APPENDIX B5

Construction Water

BORDER TO GOWRIE REVISED DRAFT ENVIRONMENTAL IMPACT STATEMENT

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1 Construction water

This document outlines relevant information related to construction water for the Border to Gowrie revised draft Environmental Impact Statement (EIS).

1.1 Estimated water volumes

Significant volumes of water will be required for various activities associated with construction of the Project, including for earthworks, track works, concrete production, revegetation and the operation of non-resident workforce accommodations. The following sections provide a discussion on the estimated water demand for each of these purposes. Actual water usages may vary, dependent on earthworks and revegetation quantities, following detailed design, climatic conditions and construction methodologies.

1.1.1 Earthworks

The greatest water demand for the Project will be for civil earthworks, which predominately includes conditioning of fill material, haul road and laydown pad maintenance, and dust suppression.

The rates of water application for earthworks activities have been adopted based on the rates used during earthworks for a recent transport infrastructure project in the region, and are as follows:

- Material conditioning is expected to require approximately 100 L/m^3 (litres per cubic metre) of fill; however, this is variable, dependent on material properties
- General dust suppression during rail and road formation works; an allowance of 50 L/m^3 of fill has been made
- Maintenance of rail and road embankment. An allowance of 40 L/m^3 of fill has been made.

Based on these rates of application and the volume of fill required for the revised reference design, a total of 2,390 ML of water is estimated to be required for road and rail civil earthworks over the four-year construction period. Estimated water volumes for each earthworks activity are presented in Table 1-1, with volumes presented by time period and chainage range in Table 1-3 and Table 1-5; noting fill and water volumes for civil earthworks will be confirmed during the detail design process.

TABLE 1-1 TOTAL PROJECT WATER REQUIREMENT FOR CIVIL EARTHWORKS

Water usage	Total water volume (ML)[1]
Material conditioning	1,260
Dust suppression and revegetation[1]	630
Maintenance of rail embankment	500

Table note:
1. Volumes rounded to the nearest 10 ML

1.1.2 Track works

Water is required during track works for dust suppression during ballast dropping and tamping. Based on previous rail project experiences, a conservative allowance of 6 L per track metre has been assumed for dust suppression during ballast dropping and 4 L per track metre for dust suppression during tamping and regulating activities. For 217.48 km of rail alignment, 2.2 ML of water is expected to be required for dust suppression during track works. Water volumes for each track works activity are presented in Table 1-2. A breakdown of this total volume by time period and chainage range is presented in Table 1-3.

TABLE 1-2 TOTAL PROJECT WATER REQUIREMENT FOR TRACK WORKS

Water usage	Total water volume (ML)[1]
Dust suppression (ballast dropping)	1.3
Dust suppression (tamping/track works)	0.9
Total volume for track works:	**2.2**

Table note:
1. Volumes rounded to the nearest 0.1 ML

1.1.3 Revegetation

Water will be required for ground preparation and for establishment of vegetation during reinstatement and rehabilitation of the Project footprint. During the establishment period, watering will:

- Be 'misted' or conducted in a manner that does not cause damage, run-off or subsequent erosion or displacement of treated areas
- Not spray onto, flow across or pond on paved areas including roadways
- Be in general accordance with the watering schedule and rates presented in Table 1-3, which are based on those adopted by DTMR in Technical Specification MRTS16: Landscape and Revegetation Works.

Watering must be applied in sufficient quantities and regularity to ensure:

- Soil moisture is established and maintained
- Germination of seedling occurs
- Emergence and establishment of seedlings
- Maintain and encourage deep rooting.

The recommended watering schedule and rate for hydromulch, as the median value, has been adopted for the purpose of estimating water requirements for revegetation (Table 1-3), which equates to 24 applications of water at a rate of 7.7 L/m^2 over a five-week period, for a total of 185 L/m^2.

TABLE 1-3 CONSTRUCTION WATER REQUIREMENTS FOR TRACK WORK LANDSCAPE AND REVEGETATION ACTIVITIES

Vegetation treatment	Percentage of recommended watering rate[2]	Frequency of watering days (excluding Sundays and public holidays)		
		Week 1-3	Week 4-5	Remainder of establishment period
Seeding[1]	100%	Daily	Every second day	As required to meet the completion criteria
Hydromulch	75%	Daily	Every second day	
Organic blanket	50%	Daily	Every second day	
Turfing	75%	Daily	Every second day	
Planting	100%	Every second day		

Recommended monthly and average watering rates for SE Queensland districts[3] (L/m^2)[4,5]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
14	14	11	11	9	9	9	9	11	13	15	14	10.2

Table notes:
L/m^2 = Litres per square metres
1. Includes drill seeding and broadcast seeding.
2. Regular checks of soil moisture shall be undertaken to determine if watering rates require adjustment due to site, soil or seasonal conditions.
3. As recognised by DTMR, includes Darling Downs
4. Based on average daily pan evaporation rates + 5 L to ensure water moisture is maintained consistent in the soil. The additional daily 5 L/m^2 accounts for inefficiencies in the watering process.
5. Watering rates or frequency should be increased during periods of wind, drought and/or where soils have low moisture retaining characteristics.

A detailed Rehabilitation and Landscaping Plan will be developed during detailed design and construction planning to document the reinstatement requirements for the Project, including revegetation. For the purpose of estimating water requirements for revegetation, it has been assumed that all embankments will be revegetated. This is a conservative estimate, as some embankments will be stabilised using alternative treatments (e.g. shotcrete or rock scour protection). The areas to be revegetated, by chainage range, are presented in Table 1-4.

TABLE 1-4 AREA OF REVEGETATION AND WATER REQUIREMENTS, BY CHAINAGE RANGE

Start (km)	End (km)	Revegetation area[1] (m2)	Water for establishment[2] @ 184.8 (ML)
NSW/QLD Border (Ch 30.6)	Kurumbul (Ch 0.00)	45,000	8
Kurumbul (Ch 0.00)	Whetstone (Ch 45.00)	249,000	46
Whetstone (Ch 45.00)	Canning Creek (Ch 94.5)	346,000	64
Canning Creek (Ch 94.45)	Millmerran (Ch 137.00)	208,000	38
Millmerran (Ch 137.00)	Brookstead (Ch 151.00)	136,000	25
Brookstead (Ch 151.00)	Pittsworth (Ch 171.00)	218,000	40
Pittsworth (Ch 171.00)	Southbrook (Ch 180.00)	71,000	13
Southbrook (Ch 180.00)	Athol (Ch 191.00)	142,000	26
Athol (Ch 191.00)	Gowrie (208.2)	460,000	85
Total Volume (ML)			**347**

Table notes:
1. Area rounded to the nearest 1,000 m^2
2. Volumes rounded to the nearest ML

The estimated construction water requirements for civil earthworks, track works and revegetation are shown for each of the chainage ranges in Table 1-5. The daily and total cumulative water requirements for the Project over the construction period are shown in Figure 1-1. Construction schedules assumed for the purposes of EIS technical assessments have been based on information available at the time of assessment and are subject to change. The assumptions made regarding construction schedules are considered suitably conservative and appropriate for the purposes of EIS impact assessment, and any changes are unlikely to alter the outcomes and conclusions presented in the EIS.

TABLE 1-5 CONSTRUCTION WATER REQUIREMENTS FOR CIVIL EARTHWORKS, TRACK WORKS AND REVEGETATION BY CHAINAGE RANGE

Start	End							
Location/ Ch (km)	Location/ Ch (km)	Water usage	Start	Finish	Daily volume (ML)[1]	Maximum daily volume (ML)[2]	Total activity volume (ML)[3]	Total volume (ML)[3]
NSW/QLD Border 30.6	Kurumbul 0.0	Rail civil earthworks	Nov-24	Aug-25	0.29	0.4	54	67
		Road civil earthworks	Aug-24	Nov-24	0.05		4	
		Track works	Nov-24	Oct-26	0.01		1	
		Revegetation	Jan-26	Jul-26	0.06		8	
Kurumbul 0.0	Whetstone 45.0	Rail civil earthworks	Nov-24	Sep-25	0.68	0.9	136	278
		Road civil earthworks	Oct-24	Aug-25	0.25		50	
		Track works	Nov-24	Dec-26	0.01		46	
		Revegetation	Feb-26	Aug-26	0.35		46	
Whetstone 45.0	Canning Creek 94.5	Rail civil earthworks	Jul-24	Sep-25	1.62	1.7	477	551
		Road civil earthworks	Sep-24	Jan-25	0.10		8	
		Track works	Jul-24	Apr-27	0.01		1	
		Revegetation	Apr-26	Oct-26	0.49		64	
Canning Creek 94.5	Millmerran 137.0	Rail civil earthworks	Sep-24	Oct-25	1.23	1.3	319	372
		Road civil earthworks	Aug-24	Mar-26	0.03		13	
		Track works	Sep-24	Jun-27	0.01		1	
		Revegetation	Nov-26	Apr-27	0.35		38	
Millmerran 137.0	Brookstead 151.0	Rail civil earthworks	Sep-24	Apr-25	0.27	0.3	43	76
		Road civil earthworks	Sep-24	Jul-26	0.01		7	
		Track works	Sep-24	Aug-27	0.01		1	
		Revegetation	Jul-26	Feb-27	0.19		25	
Brookstead 151.0	Pittsworth 171.0	Rail civil earthworks	Sep-24	May-25	1.34	1.5	217	302
		Road civil earthworks	Jul-24	Nov-25	0.13		44	
		Track works	Sep-24	Oct-27	0.01		1	
		Revegetation	Oct-26	Apr-27	0.31		40	
Pittsworth 171.0	Southbrook 180.0	Rail civil earthworks	Jan-25	May-25	1.98	2.0	164	198
		Road civil earthworks	Jan-24	Dec-25	0.05		19	
		Track works	Jan-25	Oct-27	0.01		1	
		Revegetation	Oct-26	Apr-27	0.10		13	
Southbrook 180.0	Athol 191.0	Rail civil earthworks	Sep-24	Jun-25	1.22	1.2	226	260
		Road civil earthworks	Jul-24	Jan-26	0.02		6	
		Track works	Sep-24	Oct-27	0.01		1	
		Revegetation	Oct-26	Apr-27	0.20		26	
Athol 191.0	Gowrie 208.2	Rail civil earthworks	Feb-25	Oct-25	3.26	3.3	599	686
		Road civil earthworks	Aug-24	Sept-25	0.01		1	
		Track works	Feb-25	Oct-27	0.01		1	
		Revegetation	Oct-26	Apr-27	0.65		85	
Total volume (ML)								**2,790**

Table notes:
1. All day volumes <0.01 ML are shown as 0.01 ML 2. All volumes presented to the nearest 0.1 ML 3. All volumes presented to the nearest ML

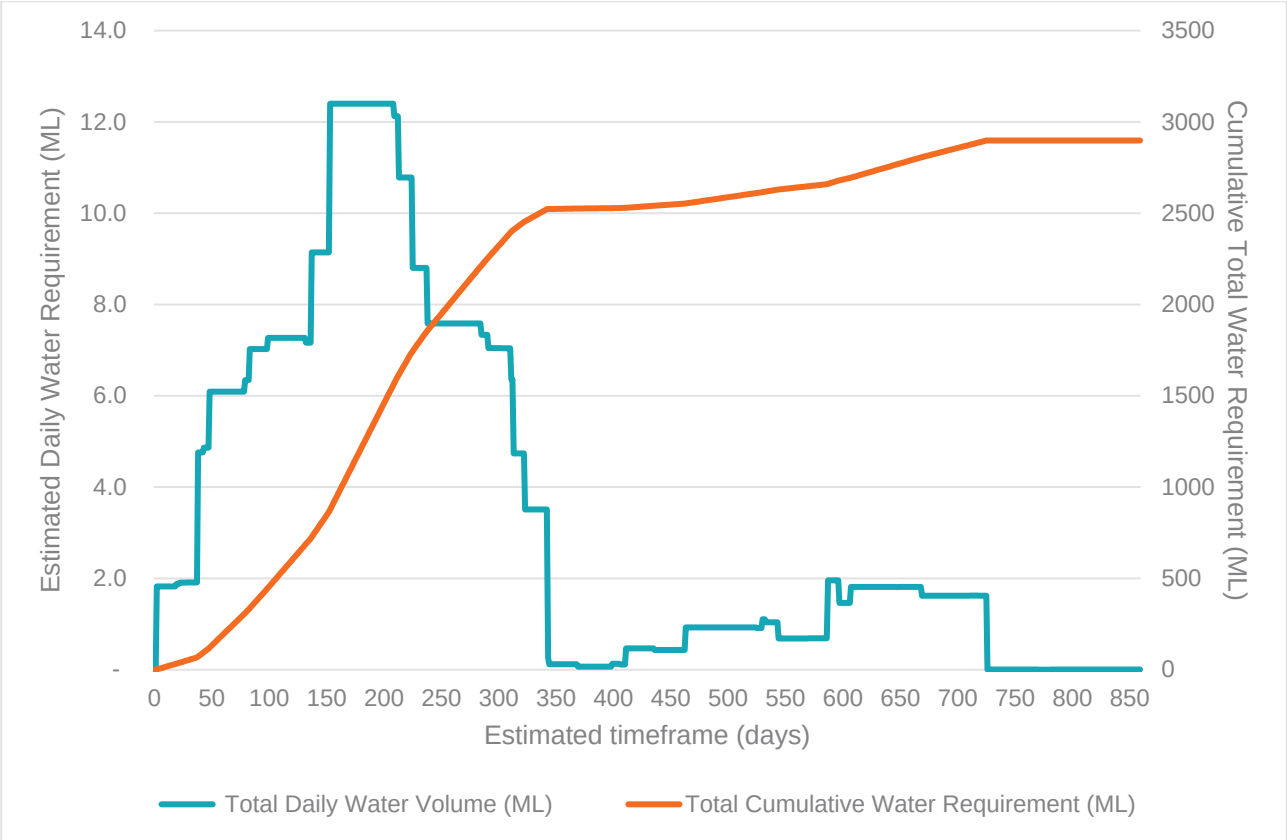

FIGURE 1-1 ESTIMATED WATER REQUIREMENT OVER THE CONSTRUCTION PERIOD

1.1.4 Non-resident workforce accommodations and site offices

The total daily water usage for non-resident workforce accommodations is largely determined by occupancy numbers and includes water used for the following purposes:

- Toilets
- Showers
- Laundry
- Food preparation
- Lawns and garden care
- Cleaning.

ARTC has consulted with a non-resident workforce accommodation service provider to determine the typical daily water requirement for a non-resident workforce accommodation. From this consultation, it was concluded that an average daily volume of 250 L/person/day should be adopted to estimate the water usage for non-resident workforce accommodations (Australian Camp Services 2022, personal communication, 21 March). As a comparison, the daily water use per person recorded in Millmerran in February 2022 was 163 L/person/day (TRC, 2022).

The daily water usage for a single non-resident workforce accommodation will fluctuate with occupancy throughout the construction period. Based on a usage rate of 250 L/person/day, a 300-bed non-resident workforce accommodation will operate on average at 90 per cent capacity (270 occupants), requiring 67.5 kL of water per day.

Onsite package wastewater treatment plants are proposed for the non-resident workforce accommodation facilities. Water for reuse will be treated in accordance with the *National Water Quality Management Strategy: Australian Guidelines for Sewerage Systems – Effluent Management* (Agriculture and Resource Management Council of Australia and New Zealand & Australian and New Zealand Environment and Conservation Council, 1997) to a standard appropriate for the intended use, so that the treated water has the potential to be used for irrigation or dust suppression. Wastewater will be used onsite for these water demands so as to minimise the volumes of water that must be imported, and to minimise the volumes of wastewater requiring disposal; this will maximise rates of wastewater capture, treatment and reuse within a non-resident workforce accommodation. Any wastewater not re-used onsite and/or by-products of treatment not suitable for reuse will be taken offsite for lawful disposal by a licenced waste contractor. Depending on the technologies that are adopted, water can be recycled for immediate use as non-potable water. A key objective of the Inland Rail Sustainability Strategy is to maximise onsite reuse of wastewater generated by non-resident workforce accommodation, to avoid water being carted offsite for treatment and discharged.

A breakdown of water usage scenarios for a single non-resident workforce accommodation is presented in Table 1-6.

TABLE 1-6 ESTIMATED WATER USAGE FOR NON-RESIDENT WORKFORCE ACCOMMODATIONS

Occupancy (%)	Occupants per accommodation	Daily water usage (ML/day/accommodation)	Daily water requirement, based on 50% recycling (ML/day/accommodation)
Maximum 100	300	0.08	0.04
Average 90	270	0.07	0.03
Minimum 50	150	0.04	0.02

Table notes:
1. Based on usage rate of 250 L/person/day.

1.1.5 Concrete batching

The Project is expected to rely on a combination of existing commercial concrete batching plants and a temporary plant for the batching and precast of concrete, established to service the Project.

Established plants are connected into the mains water supply, so the quality and uninterrupted supply of water is not an issue for existing commercial facilities; therefore, the water requirement for concrete supplied by existing concrete/precast concrete suppliers will not contribute to the Project's direct water requirement.

Locations for two temporary plants, with combined concrete batching and precast function, have been nominated in the Toowoomba Local Government Area (LGA) to service the Project. The demand for an onsite temporary batching and precast plant is driven by the large number and scale of concrete structural elements that are included in the reference design for the crossing of the Condamine River floodplain. While two locations have been nominated, only one plant is expected to be necessary to supplement the supply of concrete from established commercial operators.

A water requirement of 180 L/m^3 has been estimated for the onsite batching of concrete (wet and precast). Using this rate, the water requirement for onsite concrete batching activities is estimated to be 13.5 ML, as summarised in Table 1-7.

Concrete components of the reference design, such as culverts and bridge elements, vary in size dependent on site-specific design requirements. For example, a 3.0 m (L) x 2.4 m (W) x 1.2 m (H) concrete box culvert with 0.2 m wall thickness will consist of 2.6 m^3 of concrete. At a rate of 180 L/m^3, a culvert of this size would require 468 L of water.

TABLE 1-7 ESTIMATED WATER USAGE FOR ONSITE CONCRETE PRODUCTION

Concrete product	Volume required for the reference design (m^3)[1]	Water requirement (L/m^3)	Total estimated water usage (ML)
Precast	24,000	180	4.3
Wet (bulk)	51,000 [2]	180	9.2
Total:			13.5

Table notes:
1. Excludes concrete (in-situ and precast) for culverts, which will all be supplied by existing commercial suppliers.
2. For in-situ concrete required between Ch 138 km and Ch 165 km. In-situ concrete required outside of this chainage range will be supplied by existing commercial concrete batching plants.

1.1.6 Whetstone Material Distribution Centre

Whetstone Material Distribution Centre (MDC) will require an estimated 75 ML of water for material conditioning and dust suppression during the 12-month establishment period (6.25 ML per month).

Once operational, the MDC is expected to require water for the purposes presented in Table 1-8. The MDC is projected to support the Project during construction.

TABLE 1-8 WHETSTONE MATERIAL DISTRIBUTION CENTRE ESTIMATED WATER USAGE

Water type	Usage	Daily volume (L)	Annual volume (ML)
Potable	Drinking water	380	0.12
Non-potable	Flushing water	1,520	0.48
Non-potable	Dust suppression and maintenance	157,844	49.41

1.2 Water quality requirements

This section provides details on the water types, and quality requirements for each anticipated end use.

All water sources that are identified for construction water supply will be subject to testing prior to first use, to establish the quality at source, the appropriate end use and any intermediate treatment that may be required.

1.2.1 Earthworks, track works and revegetation

Non-potable water will be used for earthworks, track works and revegetation activities.

Section 440ZG of the EP Act requires that a person must not unlawfully deposit a prescribed water contaminant:

- In waters
- In a roadside gutter or stormwater drainage
- At another place, and in a way, so that the contaminant could reasonably be expected to wash, blow, fall or otherwise move into waters, a roadside gutter or stormwater drainage.

Therefore, water used for earthworks, track works and revegetation activities must be of a quality that is:

- Non-deleterious to earth fill properties
- Free of prescribed water contaminants, as defined in Schedule 10 of the Environmental Protection Regulation 2019
- Consistent with the quality requirements specified for irrigation and general water use in the *Australia and New Zealand Guidelines for Fresh and Marine Water Quality 2018* (Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, 2018)
- For recycled water, water will be:
  - Consistent with the quality requirements of the *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks* (Phase 1) (Environment Protection and Heritage Council (EPHC), 2006), if water is obtained from a recycled source (see Recycled water in Section 1.3)
  - Used consistent with the *Guideline for low-exposure recycled water schemes* (Queensland Health, 2001).

Additionally, in accordance with DTMR's *Technical Specification MRTS16: Landscape and Revegetation Works*, water used for revegetation works must:

- Contain no substances toxic to plant growth
- Have a pH between 6.0 and 8.5 (inclusive)
- Have a total soluble salts concentration less than 1,000 mg/L (milligrams per litre).

Additional sourcing requirements for recycled and non-potable water are discussed in Section 1.3.

1.2.2 Non-resident workforce accommodation facilities and site offices

Potable water will be required for drinking, cooking and showering. For all other non-resident workforce accommodation water uses (e.g. toilets, laundry, non-resident workforce accommodation maintenance), recycled or non-potable water may be appropriate.

Water for potable use is typically trucked in from mains standpipes or non-potable sources, treated onsite via package treatment plant, and filtered. Water will need to be tested pre and post treatment to ensure that the quality requirements specified in the Australian Drinking Water Guidelines (National Health and Medical Research Council and National Resource Management Ministerial Council (NHMRC & NRMMC), 2011) are being achieved.

Cost-effective wastewater management strategies for wastes generated onsite are:

- The adoption of onsite treatment
- Any discharge will be classed reasonable:
  - the appropriate standard of effluent quality to be used for on-land irrigation (such as dust suppression to reduce costs and emissions) with adequate exclusion areas from the non-resident workforce accommodation facilities and waterways
  - ARTC will monitor generated wastes and onsite treatment during the construction stage of the Project in accordance with the wastewater management strategy developed by the contractor during the detailed design stage.

Non-resident workforce accommodation uses of recycled water will mostly be regarded as high-exposure uses. Recycled water providers that supply recycled sewage water for high-exposure uses are regulated primarily by the Water Supply Regulator within the Department of Regional Development, Manufacturing and Water; however, Queensland Health is a co-regulator of these schemes as well. Recycled water providers that supply recycled water for these uses must have a recycled water management plan that is approved by the Water Supply Regulation; therefore, recycled water management plans will need to be established to support the use of recycled sewage water within non-resident workforce accommodations. The same requirements do not apply to recycled grey water.

All recycled water providers are obliged to supply recycled water that is:

- 'Fit for use' and does not represent a 'public health risk', as defined in the *Public Health Act 2005* (Qld)
- Consistent with the quality requirements of:
  - *The Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1)* (Environment Protection and Heritage Council (EPHC), 2006)
  - for augmentation of drinking water supplies, the *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) – Augmentation of Drinking Water Supplies* (EPHC, 2008)
  - for harvesting and reuse of stormwater, the *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) – Stormwater Harvesting and Reuse* (EPHC, 2009).

1.2.3 Concrete batching

Concrete batching has specific water-quality requirements in order to achieve structural integrity and asset life objectives. The water requirements for use in the supply of concrete are specified in:

- *AS 1379–2007: Specification and supply of concrete* (Standards Australia, 2007)
- *AS 2159–1995: Piling – Design and installation* (Standards Australia, 1995)
- *AS 3600–2018: Concrete Structures* (Standards Australia, 2018d)
- *Scaling and aggressivity potential* (Langelier, 1946 and Ryznar, 1944 indices).

If a temporary batching and precast plant is established, a water supply of guaranteed quality will be required. A temporary concrete batching and precast plant would be established with onsite water storage tanks, which would be filled by water trucks drawing water from either a potable or recycled source. Dependent on quality, recycled water may require further treatment prior to being suitable for use in concrete batching.

1.3 Water sources

ARTC recognises that water sourcing and availability is critical to supporting the construction program stage of the Project. Sources of construction water will be finalised as the construction approach is refined during the detailed design stage of the Project (post-EIS). Through this process, refined water demand planning will be undertaken, including detailed contingency options, in the event that protracted dry seasonal conditions prevail and water supply options become unavailable.

The ultimate water sourcing strategy for the Project will be documented in a construction water plan.

An assessment of the suitability of each source will need to be made for each construction activity requiring water, based on the following considerations:

- Available volume from identified source
- Legal access
- Volumetric requirement for the activity
- Water quality requirement for the activity
- Source location relative to the location of need.

Potential sources that are discussed in this section are those that are considered to meet the following assessment criteria:

- Source is located within 25 km of the Project
- Water will, subject to availability, be available for access/purchase for the Project.

Water source types are grouped into the following classifications:

- Potable
- Non-potable:
  - supplemented sources: refers to water delivered from infrastructure, e.g. dams. Supplemented supplies are managed by water supply scheme operators
  - un-supplemented sources: surface water or groundwater that is not reliant on infrastructure to store or distribute water
  - recycled sources: in Queensland, recycled water is regulated differently depending on how the recycled water is used. For example, irrigation and dust suppression are regarded as low exposure uses, while uses such as toilet-flushing, cold water laundry and outdoor irrigation, and for augmenting a supply of drinking water, are all considered high-exposure uses of recycled water.

A summary of the considerations for accessing water from each potential surface water source is presented in the following sections. ARTC has consulted with each of the potential water suppliers identified in the following sections. Details of consultation are provided in Appendix E: Consultation Report.

1.3.1 Potable water

Potable water for non-resident workforce accommodations and concrete batching will be sourced from the following:

- Commercial businesses that sell potable water in tanks with volumes up to 30 kL
- Non-potable source and subjected to further offsite treatment. For example, one registered private bore owner has expressed an interest in selling up to 50 ML of licenced groundwater entitlement to the Project either as raw water, or after treatment to a potable standard
- Non-potable source and subjected to further onsite treatment. For example, various systems and technologies are available that can be established within the footprint of a non-resident workforce accommodations to enable treatment of water to a potable standard
- Potable networks within other LGAs. For example, Queensland Urban Utilities (QUU) administers the water within the Lockyer Valley LGA and operates tanker filling stations that cater for commercial use. The closest QUU tanker filling station to the Project is located at Postman's Ridge. Cost of water from these standpipes is variable and can be up to $5/kL.

In all instances, water will be subjected to testing prior to commencement of use for potable purposes.

Both TRC and GRC maintain a network of smart (automated) standpipes for potable water across their respective LGAs; however, both councils have advised that potable water from their networks is not available for use by the Project. Consequently, there is no intention to obtain potable water from TRC or GRC sources.

1.3.2 Non-potable surface water

Non-potable water will be sourced from dams, rivers and creeks that are subject to the provisions of the relevant Water Plans. The Project extends through two water plan areas, as follows:

- Water Plan (Condamine and Balonne) 2019:
  - supplemented:
    - Upper Condamine Water Supply Scheme
  - Un-supplemented:
    - Upper Condamine Water Management Area
    - Condamine and Balonne Tributaries Water Management Area
    - Gowrie and Oakey Creek Water Management Area
- Water Plan (Border Rivers and Moonie) 2019:
  - supplemented:
    - Macintyre Brook Water Supply Scheme
    - Border Rivers Water Supply Scheme.
  - un-supplemented:
    - Upper Weir River Water Management Area
    - Callandoon Creek Water Management Area
    - Border Rivers Water Management Area
    - Macintyre Brook Water Management Area.

The water plans distinguish between supplemented and un-supplemented water supplies. Supplemented water refers to water delivered from infrastructure. A Water Supply Scheme owner is granted a license depending on whether they own the storage or distribution infrastructure, as follows:

- A resource operations license is granted to owners of headworks infrastructure such as dams and weirs
- A distribution operations license is granted to the owner of any diversion infrastructure used to further distribute water, such as pipes.

Un-supplemented water is surface water or groundwater that is not reliant on infrastructure to store or distribute water.

Unallocated water is water that can be made available for future use without compromising the security of existing users or the environmental values within a catchment. Allocated water has a title separate from a land title and can be bought and sold independently. Strategic or state reserve unallocated water can be allocated to coordinated projects under the *State Development and Public Works Organisation Act 1971* (Qld). There are no unallocated surface water reserves within the Condamine and Balonne water plan area. Unallocated surface water reserves within the Border Rivers and Moonie Water Plan area are associated with the Stanthorpe (4,500 ML/yr) and Moonie (100 ML/yr) water management areas and are therefore not proximal to the Project.

Across the two water plan areas, there are seven water trading zones for supplemented water and 22 water trading zones for un-supplemented water. This list of water trading zones has been further refined to identify viable construction water sources by:

- Excluding trading zones with available tradeable water volumes less than 2,000 ML
- Selecting trading zones with the two highest available tradeable water volumes within each designated water management area
- Excluding allocations with volume entitlements less than 300 ML/year
- Selecting water allocations that are authorised for ‘any’ purpose, only; all other authorised purposes were discounted.

This investigation resulted in a total of 33 supplemented water allocations and 50 un-supplemented water allocations that may be able to supply water to the Project, totalling >48,000 ML. The estimated water requirement for the Project (Table 1-1 and Table 1-2) can be met by the volume of these water allocations.

The results of this investigation and the available allocation volumes are presented in Table 1-10. The locations of water management areas for supplemented and un-supplemented water sources of relevance to the Project are shown in Figure 1-2.

Non-potable groundwater

Commercial and private land uses in the region have a strong reliance on access to groundwater for domestic and agricultural purposes. This reliance on groundwater as a resource is even stronger during periods of drought. Consultation feedback from Department of Regional Development, Manufacturing and Water (DRDMW) indicates that the alluvium and Main Range Volcanics aquifer units in the area are close to full allocation through existing water entitlements. This has been confirmed through a review of un-supplemented groundwater supplies and the nominal allocation volumes across the groundwater management areas and groundwater trading zones through which the Project extends.

The use of existing sustainable groundwater allocated entitlements to supplement the construction demand for the Project may be considered if owners of registered bores have capacity under their water entitlement that they wish to sell to ARTC or the contractor under private agreement.

Through the consultation process, various landowners and other stakeholders have been forthcoming with offers to sell all or part of their licenced groundwater entitlement to ARTC for use as construction water. A common theme through these consultations has been the request from license holders for their details to remain confidential. To date, offers to sell licenced groundwater entitlement are in excess of 1,870 ML/yr, from registered bores located along the full length of the Project footprint. The total volume of water made available through these offers is expected to increase as the Project progress towards construction.

The flow rate and quality of water obtainable from each bore will need to be subject to testing prior to use, to establish the quality at source, the appropriate end use and any intermediate treatment that may be required.

1.3.3 Recycled

Treated effluent from council facilities

Sewage treatment plants (STPs) are located and operational across the Toowoomba and Goondiwindi LGAs. A summary of the STPs that are in proximity to the Project and could provide sources of construction water is provided in Table 1-9.

TABLE 1-9 LICENCED SEWAGE TREATMENT PLANTS IN PROXIMITY TO THE PROJECT

Treatment plant	Owner/ operator	Capacity	Effluent quality[1]	Existing discharge arrangements
Wetalla STP/WRF	TRC	31,000m^3/day in dry conditions 93,000 m^3/day in wet conditions	Class C	Treated effluent discharged to Gowrie Creek, pumped to Millmerran Power Station or to the Advanced Water Reclamation Facility for further treatment
Wetalla AWRF	TRC	9 ML/day	Class A+	8.2 ML/day pumped to New Acland Coal Mine. Capacity may be increased to 15 ML/day in future
Pittsworth STP	TRC	Up to 4,500 EP Average daily flow 675,000 L (150 L/EP/day) Peak design capacity 2.03 ML	Class C	Treated effluent discharged to Perriers Creek. The EA encourages reuse of effluent from this facility, with opportunities to be documented in an Effluent Reuse Strategy
Millmerran STP	TRC	Up to 4,000 EP Average daily flow 600,00 L at 150 L/EP/day[2]	Class C	Treated effluent discharged to Back Creek
Goondiwindi STP	GRC	Up to 6,500 EP Average daily flow 975,000 L at 150 L/EP/day	Class C	Treated effluent is delivered to the Goondiwindi Golf Club and racing club for irrigation via pump station with design capacity of 19 L/sec. Surplus treated effluent is discharged to Crooked Creek
Inglewood STP	GRC	Up to 1,500 EP Average daily flow 225,00 L Annual inflow must not exceed 50 ML/yr	Class C	Treated effluent is not permitted to be released

Table notes:
EP = Equivalent person, WRF = Water reclamation facility, AWRF = Advanced Water Reclamation Facility, L/EP/day = Litres per equivalent person per day
1. As defined in in Table 2 of the *Guideline for low-exposure recycled water schemes* (Queensland Health, 2001).

InterGen (operators of Millmerran Power Station) has a contract with TRC for the supply of 1,000 ML/year (2.74 ML/day) of class C effluent from the Wetalla WRF. This supply commenced in 2001, with water transported from the WRF to the Millmerran Power Station via a pipeline.

New Hope Group has a contract with TRC for the supply of 3,000 ML/yr (8.2 ML/day) of class A+ water for use in coal washing and for run-of-mine operations for the New Acland Coal Mine. An Advanced Water Reclamation Facility (AWRF) had to be established to produce class A+ water and began operation in late 2008. The AWRF is operated to meet recycled water demands and has a current operational capacity of 9 ML/d, with the New Acland Coal Mine receiving 8 ML/d. There is potential to increase the capacity of the Wetalla AWRF to 15 ML/d with minor modification to the existing process trains. New Hope Group has an option to increase its supply by an additional 2,500 ML/year once the upgrade is completed (New Hope Group, 2023).

At present, there is estimated to be 19 ML/day of effluent from Wetalla WRF that is not contractually committed to InterGen or New Hope Group in dry conditions (from the WRF direct or from the AWRF), increasing to 81 ML/day in wet conditions.

Table 7 of the *Guideline for low-exposure recycled water schemes* (Queensland Health, 2001) requires that recycled water be of class C or better for irrigation or class B or better for dust suppression. While water from the AWRF would already meet this quality requirement, effluent direct from the WRF may require further treatment to be suitable for use for dust suppression.

The Southbrook (Ch 180.00 km) to Gowrie (Ch 208.2 km) section of the Project has a maximum daily water requirement for civil earthworks and track conditioning of 4.5 ML/day. Acknowledging that other commercial arrangements may be in place with TRC for supply of smaller volumes of effluent water from the WRF, it remains that some, if not all, of the construction water requirement for the Southbrook to Gowrie section of the Project could be met by supply from the Wetalla WRF/AWRF with minimal additional treatment. As stated previously, the estimated water requirements for the Project can be met from non-potable surface water and groundwater sources; therefore, the Project is not reliant on sourcing of water from the Wetalla WRF/AWRF.

During consultation, neither TRC or GRC could provide commitments to the availability of treated effluent from their facilities for construction water commencing in 2024, noting that the honouring of existing reuse arrangements would be a priority to both councils. Regardless, there may be opportunities to source construction water from facilities listed in Table 1-9. At the request of TRC and GRC, such opportunities will need to be identified through further consultation closer to the commencement of construction.

Treated sewage effluent may be transferred to another person/entity if there is a written agreement and/or policy between the holder of the Environmental Authority and the receiving person/entity. The agreement must include a commitment from the person(s) utilising the treated sewage effluent to use treated sewage effluent in such a way as to prevent environmental harm or public health incidences. The agreement must ensure the person(s) is aware of their General Environmental Duty, environmental sustainability of any treated sewage effluent, disposal and protection of environmental values of waters. A copy of the agreement would need to be provided to the administering authority.

Both InterGen and New Hope Coal Group have entered into supply contracts with TRC that allow them to access recycled water at commercial rates. A similar contractual arrangement between ARTC, and TRC or GRC would be required for access to treated effluent from any of the facilities listed in Table 1-9.

Treated effluent within non-resident workforce accommodation

A key objective of the Inland Rail Sustainability Strategy is to maximise onsite reuse of wastewater generated by non-resident workforce accommodation, to avoid water required to be carted offsite for treatment and discharged. If a rate of 50 per cent reuse is achieved, a 300-bed non-resident workforce accommodation with 250 L/person/day water usage could generate up to 0.04 ML/day of treated wastewater when at 100 per cent occupancy.

Treated effluent from Millmerran Power

Millmerran Power has stated through consultation that they have an excess of approximately 600 ML per year of recycled effluent water. This volume comprises of water that is pumped from the Wetalla WRF (1,000 ML/year or 2.74 ML/day), and is surplus to immediate requirements, and end-of-use water that has been captured and treated onsite. Millmerran Power has placed on record that they are interested in selling recycled effluent water to the Project for use as construction water; depending on quality, intermediate treatment may be required.

Coal Seam Gas production water

The extraction of natural gas involves the removal of water that is present within the underlying coal seam. The nearest coal seam gas (CSG) project is the Surat Gas Project, which has a project development footprint that extends from Wandoan in the north-west to Millmerran in the south-east.

Water infrastructure for the Surat Gas Project will include feedwater dams, treated water dams, filtration and reverse osmosis treatment plant, brine dams and distribution facilities for transfer of water to end users. Volumes of water generated by the project will be variable, but estimated to average 22,000 ML per annum, peaking at 43,000 ML per annum over the life of the project (Coffey Environments, 2012).

The quality of CSG water can vary considerably, dependent on the underlying aquifer characteristics. CSG water from the Surat Basin typically has pH of 7 to 11 and salinity generally ranging from 3,000 to 8,000 mg/L (i.e. brackish). Subsequently, the beneficial reuse options for CSG water are typically constrained by the salt content and the water often requires treatment prior to reuse, e.g. via reverse osmosis, as is planned for the Surat Gas Project.

The Surat Gas Project has commenced construction, although external pressures have meant that progress has been slower than originally scheduled. ARTC has consulted with Arrow Energy regarding the potential to access CSG water for construction. Arrow Energy has expressed in-principle interest in selling water to the Project, but have noted that the availability of water will depend on the status of the Surat Gas Project at the time of need.

Given the potential rate of CSG water production and the timing of the project, the Surat Gas Project has the ability to meet a substantial portion of the Project's construction water requirement. The levels of treatment required prior to being suitable for reuse will depend on the water infrastructure from which water is sourced and will be guided by the General Beneficial Use Approval for the associated water and the End of Waste Code, Associated Water (including coal seam gas water) (ENEW07547018, Version 1.05, 2024) (Department of Environment, Science and Innovation, 2024).

1.3.4 Other sources

While not considered to be primary sources of construction water, the following smaller volume sources could be used, if required:

- Water that accumulates in sediment basins that are located within the Project footprint for erosion and sediment control (volumes dependent on surface area and rainfall)
- Water that accumulates in rainwater tanks located on non-resident workforce accommodation facilities and attached to construction office structures (volumes dependent on surface area and rainfall)
- Water from private storages (e.g. ring dams, rainwater tanks etc.) on properties that are acquired for the Project.

1.4 Access and reliability

1.4.1 Climatic conditions

Climatic conditions may affect the availability of water from supplemented and un-supplemented sources. Other sources are less likely to be affected. To compensate for this climatic variability in availability, ARTC has identified a wide range of potential sources with total volumes in excess of requirement.

1.4.2 Purchase of privately held allocations

As mentioned, various landowners and other stakeholders have been forthcoming with offers to sell all or part of their licenced water entitlements to ARTC for use as construction water. ARTC has developed and is maintaining a register of private water entitlement holders who have made offers to the Project. ARTC commits to consulting with DRDMW in order to confirm that private water sources made available to the Project are lawful and appropriately licenced for the intended usage. Where amendments to a water allocation are required to enable lawful use (e.g. change to the 'Authorised Purpose'), ARTC will seek guidance from DRDMW in enacting those changes.

1.4.3 Trading, entitlements and permits

Seasonal water assignments are temporary trades of water that are useful for meeting short-term water needs. Under these assignments, some or all of the water that may be taken under a water entitlement in a water year can be assigned to another person or place, as long as it is within the rules of the relevant water plan.

There is no limit to the number of assignments of unused water that can be made in any water year. Both supplemented and un-supplemented water can be seasonally assigned but different processes apply.

Supplemented water

Any supplemented water allocation holder wishing to arrange a seasonal water assignment requires the consent of the resource operations license holder in every case. For water allocations that are also distributed by a distribution operations license (DOL) holder, the seasonal water assignment rules in an operations manual will state when the consent of the DOL holder is also required. DRDMW has no involvement in managing or approving these temporary trades.

Sunwater manages the supplemented water supply schemes listed in Table 1-2. During consultation, Sunwater identified Rural Water Co. as their water trading company. ARTC has held discussions with Rural Water Co. to gauge the availability of water from Sunwater's water supply schemes to supplement construction of water requirements. Rural Water Co. has advised that they will be able to trade or assign water direct from Sunwater's supply to ARTC and will also be able to negotiate with allocation holders who are looking to sell some or all of their allocation.

They advised that it is too premature to commit to what the available water supply will be from Sunwater's supplemented water supply schemes at the time of construction commencing.

Un-supplemented water

As un-supplemented water supply is highly variable throughout Queensland, a seasonal water assignment can only be undertaken in areas where a water plan, water management plan or water sharing rules contained in the Water Regulation 2016 allows for it to occur.

The rules in place for the seasonal assignment of water in each of the zones identified in Table 1-6 is outlined in the following documents:

- *Border Rivers and Moonie Water Management Protocol, Revision 1* (Department of Natural Resources, Mines and Energy (DNRME), 2019a)
- *Condamine and Balonne Water Management Protocol, Revision 1* (DNRME, 2019b).

ARTC will continue to consult with DRDMW to confirm the appropriate legal mechanism for securing construction water from each of the sources identified in Section 1.3.

Exemptions

The DRDMW maintains *Exemption requirements for construction authorities for the take of water without a water entitlement (OSW/2020/5467)* (DRDMW, 2021). These exemption requirements may only be used by a constructing authority defined under Schedule 2 of the *Acquisition of Land Act 1967* (Qld) and includes state government departments and local governments. At present, these guidelines do not directly apply to ARTC; however, ARTC's eligibility to operate under the exemption requirements will be reassessed prior to the commencement of construction.

If ARTC and its contractors remain ineligible to operate under the exemption requirements, or are unable to comply with the requirements, then a Temporary Water Permit would be required before taking any water for construction purposes.

TABLE 1-10 SURFACE WATER SOURCES WITH TRADEABLE ALLOCATIONS ≥ 300 ML

Water plan	Water management area	Water trading zone	Nominal tradeable water allocation (ML)	Sum of tradeable allocations ≥300 ML in water trading zones (ML)
Supplemented				
Water Plan (Border Rivers and Moonie) 2019	Macintyre Brook Water Supply Scheme	Macintyre Brook Zone C Upstream of Ben Dor Weir Downstream of Whetstone Weir	12,935	790
Water Plan (Condamine and Balonne) 2019	Upper Condamine Water Supply Scheme	Upper Condamine Zone UCS-03 Upstream of AMTD 10.0 km Downstream of AMTD 97.0 km	14,910	9,256
		Upper Condamine Zone UCS-04 Talgai Weir to Yarramalong Weir Yarramalong Weir to Lemon Tree Weir Lemon Tree Weir to Cecil Plains Weir	11,657	9,275
Unsupplemented				
Water Plan (Border Rivers and Moonie) 2019	Upper Weir River Water Management Area	Upper Weir Zone	21,082	2,805
	Border Rivers Water Management Area	Macintyre Zone	56,821	489
Water Plan (Condamine and Balonne) 2019	Upper Condamine Water Management Area	Upper Condamine Zone UCU-07	11,740	10,920
		Upper Condamine Zone UCU-08	7,015	6,515
	Condamine and Balonne Tributaries Water Management Area	Condamine Balonne Tributaries Zone CBT-06	4,476	3,215
		Condamine Balonne Tributaries Zone CBT-07	10,501	2,885
	Gowrie and Oakey Creek Water Management Area	Gowrie Oakey Creek Zone GOU-02	3,690	2,010
			Total un-supplemented:	28,839
			Total (supplemented and un-supplemented):	48,160

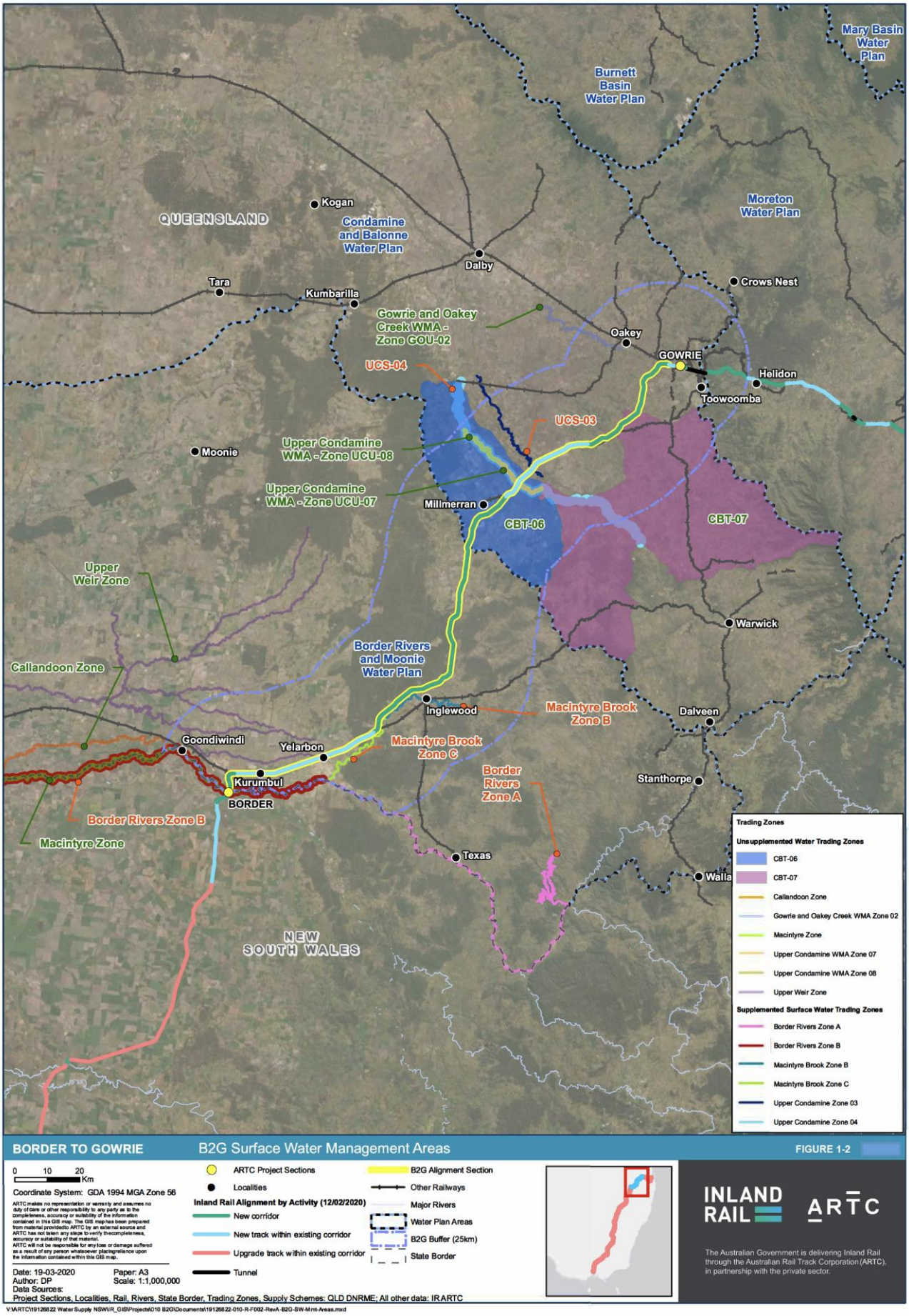

FIGURE 1-2 SURFACE WATER MANAGEMENT AREAS

1.5 Monitoring and record keeping

Construction water will only be obtained from existing licenced and/or lawful sources, within the limits of applicable allocations or entitlements. No water will be sourced from potable networks or supplemented surface water sources that are managed by TRC or GRC. ARTC will ensure that any existing commercial arrangements for the access to and/or sale of water to other end users can be honoured by water entitlement holders.

Prior to taking water from existing licenced source points, ARTC or the contractor will obtain all necessary permits and licences, and will enter into an agreement with the water entitlement holder to purchase water at a negotiated rate.

In all such instances, the take of water will be metered and/or recorded to ensure that volumes taken for the Project are within the allocated annual limits for each source. The take of water from a source will cease once the allocated annual limit has been reached.

For each take of water, the minimum information that will be recorded includes:

- The date the water was taken
- The time the take commenced and ceased
- The purpose for which the water was taken
- The source of water; if applicable, the relevant works number of the overland flow storage
- The location from where the water was taken, including latitudinal and longitudinal coordinates, including the specified datum and adjacent lot on plan details
- The volume of water taken
- Any identified impacts on the environment and measures to remedy such impacts, e.g. the ‘make-good’ process for groundwater bores (Chapter 15: Groundwater)
- Any concerns or issues raised by other water users and arrangements put in place to address these.

1.6 Summary

A summary of the construction water volumetric requirements, by location and time, is presented in Table 1-11 within potential sources identified for each water type.

TABLE 1-11 SUMMARY OF CONSTRUCTION WATER REQUIREMENT, SCHEDULE FOR DEMAND, AND POTENTIAL SOURCES OF WATER TO MEET DEMAND

	Start	End					Potential sources			
Purpose	Location/ Ch (km)	Location/ Ch (km)	Start	Finish	Maximum daily volume (ML)	Total volume (ML)	Non-potable surface water (incl. estimated annual tradeable allocations)	Non-potable groundwater	Recycled	Potable
Civil earthworks, track works and revegetation	NSW/QLD Border 30.6.0	Kurumbul 0.00	Y1 Q4	Yr 3 Q3	0.4	67	Tradeable allocations in: ▸ Macintyre Brook WSS (up to 790 ML) ▸ Upper Weir River WMA (up to 2,805 ML) ▸ Border Rivers WMA (up to 489 ML)	Registered bores with available water entitlement—received offers to sell >200 ML/yr in Goondiwindi LGA	CSG production water	N/A
	Kurumbul 0.00	Whetstone 45.00	Y1 Q4	Yr 3 Q3	0.9	278	Tradeable allocations in: ▸ Macintyre Brook WSS (up to 790 ML) ▸ Upper Weir River WMA (up to 2,805 ML) ▸ Border Rivers WMA (up to 489 ML)	Registered bores with available water entitlement—received offers to sell >200 ML/yr in Goondiwindi LGA	CSG production water	N/A
	Whetstone 45.00	Canning Creek 94.50	Y1 Q3	Yr 3 Q4	1.7	551	Tradeable allocations in: ▸ Macintyre Brook WSS (up to 790 ML) ▸ Upper Weir River WMA (up to 2,805 ML) ▸ Border Rivers WMA (up to 489 ML)	Registered bores with available water entitlement—received offers to sell >200 ML/yr in Goondiwindi LGA	Millmerran Power (up to 600 ML/yr) CSG production water	N/A
	Canning Creek 94.45	Millmerran 137.00	Y1 Q3	Yr 4 Q1	1.3	372	Tradeable allocations in: ▸ Upper Condamine WSS (up to 18,531 ML) ▸ Upper Condamine WMA (up to 17,435 ML) ▸ Condamine and Balonne Tributaries WMA (up to 6,100 ML)	Registered bores with available water entitlement—received offers to sell >1,670 ML/yr in Toowoomba LGA	Millmerran Power (up to 600 ML/yr) CSG production water	N/A
	Millmerran 137.00	Brookstead 151.00	Y1 Q3	Yr 4 Q1	0.3	76	Tradeable allocations in: ▸ Upper Condamine WSS (up to 18,531 ML) ▸ Upper Condamine WMA (up to 17,435 ML) Condamine and Balonne Tributaries WMA (up to 6,100 ML)	Registered bores with available water entitlement—received offers to sell >1,670 ML/yr in Toowoomba LGA	Millmerran Power (up to 600 ML/yr) CSG production water	N/A

Purpose	Start	End			Maximum daily volume (ML)	Total volume (ML)	Potential sources			
	Location/ Ch (km)	Location/ Ch (km)	Start	Finish			Non-potable surface water (incl. estimated annual tradeable allocations)	Non-potable groundwater	Recycled	Potable
	Brookstead 151.00	Pittsworth 171.00	Y1 Q3	Yr 4 Q1	1.5	302	Tradeable allocations in: ▸ Upper Condamine WSS (up to 18,531 ML) ▸ Upper Condamine WMA (up to 17,435 ML) Condamine and Balonne Tributaries WMA (up to 6,100 ML)	Registered bores with available water entitlement—received offers to sell >1,670 ML/yr in Toowoomba LGA	Millmerran Power (up to 600 ML/yr)	N/A
	Pittsworth 171.00	Southbrook 180.00	Yr 2 Q1	Yr 4 Q1	2.0	198	Tradeable allocations in Gowrie and Oakey Creek WMA (up to 2,010 ML)	Registered bores with available water entitlement—received offers to sell >1,670 ML/yr in Toowoomba LGA	Millmerran Power (up to 600 ML/yr) Wetalla WRF	N/A
	Southbrook 180.00	Athol 191.00	Y1 Q3	Yr 4 Q1	1.2	260	Tradeable allocations in Gowrie and Oakey Creek WMA (up to 2,010 ML)	Registered bores with available water entitlement—received offers to sell >1,670 ML/yr in Toowoomba LGA	Wetalla WRF	N/A
	Athol 191.00	Gowrie 206.95	Yr 2 Q1	Yr 4 Q1	3.3	686	Tradeable allocations in Gowrie and Oakey Creek WMA (up to 2,010 ML)	Registered bores with available water entitlement—received offers to sell >1,670 ML/yr in Toowoomba LGA	Wetalla WRF	N/A
Non-resident workforce accommodations	Inglewood	Y1 Q3	Yr 4 Q1	0.08	70.7	Tradeable allocations in: ▸ Upper Weir River WMA (up to 2,805 ML) ▸ Border Rivers WMA (up to 489 ML)	Registered bores with available water entitlement—received offers to sell >200 ML/yr in Goondiwindi LGA	On-site recycling. 50 per cent targeted.	Treated un-supplemented supply Tanker delivery	
	Yelarbon	Y1 Q3	Yr 3 Q4	0.08	75.3	Tradeable allocations in: ▸ Upper Weir River WMA (up to 2,805 ML) Border Rivers WMA (up to 489 ML)	Registered bores with available water entitlement—received offers to sell >200 ML/yr in Goondiwindi LGA	On-site recycling. 50 per cent targeted.	Treated un-supplemented supply Tanker delivery	
	Millmerran	Y1 Q3	Yr 4 Q1	N/A	61.7	N/A	N/A	N/A	Treated un-supplemented supply Tanker delivery	