8 BASE CASE

CHAPTER SUMMARY AND CONCLUSIONS:

This Chapter defines the base case against which the Reference Project is to be assessed. The base case provides the benchmark against which the economic and social impacts of the NDMIP are evaluated and quantified. A base case has been defined separately for each of the potential user groups likely to be impacted by the NDMIP.

As the primary service need for Nullinga is an opportunity (rather than a problem), it is considered there is no base case in which any user group will run out of water supply. However, there will be a point in time when CRC and MSC, having exhausted more cost-effective water supply options, will either need to develop a dam solely focussed on urban services (potentially at the Nullinga Dam site) or other climate dependent or independent supply to meet urban and industrial water demand due to population growth.

Over the assessment period:

- Cairns' supply security is met by existing and planned source options on the Mulgrave and Barron.
- MSC and TRC urban water supply security is adequately met through existing sources.
- In absence of NDMIP, irrigated agricultural production is expected to be relatively stable, with a small increase in production when MDWSS Efficiency Improvement Project works are completed, 8,304 ML/a of MP (refer Section 7.2.3), with a gradual shift from lower to higher value crops expected to continue in MDWSS.

8.1 Purpose

This Chapter defines the base case against which the Reference Project/s are to be assessed. The base case is defined as a 'business-as-usual' approach, occurring in the absence of a proposed project, i.e. no Nullinga Dam.

Development and analysis of a base case is essential as it is the benchmark against which the Reference Project/s is assessed. Therefore, the base case must be tightly specified and modelled on a whole-of-life basis, including all expected impacts, expenditures and benefits. A well-articulated base case:

- provides decision makers with information of what situation will exist in the absence of the proposed investment, policy change or project being approved
- provides the benchmark against which the economic analysis and SIE is compared and ultimately informs the investment choices
- highlights the ongoing impacts that would be reasonably expected or forecast to occur in the absence of any intervention.

As a result, the base case must:

- consider maintaining specified service levels provided by existing infrastructure (as appropriate)
- account for any actions which will be required in future to ensure service levels are reasonably maintained. Full lifecycle costs required to maintain those service levels must be accounted for.

8.2 Proposed Nullinga Dam

As discussed in Section 2.2, the site of the proposed Nullinga Dam is located on the Walsh River, approximately 55 km south-west of Cairns and approximately 24 km south-south-west of Mareeba. The Nullinga Dam was proposed in the 1950s as part of the investigation into the MDWSS. At the time, Tinaroo Falls Dam was chosen, due to its greater rainfall and higher elevation.

The Nullinga Dam could be used to augment water supplies to the MDWSS and nearby Cairns, so the base case has been defined separately for each of the potential user groups:

- Cairns urban and industrial water users
- Mareeba urban and industrial water users
- Agricultural and industrial water used located in the MDWSS, and neighbouring vicinity.

Under all considered scenarios there is no base case in which any user group will catastrophically run out of water supply. However, there will be a point in time when CRC and MSC, having exhausted more cost-effective water supply options, will either need to develop an urban focused dam (potentially at the Nullinga Dam site) or other climate dependent or independent (such as desalination) facility to meet urban and industrial water demand.

8.3 Overarching assumptions

Under the base case for the DBC the following overarching assumptions have been adopted:

- Base year is 2018-19
- analysis period is 30 years of operations.

A specific discussion of the base case for each user is provided below. The assessment undertaken in the DBC includes consideration of an analysis period of 50 years from the base year, to reflect the current Infrastructure Australia evaluation requirements.

8.4 Urban water

The urban water users in the defined Study Area include CRC, MSC and TRC.

8.4.1 Cairns

This section describes the base case with respect to water demand and supply for water users in the CRC area.

Cairns currently relies on Copperlode Falls Dam and extractions from Behana Creek for its urban water supply needs. In September 2015, CRC adopted a preferred strategy for implementing a series of short, medium and long-term actions to address the future demand for water in Cairns.

In 2015, CRC adopted the recommendations included in the report of the Water Security Advisory Group (WSAG) as the Cairns Water Security Strategy. This strategy aimed to develop a long-term (30+ years) water supply strategy that identifies a program of supply augmentations and demand management initiatives to ensure that Cairns has sufficient water to meet demand under normal and adverse environmental conditions.

In summary the source development schedule (Table 8-1) comprises four sources:

- first source: Mulgrave River Stage 1 and associated Draper Road water treatment plant (WTP) Stage 2

- second source and third source: Barron River Stage 1 and associated Kamerunga WTP; and Mulgrave River Stage 2 and associated Draper WTP Stage 3
- fourth source: a small variant of Nullinga Dam, a desalination plant or another source.

Table 8-1 Preferred Water Security Strategy for Cairns[87]

Source and Treatment	Aspect	Notes
Copperlode Falls Dam	Existing	
Freshwater Creek WTP		
Behana Creek Intake		
Draper Road WTP Stage 1	Planned	
Augment Behana Creek Intake		
Demand Management Strategy Parts A, B, C and D	Commence as soon as practicable	
Smart Metering		
Mulgrave River Stage 1 Associated WTP: Draper Road WTP Stage 2	1st additional source	Further assessment and monitoring
Barron River Associated WTP: Kamerunga WTP Stage 1	2nd / 3rd additional source	Requires further investigation before development proceeding including a comparative study regarding Barron River, Mulgrave River Stage 2 and Mulgrave Mill entitlement sources
Mulgrave Mill entitlement or Mulgrave River Stage 2 Associated WTP: Draper Road WTP Stage 3		Requires further investigation Only after environmental concerns investigated and resolved
Conversion of MDWSS Losses, Nullinga Dam Associated WTP: Kamerunga WTP Stage 2	Further investigation as soon as possible	WSAG forum continues

There are several points of uncertainty around the forward source planning for CRC, including:

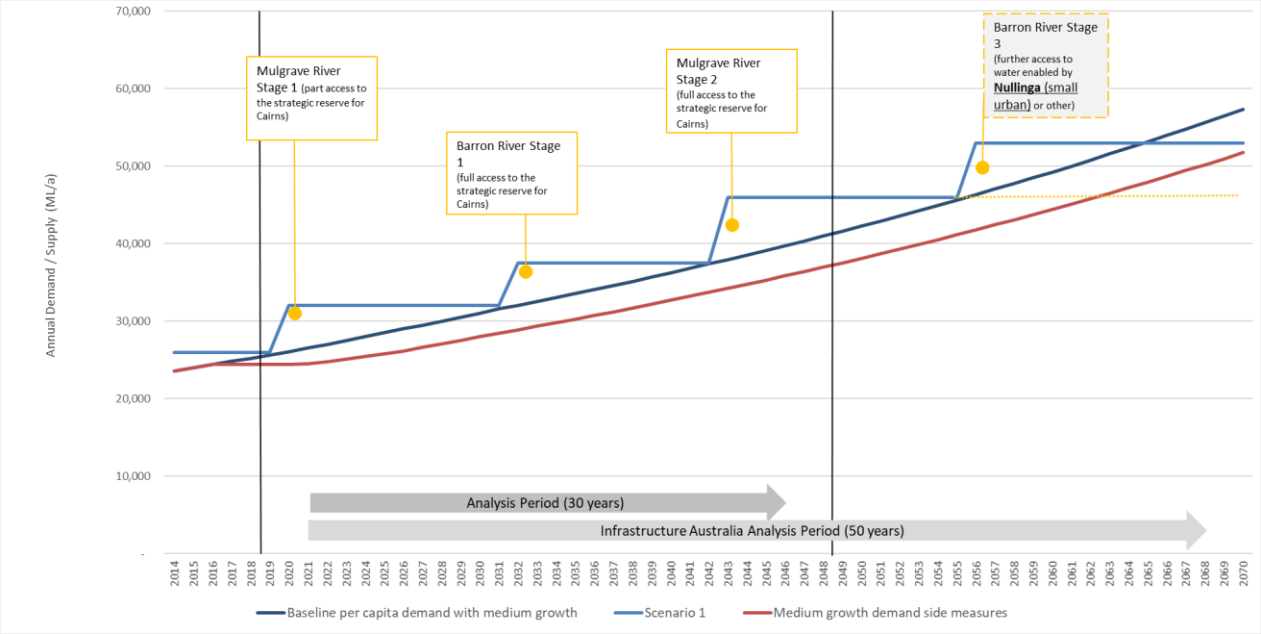
- demand growth, which is a function of population growth
- the outcomes of further investigations into the cost and feasibility of the identified source and treatment options.

Under a medium population growth forecast (see Figure 8-2), issued by the Queensland Government Statistician's Office (QGSO), CRC will either need to develop an urban focused dam (potentially at the Nullinga Dam site) or other climate dependent or independent (such as desalination) facility to meet urban and industrial water demand as the next source in 2055 (without demand management) and 2063 (with demand management). Thus, while Nullinga is identified in the source development schedule for Cairns it

[87] Cairns Regional Council, Our Water Security, Cairns Regional Council Water Security Strategy, Final Report, March 2015 – Table 15

falls outside the 30-year analysis period (for Building Queensland), but it falls within the 50-year analysis period (for Infrastructure Australia), see Figure 8-1.

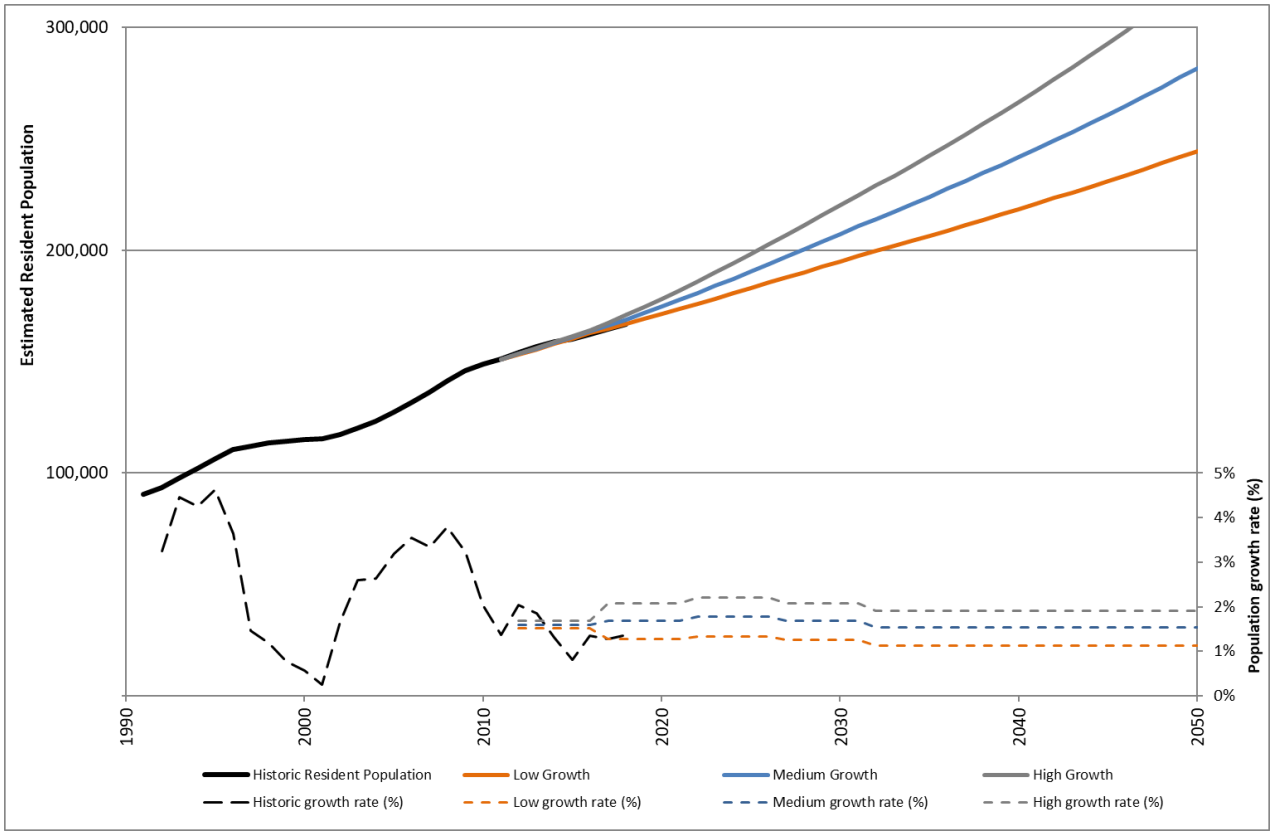
Figure 8-1 Supply augmentation for Cairns – Medium Population Growth[88]



At the SRG meeting in October 2018, it was commented that CRC's population growth could be higher than the QGSO projections to 2036 of 1.65 per cent (medium projection) and 1.99 per cent (high projection). This is confirmed in Figure 8-2 which shows that while population growth is currently tracking in line with the low growth scenario, there has been considerable historical variability and for most of the 1990-2018 period population growth was higher. A review of historical population growth identifies 15, 20 and 25-year average growth rates of 2.21 per cent, 1.95 per cent and 2.16 per cent, respectively.

[88] CRC data, Marsden Jacob analysis, 2018

Figure 8-2 Cairns Population Growth[89]



While Nullinga (urban only) appears in CRC's source development schedule there is considerable uncertainty associated with this source.

8.4.2 Tablelands Regional Council

This section assesses the base case with respect to water demand and supply for water users in the TRC area.

Potable water supply for the Tablelands region is sourced from a range of local rivers, lakes and bores.

The QGSO reports that from 2011 to 2036 the population of the Tablelands local government area is projected to increase from 24,372 to 29,677 persons, an average annual growth rate of 0.8 percent. Given the low growth rate and the small population the base case assumes that the prevailing water supply-demand balance does not represent a constraint.

8.4.3 Mareeba Shire Council

This section assesses the base case with respect to water demand and supply for water users in the MSC area.

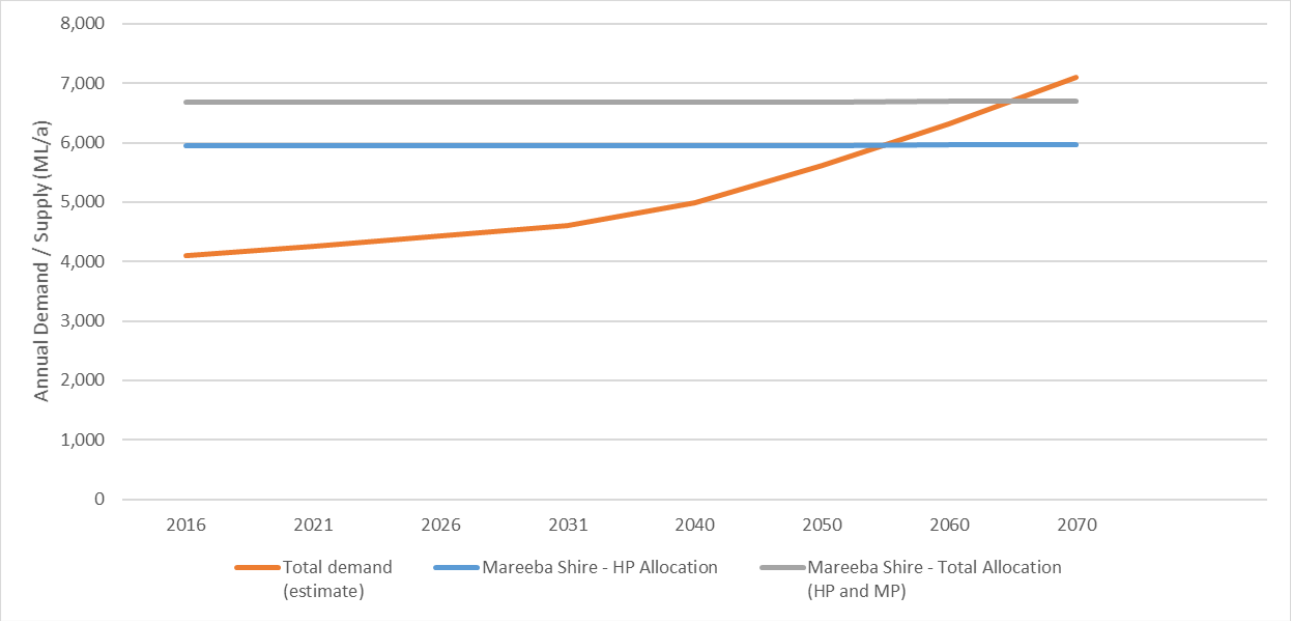
The MSC water supply system services mainly the catchment of Chillagoe, Dimbulah, Kuranda and Mareeba. However, reticulated sewerage system is limited to the townships of Kuranda and Mareeba only.

Water for these urban supplies is sourced from both the Barron River system and the MDWSS to supply these towns.

[89] CRC data (2018-19)

The base case assumes that the prevailing water supply-demand balance does not represent a constraint for MSC over Building Queensland's 30-year analysis period, however, it may emerge as a constraint towards the back end of the 50-year analysis period for Infrastructure Australia (see Figure 8-3).

Figure 8-3 Mareeba Shire supply and demand[90]



8.5 Industrial water use

Under the Base Case, it is assumed all industrial users will continue to be supplied by existing reticulated supply networks within the Mareeba, Tablelands and Cairns regions, and any future growth in this demand is expected to be approximately proportionate to population growth. As such, growth in demand from industry will be reflected in the growth figures for urban demand.

There are no anticipated constraints for current industrial users over the 30-year analysis period.

8.6 Agricultural water use

The MDWSS covers about 1,175 square kilometres, with the Tinaroo Falls Dam and an associated distribution system delivering water to about 1,097 customers.[8]

The MDWSS was established in the mid-1950s, and supply from Tinaroo Falls Dam is supplemented by Collins Weir on the Walsh River and other weirs in the scheme area. Sunwater, a government-owned corporation, owns and manages the MDWSS.

Irrigated agriculture is the largest component of water use in the scheme (Table 8-2)[91].

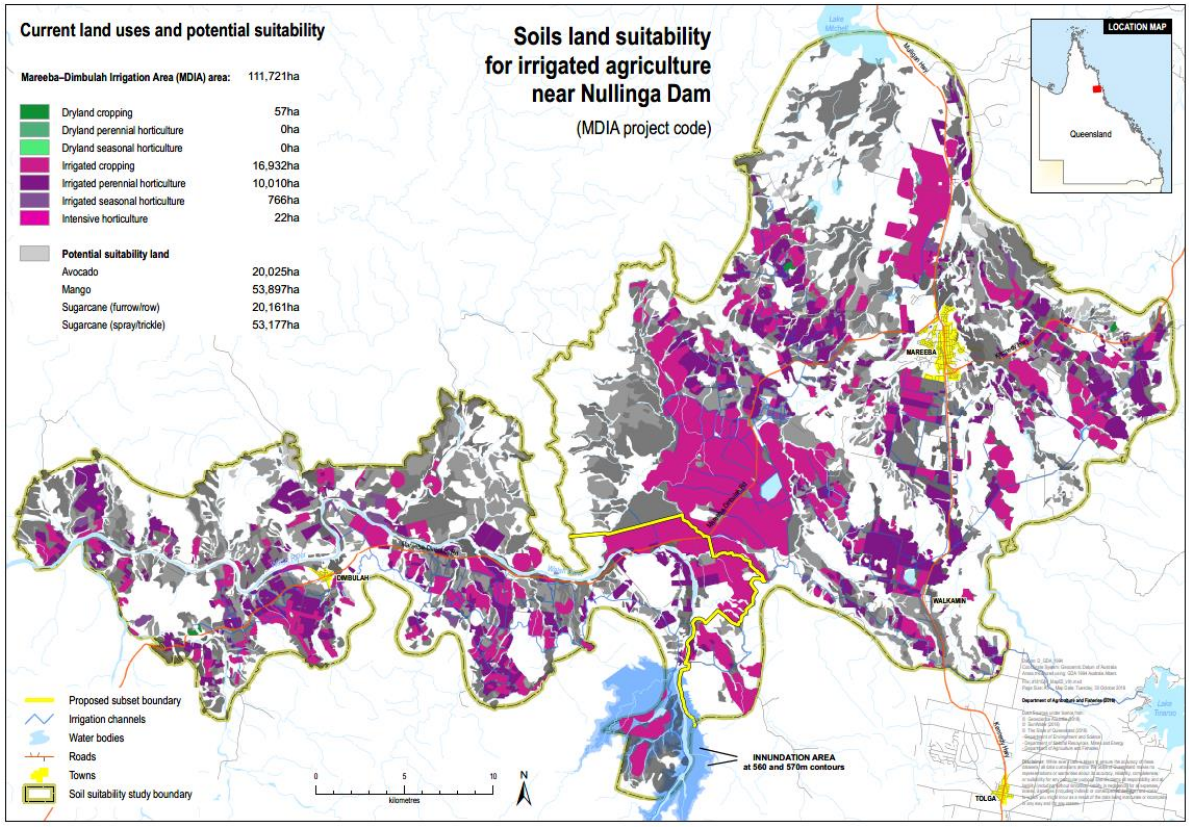
[90] MSC data (2018-19)
[91] Riparian allowance, channel harvesting and river harvesting are excluded from the figures

Table 8-2 Water use in the MDWSS, 2016–17[92]

Customer segment	Water entitlements1	Water available	Water delivered	Comment
Industrial	1,561	1,294	691	Barron Gorge Hydroelectric Power Station at Kuranda
Irrigation	151,202	152,169	109,135	Agricultural use
Urban	6,656	5,959	3,784	Towns such as Tinaroo, Mareeba, Mutchilba, Dimbulah.
Sunwater	45,005	45,002	25,308	Conveyance losses
Total	204,424	204,424	138,918	

The total area of the MDWSS is 111,721 hectares of which over 27,000 hectares (with the area irrigated fluctuating from about 18,000 to 27,000 hectares) is currently irrigated and there is over 53,000 hectares with suitable soils for irrigated agriculture (see Figure 8-4).

Figure 8-4 Land suitability mapping for irrigated agriculture in the MDIA[93]



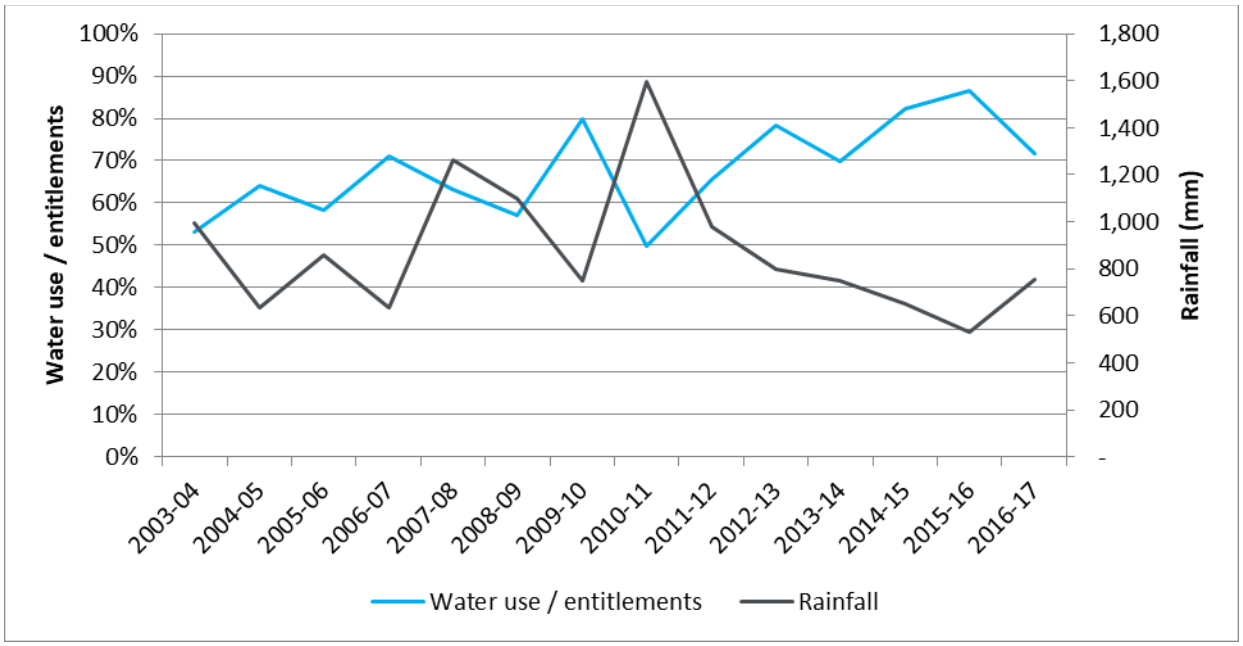
A large proportion of this land is located in the western zones, particularly the South Walsh part of the system, noting that land towards the west of MDWSS is considered less fertile for agricultural purposes, receives less rainfall and so is more dependent on water deliveries. Moreover, use of this land for irrigated

[92] Sunwater, 2017 Annual Performance Report, Mareeba Bulk, October 2017, p. 6.
[93] DAF (2018)

production is constrained because existing water supplies to the MDWSS are fully committed. Alternative options, such as efficiency gains (See 8.6.2) or new dam infrastructure, would therefore need to be progressed to allow for the potential expansion of irrigated agriculture.

Operational systems that have seen the most growth in terms of water use are South Walsh and Mareeba. The compound annual growth rates for South Walsh and Mareeba since 2002–03 are about 2.1 per cent and 3.5 per cent respectively (Marsden Jacob 2018). Recent years have also seen the limits of specific elements of the delivery system being reached, most notably for the East Barron system, for which peak demand now exceeds the capacity of the system. However, increased production is now constrained limited by the capability of the infrastructure in place to supply water (Figure 5-12).

Figure 8-5 Water use and availability in the MDWSS[94]



8.6.1 Higher value crops are expanding in the region

Recent discussions with irrigators in the region and with DAF have pointed to continued changes in the crop profile and industry growth as key drivers of future growth. This is confirmed by the Tablelands Agriculture Profile data, which shows that as at 2015 sugarcane production has grown but so too has the production of other high values crops:

- sugarcane = 10,956 hectares, an increase of 3,015 hectares since 2010–11
- bananas = 1,850 hectares, an increase of 578 hectares since 2010–11
- avocados = 950 hectares, an increase of 100 hectares since 2010–11

DAF has recently produced a Profile of the Atherton Tablelands Citrus Industry (October 2018)[95] which identifies that across the Atherton Tableland region:

- 124 growers

[94] Sunwater data, http://www.bom.gov.au/climate/averages/tables/cw_031066.shtml and Marsden Jacob analysis. 2017-18 annual report is not yet available (as at 15 Sept 2018)

[95] https://publications.qld.gov.au/dataset/profile-of-the-atherton-tablelands-citrus-industry/resource/668f31e4-14b6-4855-b04a-867f2059dbcd

- 1,133 hectares under production
- Australia's largest lime, red fleshed orange and pomelo production region
- continuing expansion for lime, lemon, mandarin, grapefruit and pomelo categories.

This confirms the observation from numerous stakeholders, including a consensus position of the SRG that there is an ongoing switch from lower value crops to permanent plantings of high value crops (avocados, bananas, mangos and table grapes have been identified) occurring in the MDWSS.

These producers are acquiring land and water from lower value producers, including farms that previously produced tobacco, nuts or sugarcane. This movement of water from lower to higher value users is confirmed by the permanent and temporary market trade data, which identifies that considerable volumes have been traded over the last several years (see Table 8-3 and Table 8-4).

Table 8-3 Permanent market summary

	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
No. of trades	68	116	92	90	75	128	96
Total volume	3779	11511	14470	5190	3326	30636	5436
Liquidity	2.5%	7.5%	9.4%	3.4%	2.2%	19.9%	3.5%

Note: Liquidity = trade volume/MP EOI (excl. non-tradeable Sunwater entitlements).
Source: Queensland water trade data, Marsden Jacob analysis.

Table 8-4 Temporary market summary

	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Total volume	19,649	30,196	26,949	34,818	46,162	37,992	27767
Liquidity	12.3%	18.9%	16.9%	21.8%	29.0%	23.8%	17.4%

Note: Liquidity = trade volume/EOI (excl. non-tradeable Sunwater entitlements).
Source: Queensland water trade data, Marsden Jacob analysis.

8.6.2 MDWSS Efficiency Improvement Project

In the coming years, water delivery efficiency gains from the improvement initiatives will be made available to irrigated agriculture and will support the growth of high value crops, reducing impacts on sugarcane production.

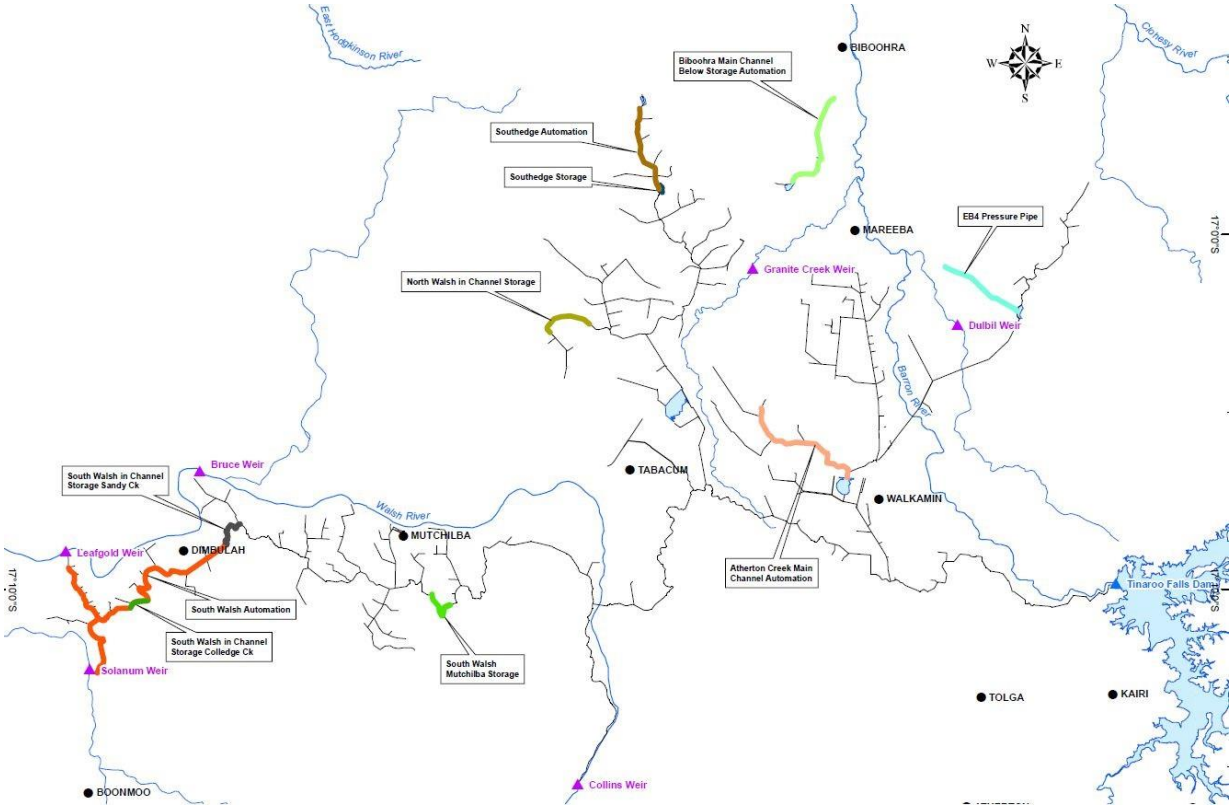
As discussed in Section 7.2.3, this Sunwater project will deliver the following six initiatives:

- 'EB4'. Construction of 4.5 kilometres pressurised pipeline system to replace open, earth channel
- Southedge. Conversion of 7km downstream section of open channel to pressurised pipeline and automation of channel upstream to the West Barron Balancing Storage
- South Walsh. In-channel and stand-alone earthworks construction of additional 50 ML balancing storage and installation of automated control gates within main channels
- Atherton Creek. Conversion of 2.5km downstream section from open channel to pressurised pipeline and of channel upstream to the Nardellos Balancing Storage
- Biboohra Main Channel downstream of storage. Installation of 5 automated control gate
- North Walsh. In-channel earthworks construction of additional 5 ML of balancing storage.

These works are expected to allow at least 8,304 ML/a of existing loss allocations available for sale to the water market. Design work for the six sub-projects are being finalised, with construction expected to occur between 2019 and 2021.

Following confirmation of the delivery loss savings achieved, water is expected to be made available by 2023.

Figure 8-6 MDWSS Efficiency Improvement Project[96]



Sunwater will construct approximately 4.5 kilometres of pressurised pipeline, creating an additional three balancing storages with capacities of 200 ML, 100 ML and 5 ML, as well as installing 25 automated gates in key reaches of the channel system.

8.6.3 Agricultural production forecast

Based on the analysis of agricultural production in the region and interviews with local stakeholders, the base case assumes that the switch to production of high value crops such as avocados, mangoes and citrus will continue at an average rate of one percent per annum.

It is anticipated that irrigators will continue to turn to the water market to facilitate this transfer of water from lower to higher value production. Figure 8-7 shows that this is anticipated to result in a transfer of water from lower value crops (such as sugarcane and fodder) towards higher values crops. The tradeable allocation that is made available by the MDWSS efficiency improvement project temporarily halts the reduction in sugarcane production, because it is assumed that sugarcane production will most rapidly take up the available water.

[96] Sunwater, 2018

The forecast modelling indicates that this shift in crops will marginally increase the irrigated area because some of the higher values crops use less water per hectare of land, than is currently the case for sugarcane (see Figure 8-8).

Figure 8-7 Base Case, irrigated agricultural production outlook (ML)[97]

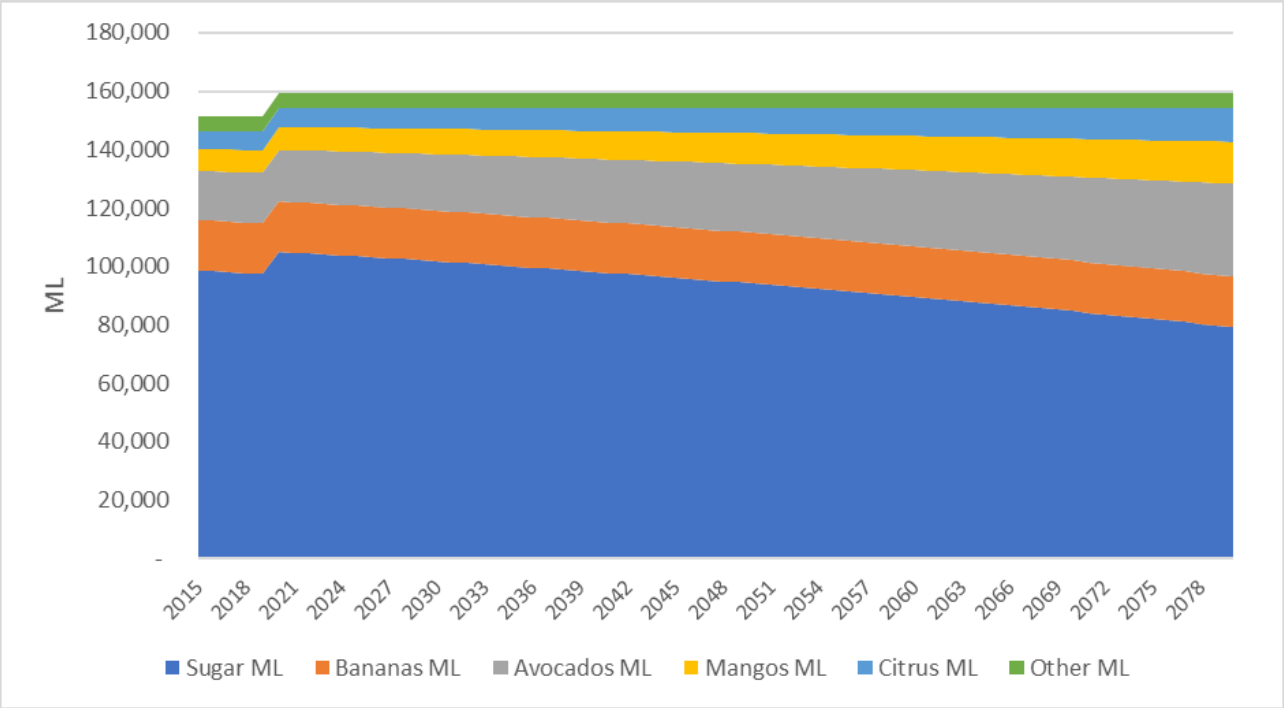
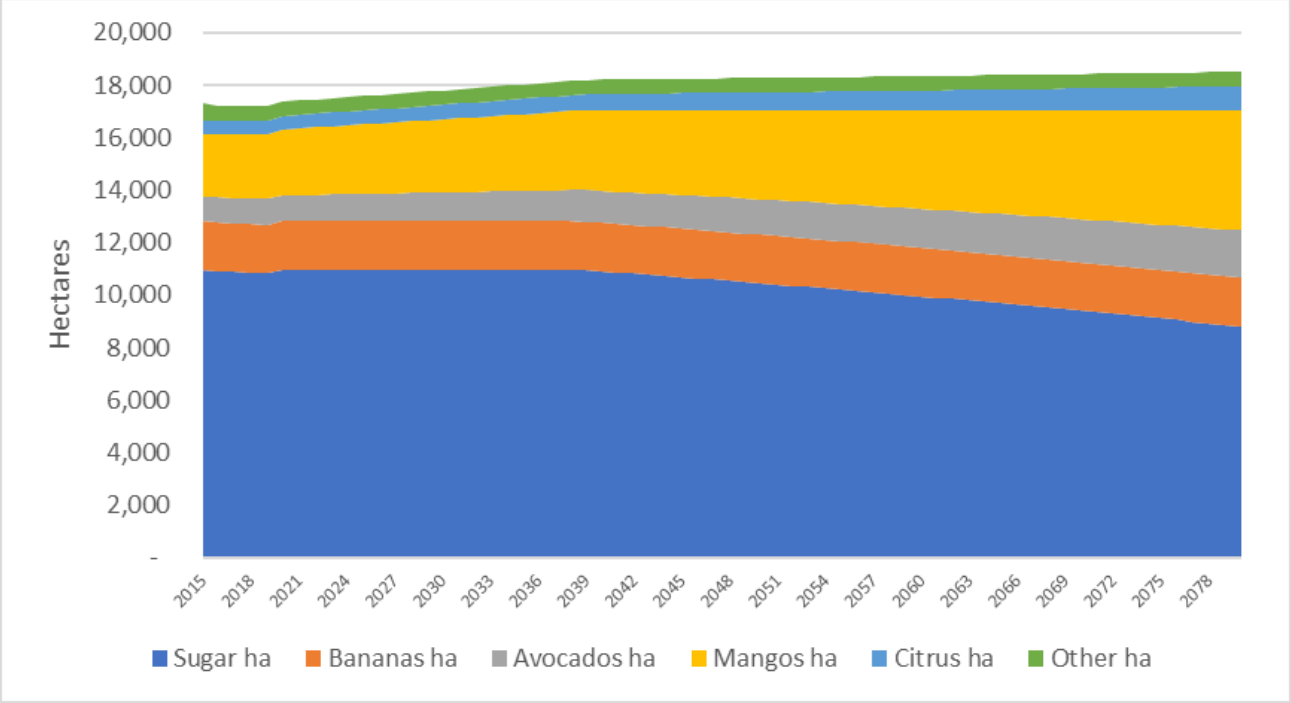


Figure 8-8 Base Case, irrigated agricultural production outlook (Ha)[98]



[97] Marsden Jacob analysis
[98] Ibid

8.7 Summary of the Base Case

Table 8-5 provides a summary of the base case for each of the user groups, as discussed above.

Table 8-5 Summary of the Base Case

WATER USER	SUMMARY OF BASE CASE
Cairns	▪ Cairns' water security strategic plan includes the implementation of a demand management strategy and utilising strategic reserves in the Mulgrave and Barron Rivers, after which access to additional water in the Barron River—as could be enabled by Nullinga Dam—would provide continued benefit for Cairns' population growth. ▪ CRC's long-term capital works program has its next supply augmentation (Mulgrave River Stage 1) scheduled for completion by mid-2026. ▪ After implementation of Mulgrave River Stage 1, Cairns' water security strategy includes a future decision point about whether to proceed with Stage 2 or access the strategic reserve in the Barron River. The outcome of this decision also influences the timing of future supply augmentations. ▪ Under a medium population growth forecast, by the Queensland Government Statistician's Office (QGSO), a small variant of Nullinga (or equivalent) is identified as the next source (after Mulgrave Stage 2) in 2055 (without demand management) and 2063 (with demand management). ▪ While Nullinga is identified in the source development schedule for Cairns it falls outside the 30-year analysis period (for Building Queensland). ▪ If a high population growth scenario eventuates then the need for water from Nullinga Dam would be brought forward.
Mareeba and Tablelands	▪ Over the 30-year base case period Mareeba and Tablelands supply security is adequately met through existing allocations.
Agriculture	▪ The MDWSS is operated by Sunwater, with the Tinaroo Falls Dam and an associated distribution system delivering water to about 1,097 customers. ▪ Irrigated agriculture is the largest component of water use in the MDWSS, with a diverse set of crops being grown. Sugarcane is the dominant crop; however, several other crops are also grown at increasing scale, including mangoes, avocados, bananas and citrus. ▪ There is over 50,000 hectares in the MDWSS area that could be irrigated. A large proportion of this land is in the western zones (particularly the South Walsh part of the system), noting that land towards the west of MDWSS is considered less fertile for agricultural purposes, receives less rainfall and so is more dependent on water deliveries. ▪ Water allocation are fully utilised, so expansion of irrigated production is constrained by access to additional water supplies. ▪ Recent discussions with irrigators in the region and with DAF have pointed to continued changes in the crop profile and industry growth as key drivers of future growth. It is understood that expansion is now particularly occurring in high value crops, who are purchasing land and water from lower value crops.

WATER USER	SUMMARY OF BASE CASE
Industrial water users	▪ There are no anticipated constraints for current industrial users over the 30-year analysis period ▪ Growth in demand from industry will be reflected in the growth figures for urban demand