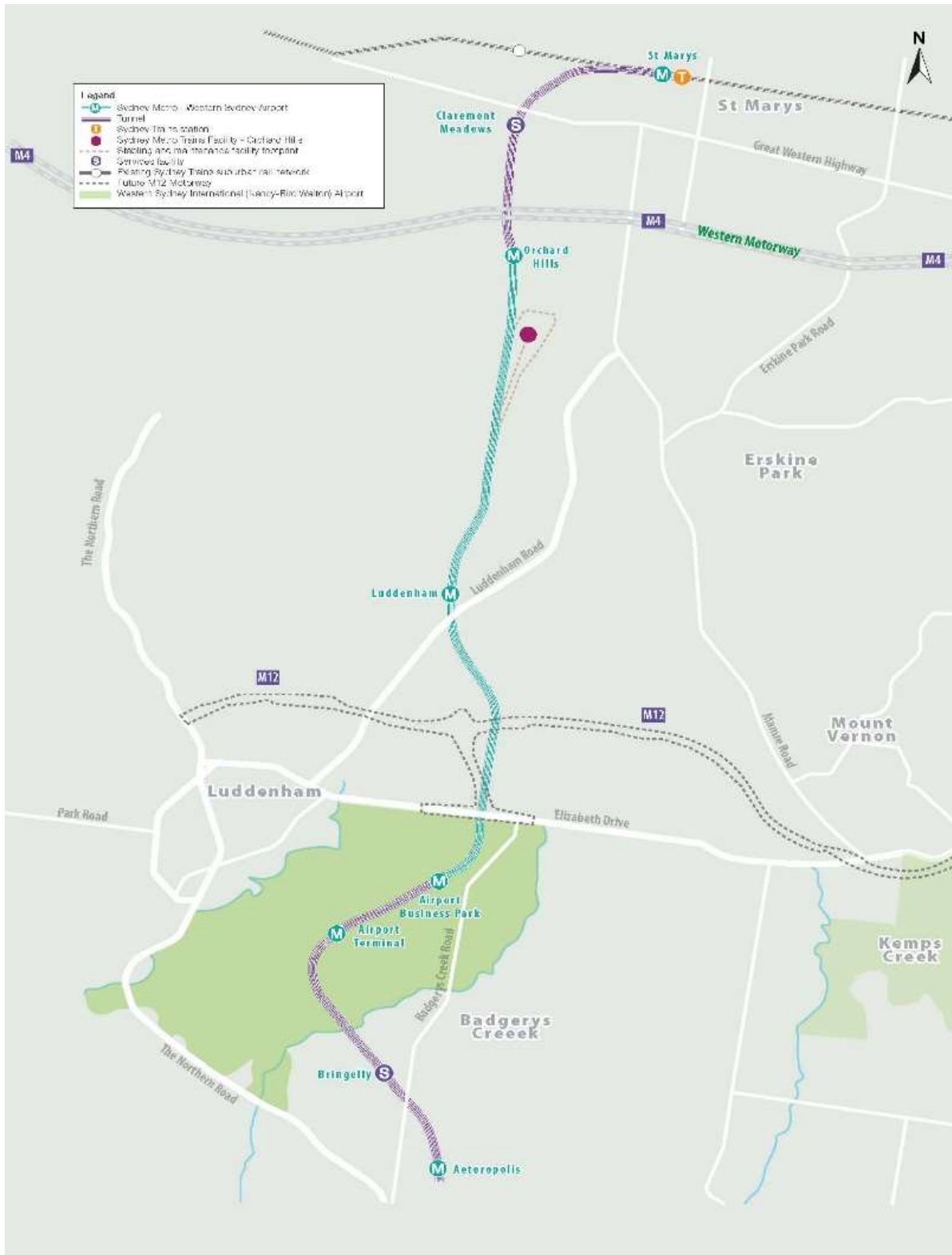


Figure 1: Overview of the Project



1.3. Scope

This Strategy addresses the water use requirements and re-use options for the construction and operation phases of the Station Boxes and Tunnelling Works.

This Strategy addresses and details the following issues:

- Water use requirements for surface and tunnelling works;
- Water minimisation strategies to reduce water consumption; and
- Non-Potable water use, including:
 - Rainwater collection, management and discharge during surface works construction and operation activities,
 - Groundwater management throughout the tunnelling works.

This Strategy does not consider the following:

- Treatment and re-use of sewerage
- Treatment and re-use of leachate 'contaminated groundwater.'

1.4. Project requirements

A Water Reuse Strategy is required by the *CSSI 10051 CoA E102*. A description of the requirement of the Condition of Approval (CoA) is provided in Table 1.

Table 1: CoA E102 requirements

Requirement	Reference
A Water Reuse Strategy must be prepared, which sets out options for the reuse of collected stormwater and groundwater during construction and operation. The Water Reuse Strategy must include, but not be limited to:	This Document
(a) evaluation of reuse options;	Section 2
(b) details of the preferred reuse option(s), including volumes of water to be reused, proposed reuse locations and/or activities, proposed treatment (if required), and any additional licences or approvals that may be required;	Section 4
(c) measures to avoid misuse of recycled water as potable water;	Section 3
(d) consideration of the public health risks from water recycling; and	Section 3
(e) time frame for the implementation of the preferred reuse option(s).	Section 4
The Water Reuse Strategy must be prepared based on best practice and advice sought from relevant agencies, as required. The Strategy must be applied during construction.	Section 1.7
Justification must be provided to the Planning Secretary if it is concluded that no reuse options prevail.	N/A
A copy of the Water Reuse Strategy must be made publicly available.	Section 1.7

1.4.1. General and Particular Specifications

The General and Particular Specification contains the project-specific requirements related to sustainable water consumption and are outlined in Table 2 below.

Table 2: General specification related to water consumption



Requirement	Reference
2.8.1 General	This Strategy
(a) The SBT Contractor must ensure that sustainability is addressed throughout the performance of the SBT Contractor's Activities and that sustainability is embedded into the design and construction of the Project Works.	
(b) The SBT Contractor must meet the following sustainability targets:	N/A
(iv) ensure a minimum of 50% of water used in the performance of the SBT Contractor's Activities is sourced from non-potable sources	Section 4
2.8.2 (d) In achieving the "design" rating, the SBT Contractor must, as a minimum, achieve the following levels using the ISCA IS rating tool version 1.2	Section 4
(iv) Level 1.5 for credit Wat-2 'Replace potable water', demonstrating that at least 50% of water used is from non-potable sources;	
2.8.2 (f) In achieving the "as built" rating, the SBT Contractor must, as a minimum, achieve the following levels using the ISCA IS Rating Scheme version 1.2:	Section 4
(iv) Level 1.5 for credit Wat-2 'Replace potable water', demonstrating that at least 50% of water used is from non-potable sources;	

1.4.2. Particular Specification

The Particular Specification contains the project-specific targets related to sustainable water consumption and are outlined in Table 3 below.

Table 3: Particular specification water consumption related requirements

Requirement	Reference
3.4.5.2 Water Sensitive Urban Design	-
(a) The SBT Contractor must adopt an integrated approach to urban water cycle management and design to minimise construction phase impacts on stormwater quality. This includes consideration of stormwater management within site facilities. [SM-WSA-SBT-PS-671]	Sections 3, 4.2 & 4.3
(b) The SBT Contractor's integrated approach must achieve: [SM-WSA-SBT-PS-672]	-
(i) a reduction in potable water demand through: [SM-WSA-SBT-PS-673]	-
A. the use of rainwater or greywater where a reticulated reuse system is not available; and [SM-WSA-SBT-PS-674]	Sections 3 & 4.3
(ii) a reduction in wastewater generation; [SM-WSA-SBT-PS-676]	Sections 3 & 4.4
(iii) stormwater quality targets which are suitable for either reuse or discharge into local streams and waterways; [SM-WSA-SBT-PS-677]	Section 1.4.3
(iv) a maximum use of stormwater in the urban landscape; and [SM-WSA-SBT-PS-2841]	Sections 3, 4.2 & 4.3
(v) the water quality targets identified in section 3.4.5.3 (Stormwater Quality). [SM-WSA-SBT-PS-2842]	Section 1.4.3
3.4.4.1 (d) The SBT Contractor must not use potable water as a substitute for non-potable water where on-site or local sources of non-potable water are suitable for the SBT Contractor's Activities and are available.	Section 4



<p>3.4.4.1 (g) The SBT Contractor must meter the water supplied for the SBT Contractor's Activities from both recycled water networks and potable sources in order to report against the targets set out in the General Specification and in the Particular Specification.</p>	<p>Section 5</p>
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1.4.3. Project Environmental Protection Licence

CPBG will obtain an Environmental Protection Licence (EPL), which will prescribe water discharge requirements. Discharge will be carried out in accordance with approvals under the EPL or Trade Waste Agreement with Sydney Water. During Stage 1 Preliminary Construction, refer to the Water Reuse and Discharge Management Procedure (SMWSASBT-CPG-SWD-SW000-WA-PRO-000003) for further information regarding water discharge measures. This Strategy will be updated to include any relevant details associated with the EPL or any Trade Waste Agreement.

1.4.4. Infrastructure Sustainability targets

CPBG is required to achieve a leading IS Rating. CPBG is utilising Infrastructure Sustainability (IS) Rating v1.2, including Wat-2 credits relating to water management, detailed in Table 3.

Table 4, shows the IS Rating credits related to water reuse.

Table 4: Indicative IS targets

Requirement	Required Level	Reference
Wat-2 Replace Potable Water	Level 1.5: (Equivalent to 50% non-potable replacement)	Section 4

1.5. Objectives and targets

CPBG has a sustainability objective to maximise efficiencies to reduce our footprint in relation to water. The Strategy we will adopt to support sustainable consumption of water during delivery and operations of the Project is based on the following four principles:

1. Understand the project water demand, including identification aspects with high demand;
2. Reduce the volume of water required during project delivery and operations, to the greatest extent practicable;
3. Replace potable water with sustainable non-potable sources, where feasible; and
4. Monitor and measure water consumption during project delivery.

This approach will ensure a holistic approach to water management and best practice environment and sustainability outcomes.

CPBG water targets based on the General and Particular Specifications and are outlined in Table 2 and Table 3.



1.6. Strategy Structure

This strategy structure is detailed below.

Part A: Overview	<ul style="list-style-type: none"> Introduction Project water sources Consideration to suitability Evaluation and selection of preferred water re-use options Measuring and Reporting Evaluation and improvement
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1.6.1. Interactions with other Project Plans

This Strategy is part of an integrated set of Project documents. Table 5 below outlines key sustainability items/content addressed within other relevant Plans.

Table 5: Project Plan Interfacing

Management Plan	Sustainability items/content addressed
Construction Environmental Management Plan (SMWSASBT-CPG-1NL-EV-PLN-000002)	Sets out governance, monitoring, reporting, auditing and corrective action processes applicable to sustainability and environment management practices in relation to water management
Sustainability Management Plan (SMWSASBT-CPG-1NL-EV-PLN-000001)	Sets of governance, monitoring, reporting, auditing and corrective action processes applicable to sustainability Identifies water minimisation measures
Soil and Water CEMP Sub-plan (SMWSASBT-CPG-1NL-NL000-WA-PLN-000002)	Details strategies to be applied to minimise water usage and manage groundwater resources during the WSA SBT Works
Construction Waste and Recycling Management Plan SMWSASBT-CPG-1NL-NL000-WM-PLN-000001	Details strategies to be applied to minimise and manage waste during the WSA SBT Works



2. Project Water Sources

Over the course of the project, a number of water sources will be utilised. CPBG will adopt the water use and sourcing hierarchy illustrated in Figure 2 during the construction and operation of the project.

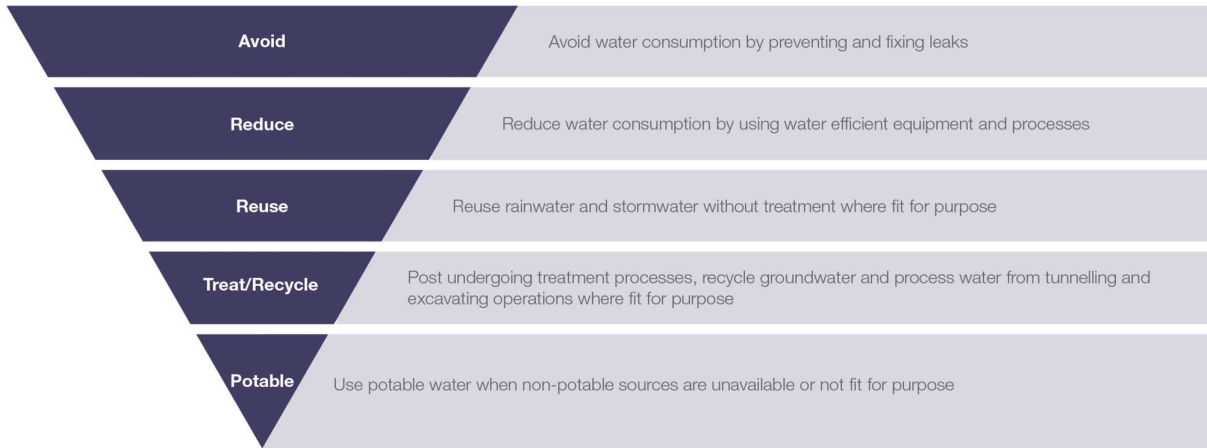


Figure 2: Water Use and Sourcing Hierarchy

There is a range of water sources available during the construction phases, including:

- Connection to mains supply (potable water);
- Captured surface water;
- Rainwater harvest;
- Onsite construction water treatment and re-use;
- Treated groundwater; and
- Recycled Water;



3. Consideration to suitability

All water sources will be evaluated for suitability. The use of non-potable water will be prioritised over the use of potable where suitable quality and supply is available and practical. CPBG notes the following considerations for water re-use suitability. The table below (Table 6) highlights the consideration and measure to deem a water source suitable within the evaluation process.

Table 6: Consideration to suitability

Health and safety (Project)	<p>Personnel contact with bacteria during reuse of partially treated grey water.</p> <p>Personnel contact with contaminants including chlorinated hydrocarbons during reuse</p> <p>Personnel consuming recycled water due to poor identification of recycled water lines</p>	<p>Adequate treatment including disinfection/chlorination and carbon filtration of treated water</p> <p>Clear labelling and colour coding of recycled water lines.</p> <p>Separate potable water and recycled water lines to work areas</p>	<p>Regular sampling and analysis of recycled water to determine compliance with Australian guideline for recycled water.</p> <p>Where appropriate a risk assessment will be conducted</p>
Specification	<p>Recycled water does not meet required quality standards to meet construction specifications e.g. earthworks, concrete batching.</p>	<p>Initial and ongoing laboratory analysis of recycled water to determine suitability for reuse.</p>	<p>Limits detailed in relevant specification.</p>
Demand and reliability	<p>Water demand (quantities of water) and reliability (constant supply and quality of water) from source is not able to be met for the proposed water use.</p>	<p>Detailed water balance study to be developed prior to commencing reuse of non-potable water</p>	
Financial feasibility	<p>The economics of the proposed water source is not viable due to initial capital costs or ongoing operations costs.</p>	<p>Detailed cost estimates during procurement to include capital costs including additional equipment used for treatment and reticulation of treated water. Ongoing operating costs including chemicals and laboratory analysis to be assessed. Cost benefit analysis to be completed</p>	
Environmental	<p>Use of recycled water containing elevated levels of salinity or other contaminants result in impact on soils, groundwater, vegetation, or surface waters</p>	<p>Treatment of water prior to reuse</p> <p>Completion of a risk assessment to determine maximum salinity levels for recycled water reuse</p> <p>Ongoing analysis of recycled water to meet environment requirements</p>	<p>To be confirmed following risk assessment</p>



4. Evaluation and selection of preferred water options

CPBG completed an evaluation for water re-use opportunities during the tender phase of the Project. The use of non-potable water will be prioritised over the use of potable water on all sites where suitable quality and quantity is available.

The sub-sections below highlight the evaluation process in determining a preferred water source, including non-potable water. Water consumption estimates are calculated in the Project's Water Balance Study and will be updated as detailed design progresses. The supply of non-potable water will be dependent on rainfall, groundwater inflow, construction activities, water quality and availability of storage at each site.

4.1. Mains supply potable water

All construction sites will have access to potable water supplies through metered connections to the Sydney Water network or other arrangements involving water tanks onsite. During construction, potable water will supply the site offices and amenities and be used to supplement non-potable water supplies as needed. Potable water will be used where manufacturers or technical specifications require or concerns related to health and safety considerations.

4.2. Surface water capture

The WSA SBT Project will construct sediment basins onsite which enable capture and re-use of surface water. Water will be re-used where appropriate for dust suppression, washdown water or for earthworks compaction.

4.3. Rainwater harvesting

Rainwater has been identified as a potential source of non-potable water. Rainwater can be harvested from site and acoustic sheds.

Consistent water quality measures from rainwater are not possible to achieve, and therefore compliance with water quality parameters is difficult to achieve. Consequently, rainwater harvest is deemed unsuitable for activities requiring a technical specification, i.e. grout production.

Table 7 estimates quantities of water demand and estimated rainwater capture. This was based on the estimated roof area and calculated using local BOM weather station data. Opportunities to harvest water from crib sheds will be investigated and discussed during procurement of site sheds.

Table 7: Estimated rainwater harvest quantities for construction

Orchard Hills	746	0.27	30

Further feasibility and practicality of rainwater harvest will be completed on a site-by-site basis, taking into account:

- positioning of tanks and required infrastructure, in relation to potential water demand;
- potential contaminants, such as faecal coliform from wildlife; and
- cost-benefit analysis.

¹ Based on summer capacity and 4mm Morton evaporation rates

² Calculated from daily average rainfall volume derived from BOM average annual rainfall



4.4. Treated tunnel water

Treated tunnel water describes all water that will enter the tunnel from the water table during tunnel excavation and construction. Once tunnelling commences, the groundwater and any residual construction water will be combined, pumped to the surface as one stream and processed within the construction Water Treatment Plants (WTP).

CPBG intends to use commercially available sodium hypochlorite solutions to treat water. All WTPs will allow for water recycling and re-use for suitable activities on a case by case assessment. WTPs will be installed during site establishment and will require commissioning prior to operation.

Feedback and lessons learnt from previous projects suggest that treated water may not be suitable for wheel wash systems as water has higher hardness/mineral content in the water, can cause damage to plants and trucks. It is expected the groundwater captured and treated during the works will have high salinity, and therefore is unsuitable for reuse. At the time of drafting the first revision of the strategy reuse opportunities for treated groundwater was being investigated in consultation with WTP designers, EPA and Sydney Water. As noted above any opportunities for reuse will be incorporated into subsequent revisions of the strategy.

CPBG has identified this water source as a potential non-potable water source. Potential activities which could utilise treated tunnel water include surface dust suppression on haul roads and work areas.

For public health and safety considerations, for water to be deemed suitable, water must have no potential to leave the premises.

Table 8 estimates quantities of water demand and estimated treated tunnel water.

Table 8: Estimated treated tunnel water quantities for dust suppression

St Marys	125	23.9	5
Claremont Meadows	66	22.4	14
Orchard Hills	746	463	16
Airport Dive	502	51.2	10
Airport Terminal Station	394	466	8
Bringelly	81	26.9	18
Aerotropolis	279	31	16

4.5. Recirculation of production water

CPBG is investigating the opportunity to recirculate production water within plant, in particular within the Tunnel Boring Machines. The primary feasibility will be dependent on the related to manufacturers or technical specifications.

³ Based on summer capacity and 4mm Morton evaporation rates



4.6. Recycled Water

CPBG has been made aware of the opportunity to access recycled water from Sydney Water through a recycled water tanker filling station at Penrith Sewerage Treatment Plant. Water would be supplied as a 12 month pilot which can be extended. Prices, flow rates and operations have been provided.

Water suitability is limited to dust suppression (as per Sydney Water Agreement). CPBG is expecting treated water would be used for this water demand. Water consumption will be monitored, should the demand increase, recycled water may be reconsidered.



5. Measuring and Reporting

Measuring and reporting will be undertaken as detailed in Section 10.3 of the Sustainability Management Plan (SMWSASBT-CPG-1NL-NL000-EV-PLN-000001).



6. Evaluation and improvement

This strategy will be reviewed annually or as required to incorporate water reuse initiatives and assessments. Audits, inspections, and reviews will be undertaken as detailed in Section 8 of the Sustainability Management Plan (SMWSASBT-CPG-1NL-NL000-EV-PLN-000001).

6.1. Availability Review and update of the Strategy

6.1.1. Strategy Availability

A copy of this strategy will be available on the Project website.

6.1.2. Review and update of the Strategy

As noted above the strategy has been developed to address regulatory and contract requirements with the first revision of the strategy developed prior to the commencement of construction.

At the time of publishing the initial Strategy CPBG were consulting with the EPA and Sydney Water to identify any opportunities and potential limitations to water reuse. Future revisions of the Strategy will provide details of the outcome of ongoing consultation.

The strategy will be regularly reviewed and updated to address changes to water reuse identified during design of temporary works, site establishment and throughout construction. Detailed water balance assessments will be provided in the sustainability design reports. As also noted above each revision of the Strategy will be publicly available on the project website.

