Department of Natural Resources, Mines and Energy

Chinchilla

regional water supply security assessment

WESTERN DOWNS REGIONAL COUNCIL

Queensland Government

CS8820 11/18

This publication has been compiled by the Department of Natural Resources, Mines and Energy

Introduction

The town of Chinchilla is located in south-eastern Queensland's high country on the Darling Downs, 290 km from Brisbane, and is famous for its biennial watermelon festival.

Western Downs Regional Council is the registered water service provider for Chinchilla's urban water supply system, providing both water and wastewater services to Chinchilla. Based on the Queensland Government Statistician's Office estimates, Chinchilla currently has a population of around 6200, and is forecast to increase to about 8000 by 2041.

Safe, secure and reliable water supplies are an essential resource for Chinchilla, not only providing for the health and wellbeing of the community, but also providing opportunities for economic and community development.

The Queensland Government, through the Department of Natural Resources, Mines and Energy (DNRME), and council committed to a partnership to investigate and establish a shared understanding of the existing security of Chinchilla's urban water supply system and its capacity to support current demands and future growth. Arising from this partnership, this regional water supply security assessment (RWSSA) provides valuable information to the community and water supply planners about Chinchilla's urban water supply security, thereby providing a foundation for future water supply planning by council.

This assessment has considered a number of water demand scenarios for the population of Chinchilla to identify the timing and magnitude of potential water supply risks. The assessment showed that council's existing supply system, incorporating supply from the Chinchilla Weir Water Supply Scheme augmented with treated coal seam gas (CSG) water and the application of council's water restriction regime, is able to meet Chinchilla's urban water requirements with a low likelihood of supply failure to at least 2041. However achieving this supply security out to 2041 is dependent on the application of water restrictions and the continuing availability of the CSG water to council. The assessment found that under the council's existing water restriction regime it is likely that moderate to severe restrictions could be experienced relatively frequently.

The information presented in the assessment is based on the capacity of the existing water supply system and associated infrastructure.

Image courtesy of Tourism and Events Queensland

Water supply sources

Chinchilla's primary bulk water source is the Chinchilla Weir Water Supply Scheme. Water in the Chinchilla Weir Water Supply Scheme is managed under the Water Plan (Condamine and Balonne) 2004 and administered through the Condamine and Balonne Resource Operations Plan 2008. Chinchilla's water supply is supplemented by supply of treated coal seam gas water from the Queensland Gas Company's Kenya Water Treatment Plant (since 2013).

Chinchilla Weir was constructed in 1975 and is located about 9 km southwest of Chinchilla on the Condamine River. Chinchilla Weir, owned and managed by SunWater, has a full supply volume of 9780 megalitres (ML) and a minimum operating volume of 120 ML. Chinchilla Weir is the sole storage in the Chinchilla Weir Water Supply Scheme (WSS), which provides water for irrigated agriculture both adjacent to the ponded area and downstream along the Condamine River. Council holds high priority water allocations of 1160 ML per annum (ML/a) from the Chinchilla Weir WSS.

Chinchilla Town Weir, locally known as Charleys Creek Weir, was Chinchilla's sole water supply source prior to the construction of Chinchilla Weir. Council holds a small water entitlement of 6 ML/a from the Chinchilla Town Weir; however, this entitlement is less reliable than council's supply from the Chinchilla Weir WSS. Council has the option to draw up to 200 ML/a of its Chinchilla Weir WSS allocation from the Chinchilla Town Weir storage, subject to water being available in the Chinchilla Town Weir.

The Kenya Water Treatment Plant (WTP), some 20 km southwest of Chinchilla Weir, supplies treated CSG water into Chinchilla Weir via SunWater's Kenya to Chinchilla Weir Pipeline. Through a contractual arrangement with SunWater, council has access to about 40 ML of CSG water each month (500 ML/a) which it uses to supplement the supply to Chinchilla. The volume of CSG water supplied into Chinchilla Weir to date has substantially exceeded the volume required by council, and is taken by irrigators under contract. However, in the event that the supplies of CSG water become depleted, council have the first right to take the 40 ML/month of CSG water as long as this quantity, or more, is being supplied into Chinchilla Weir.

As water levels in Chinchilla Weir fall, the storage area upstream of the weir becomes a series of separated water holes. The water hole from which council extracts Chinchilla's urban water supply is located about 8 km upstream from Chinchilla Weir, and becomes separated when water levels in the weir fall below about 19% of the weir's full supply volume, or around 1850 ML. Accessing the remaining volume of water stored in the weir (including CSG water) down to the minimum operating volume of 120 ML would require accessing water from these separated water holes.

Water extracted from Chinchilla Weir is transferred to Chinchilla by pipeline for treatment at Chinchilla's WTP as shown in Figure 1, and subsequently delivered to customers through the reticulation network.

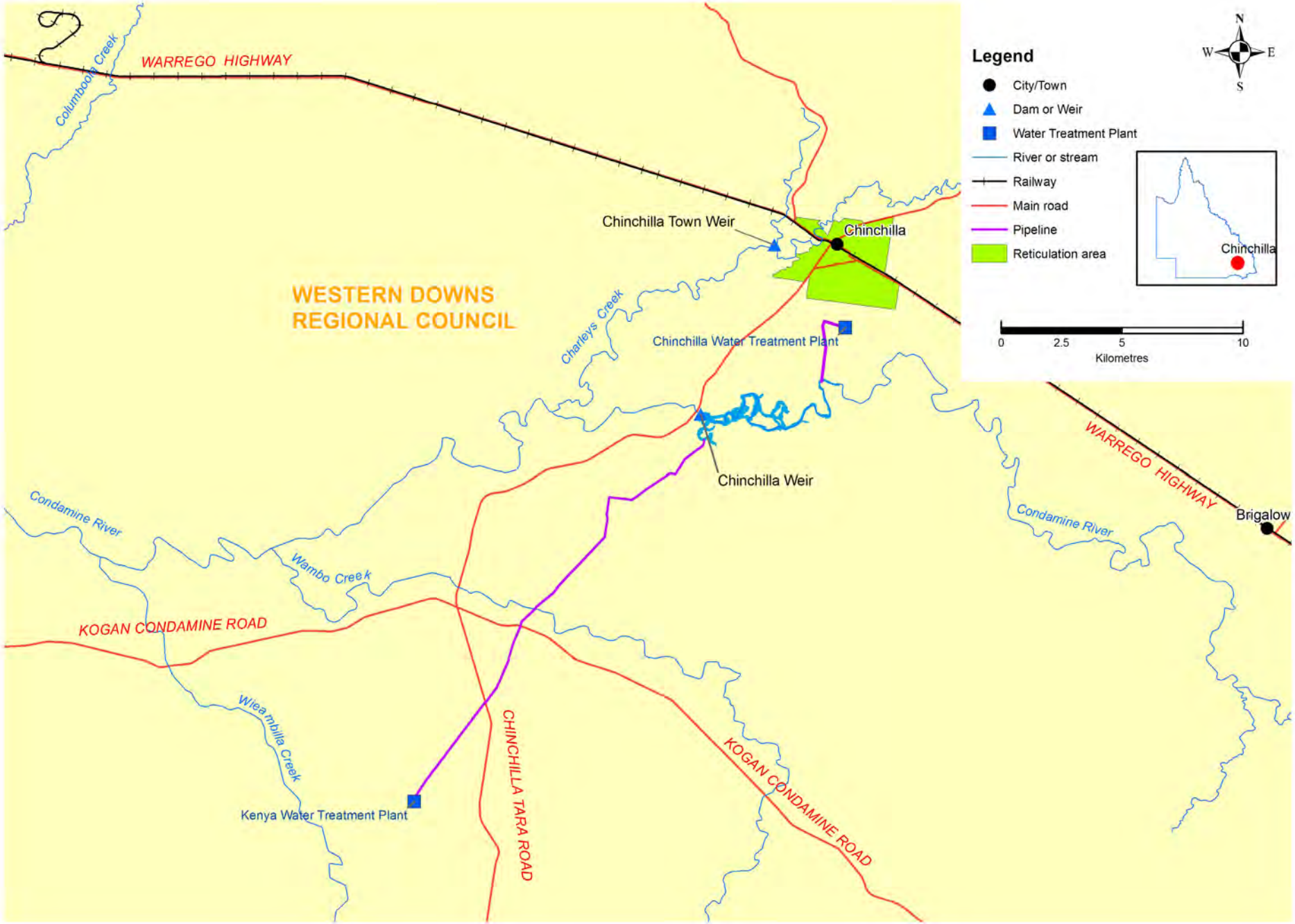

Figure 1: Location of Chinchilla and the water supply sources of Chinchilla Weir and Kenya Water Treatment Plant

Image courtesy of Tourism and Events Queensland

Water users and water demand

Chinchilla's reticulation network provided water for urban purposes to about 6200 people as at June 2017.

Chinchilla's reticulation network

Council's water supply and use data shows that the total volume of water sourced for Chinchilla's reticulation network over the 5 years from 2012–13 to 2016–17 averaged 999 ML/a (ranging from 873 ML/a to 1155 ML/a). However, during the first three years of this period (2012–13 to 2014–15), water was supplied from the reticulation network (trucked from standpipes) to workers camps associated with the CSG operations. This resulted in the volume of water supplied during this period being elevated. Data from the Queensland Government Statistician's Office indicates that Chinchilla's transient population (which includes the non-resident workers at these camps, tourists and other visitors) declined from around 1200 people in 2012–13 to under 500 people in 2016–17. Council consider that the water demand during 2015–16 and 2016–17 is more representative of current and ongoing average urban demands for Chinchilla. Based on the total volume of water sourced and the serviced population, the average daily total water demand on Chinchilla Weir from the reticulation network during these latter two years was 397 litres per capita per day (L/c/d). This figure accounts for residential, commercial, municipal, and industrial water supplied from the reticulation network, plus any system losses. It also includes water use by the transient population, such as tourists and temporary workforces; however, the transient population is not included in the serviced population figures.

The Statewide Water Information Management data indicates residential water use was about 66% of the total water demand for the period 2015–16 to 2016–17. Based on water use data from council records, this equates to an average residential demand of 264 litres per person per day (L/p/d).

Water demand affected by climate variations

Urban water demand varies between years and within each year, depending on various factors including climatic conditions such as rainfall, with higher demand usually occurring during hotter drier periods. However, during extended dry periods weir levels may become very low and, as a result of water restrictions being applied, water use may be lower than it would otherwise have been.

The long-term historical rainfall data for Chinchilla (1889–90 to 2016–17) is summarised in Table 1 and shows an average rainfall for Chinchilla of 663 mm/a. Also shown in Table 1 is the average rainfall over the recent 2012–13 to 2016–17 period, which is 14% lower than the average over the longer term, and 4% lower than the average rainfall over the climate change reference period (1986–2005) referred to in the later Climate Change section.

Table 1: Summary rainfall statistics for Chinchilla

Rainfall station No. 041017 Chinchilla WTP.	Annual average (mm)	Median (mm)	Historic low (mm)	Historic high (mm)
1889–90 to 2016–17	663	633	273	1479
1986 to 2005	593	576	364	826
2012–13 to 2016–17	570	515	446	792

Figure 2 illustrates the relationship between the annual (July–June) rainfall recorded in Chinchilla (Station 041017 Chinchilla Water Treatment Plant) for the period 2012–13 to 2016–17, and Chinchilla's annual water demand over the same period. During this period Chinchilla's annual water demand varied from year to year, ranging from 388 L/c/d to 566 L/c/d.

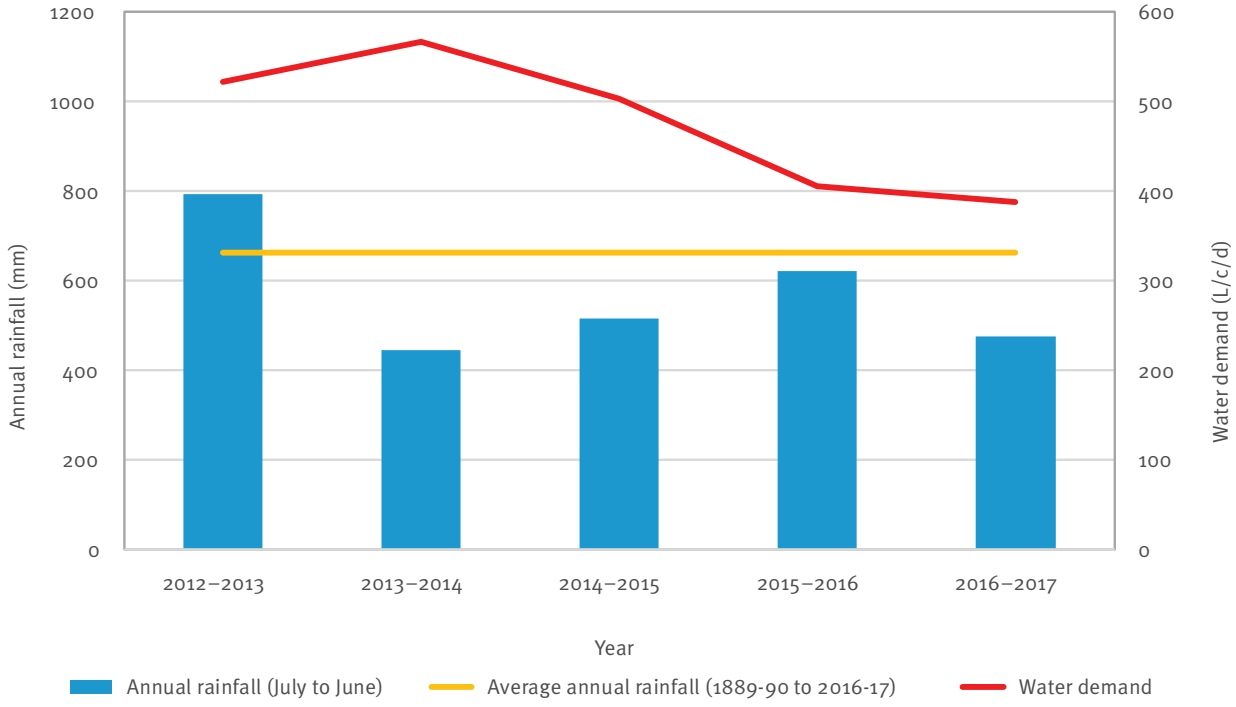

Figure 2: Annual rainfall and water demand for Chinchilla

Image courtesy of Tourism and Events Queensland

Climate change

The Queensland Government provides climate change projections for 13 Queensland regions, including an 'Eastern Downs' region in which Chinchilla is located. The projections are based on data from the CSIRO and the Bureau of Meteorology, and are referenced against the historical period 1986–2005 for temperature, evaporation and rainfall. The climate change projections are regularly reviewed and revised as new data and improved methodologies become available. In general, Queensland's future climate is projected to be warmer and drier, with increased evaporation and a potential increase in the annual and inter-annual variability.

For the 'Eastern Downs' region under an unchanged greenhouse gas emission scenario, the projected change in climatic median values by 2030 (as at August 2018) are:

- average annual temperature may increase by 1.1°C
- average annual evaporation may increase by 4%
- average annual rainfall may decrease by 5%.

These projections are an average for a region, and therefore the degree of change across the region may vary, but if applied to rainfall for Chinchilla this would result in an average annual rainfall for Chinchilla of 563 mm/a in 2030, which is slightly less than the average rainfall experienced during the recent 2012–13 to 2016–17 period of 570 mm/a.

The projected climatic changes may potentially result in reductions in water supply availability and increases in average annual water demands within the region. Further, an increase in the annual and inter-annual climatic variability may result in longer dry periods, consequently increasing the duration of higher demand periods.

Other users of the bulk water supply sources

Agriculture

The Western Downs region is dependent on agriculture and agricultural support industries (e.g. rural produce and machinery suppliers). The main agricultural industries in the Chinchilla area include livestock (mainly cattle, sheep and pigs) and livestock products, and crops including irrigated and dryland cereal, cotton crops and horticultural crops including watermelons.

Water used for agricultural purposes around the Chinchilla area is primarily supplied through unsupplemented water allocations and, to a lesser extent, supplemented water allocations supplied from the Chinchilla Weir WSS and various water licences. In addition, the majority of the CSG water produced by the Kenya Water Treatment Plant is currently used for agriculture in the area.

Agricultural water demand from the Chinchilla Weir WSS is more than double the volume of the urban water demands. To help conserve water supply for high priority allocations, the Condamine and Balonne Resource Operations Plan places limits on the releases of scheme water that can be made from Chinchilla Weir when the weir is below 294.39 m AHD (Australian Height Datum)—around 6000 ML in storage. Further, no releases of water can be made to supply water allocations downstream of the weir (which are primarily used for agriculture) when the storage level in Chinchilla Weir is less than or equal to 292.71 m AHD—around 3250 ML in storage. In addition, medium priority water must not be taken from the Chinchilla Weir storage when Chinchilla Weir is less than or equal to 292.71 m AHD.

Water allocations in the Chinchilla Weir WSS are also subject to a system of announced allocations, which determine the percentage of the allocation volume that can be extracted from the WSS throughout the year. Announced allocations are calculated according to formulas provided in the Condamine and Balonne Resource Operations Plan, based on (among other things) the available water in the storage. Historical water-use data shows that, for the 12 year period from 2004–05 the annual volume of water used for agriculture was strongly correlated with the announced allocation during early summer months, even when announced allocations were significantly increased later in the water year.

Industry

There is no significant industrial water demand on Chinchilla's water supply sources from industries outside the Chinchilla urban area.

The main industries in Chinchilla are associated with retail trade, agribusiness, manufacturing, construction, tourism and transport. The water use by these businesses is accounted for within the total water demand figures for the network, under the category of industrial, commercial and municipal water use.

Image courtesy of Tourism and Events Queensland

Historical performance of Chinchilla Weir

The recorded storage behaviour of Chinchilla Weir from 2002 to 2017 is shown in Figure 3. While there have been no urban supply failures to date from Chinchilla Weir, the water level has fallen below 292.71 m AHD, or about 3250 ML, on a number of occasions during this period. As discussed earlier, below this weir level medium priority water must not be taken from Chinchilla Weir's storage, nor releases of scheme water made from the weir. At this storage level there is around two years' urban water supply remaining for Chinchilla (assuming current demand, supply of CSG water, no other inflows into the weir, all available water in the storage can be accessed, and council's water restrictions regime is applied).

Council's water restriction regime is discussed in more detail later.

As previously mentioned, when the water level in Chinchilla Weir falls below about 19% of full supply volume (about 1850 ML), the upstream system becomes a series of separated water holes. Therefore, the frequency of water levels falling below this level to, say, 15% of full supply volume becomes an important consideration, due to the additional complexities associated with accessing water from the separated water holes. Figure 3 shows the performance of the Chinchilla Weir storage (2002–2017) and the occurrence of water levels declining to the point at which the system becomes a series of separated water holes (19% of full supply volume).

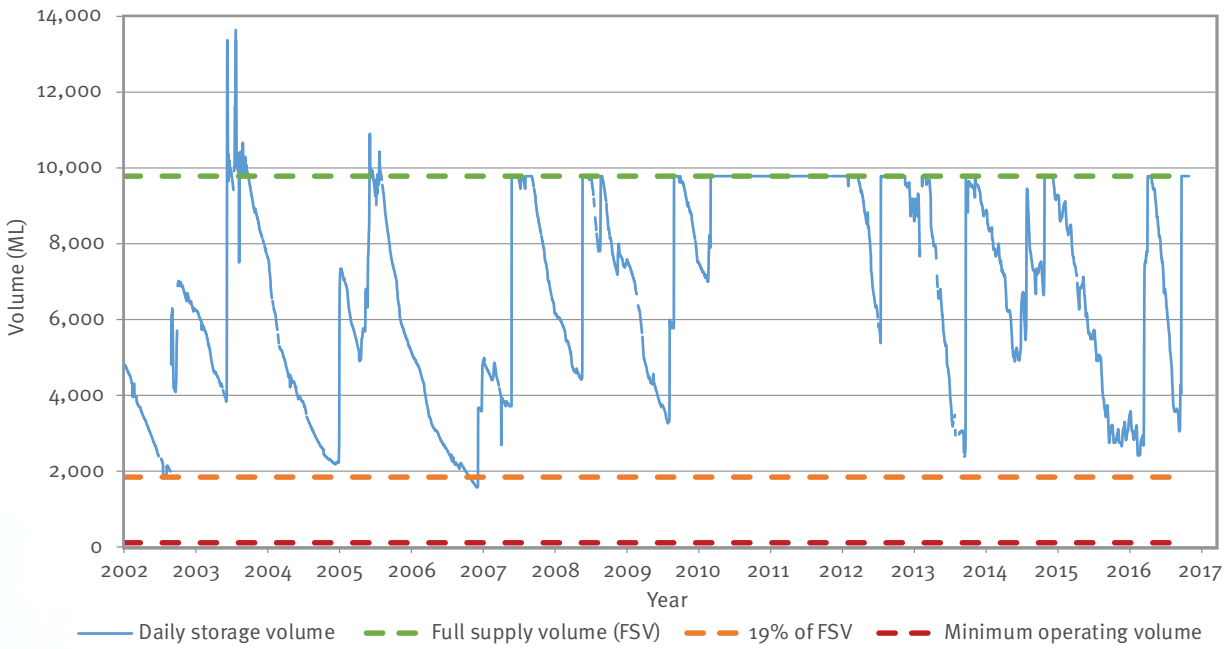

Figure 3: Chinchilla Weir – Recorded storage behaviour from 2002–2017

Coal seam gas water supply

Since 2013, the recorded storage behaviour of Chinchilla Weir includes the effects of the supply of CSG water from the Kenya Water Treatment Plant on water levels in the Weir. The monthly volume of CSG water supplied into the Chinchilla Weir storage is shown in Figure 4 below. Between August 2013 and April 2017, on average about 870 ML/month (about 10 500 ML/a) was supplied into Chinchilla Weir. Supply of CSG water into Chinchilla Weir between May 2017 and June 2018 was lower, with a monthly average of 416 ML (ranging from 212–619 ML/month).

The Chinchilla CSG operations are part of the larger Surat Gas Project which, for the purposes of the Environmental Impact Statement (EIS), adopts a project life of 35 years. Following the initial 'ramp-up' period of 4–5 years starting in 2014, peak production is expected to occur for around 20 years, suggesting that the CSG operations may continue until at least 2038. Production is then expected to decline. It is important to note that continued CSG production is dependent not only on the availability of the resource, but also on market forces which determine the ongoing viability of the CSG operations. Additionally, the extraction of water associated with this production generally declines over time.

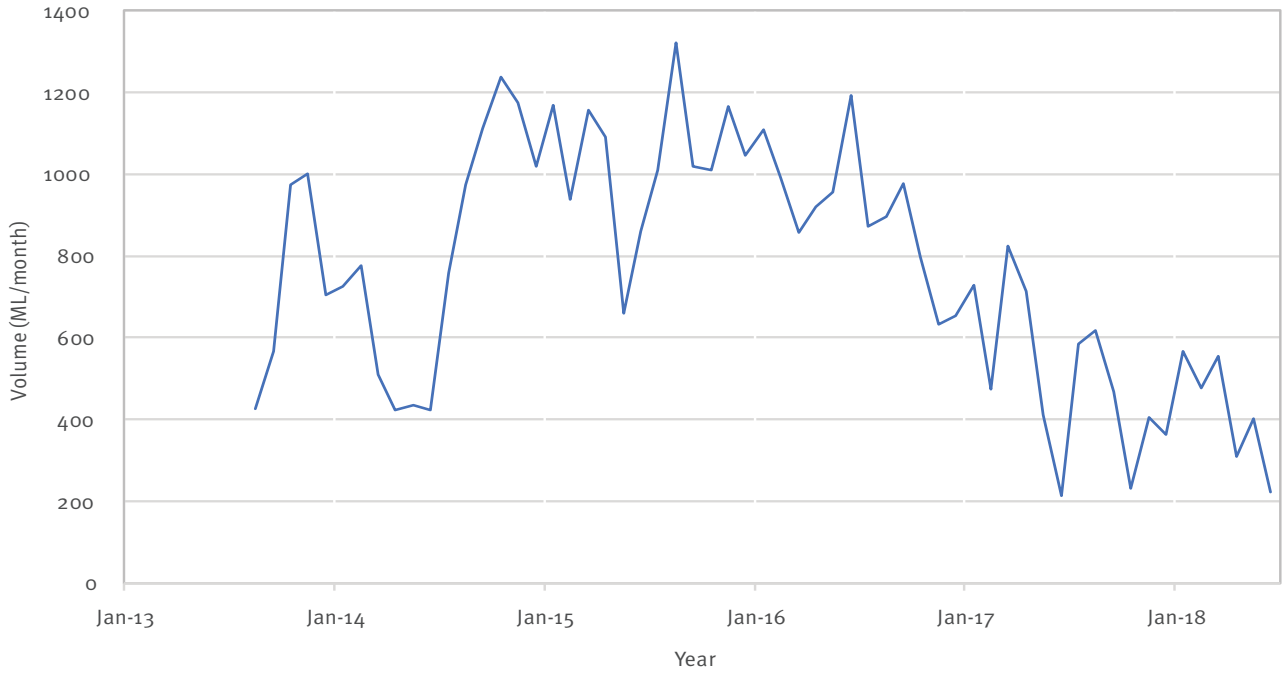

Figure 4: Monthly volume supplied into Chinchilla Weir from the Kenya to Chinchilla pipeline

Image courtesy of Tourism and Events Queensland

Future water demand

Well-founded water supply planning necessitates an understanding of the likely and possible changes in water demand into the future.

Chinchilla's reticulation network

The resident population of Chinchilla serviced by the Chinchilla reticulation network is projected to increase from approximately 6200 as of June 2017 to between about 7700 and 8400 people by the year 2041, depending on the growth rate achieved (1% growth rate as forecast by council or around 1.5% as forecast by the Queensland Government Statistician's Office).

Water demand projections for Chinchilla's reticulation network have been developed based on a water demand of 397 L/c/d (the average water demand for Chinchilla's reticulation network during the period 2015–16 to 2016-17) and population growth rates of 1% and around 1.5%.

The use of average demand figures provides a means of directly comparing future demand projections to determine when demand is likely to exceed available supply. For planning purposes, this means an appropriate balance can be reached between the cost of water supply and the demand for available water.

The projected water demands for Chinchilla are shown in Figure 5, and indicate that Chinchilla's average annual water demand could be around 1160 ML/a by 2041 (equal to council's allocation from the Chinchilla Weir WSS, but ranging from about 1120–1220 ML/a under 1% and 1.5% annual population growth, respectively). At 1.5% annual population growth, Figure 5 shows that Chinchilla's

average urban demand may exceed council's entitlement from the Chinchilla Weir WSS (excluding CSG water) by around 2038 (see red projection line). Actual water demand in any particular year may be higher or lower for a variety of reasons, including variations in climatic conditions. The projections will also remain subject to ongoing monitoring of actual population growth and variations in water use trends (e.g. changes in water use practices may increase or decrease consumption).

It is worth noting that the water demand figure of 397 L/c/d (which is used in Figure 5, above) is about 20% lower than the five year average (477 L/c/d, from 2012–13 to 2016–17), which included water supplied to a larger transient population (including CSG workers' camps).

If the transient population being supplied with water was to increase disproportionately to the resident population in the future (for example, due to increased CSG operations in the area), the average 'per capita' water demand figure may also increase, resulting in higher average annual urban demands. For example, at an average urban demand of 477 L/c/d and a population growth rate of 1% per annum, Chinchilla's average urban demand may be around 1340 ML/a in 2041 and may exceed council's entitlement from the Chinchilla Weir WSS (excluding CSG water) by around 2028.

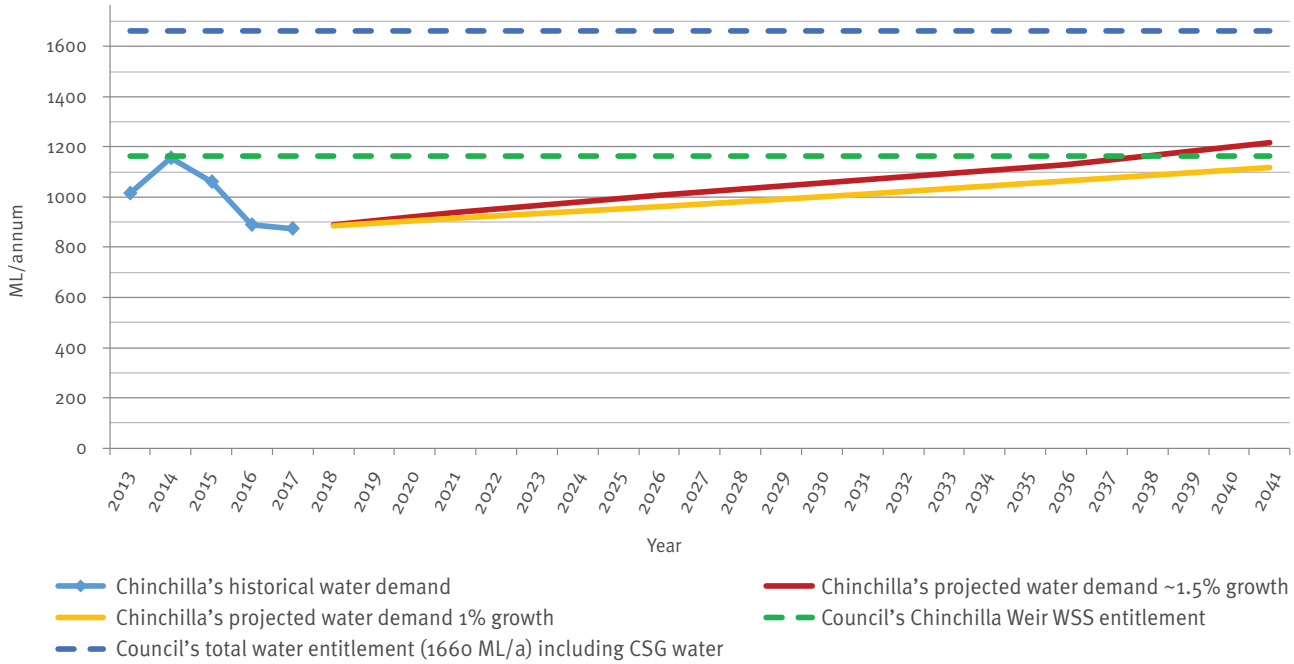

Figure 5: Historical and projected water demand (based on 397 L/c/d) for Chinchilla

Image courtesy of Tourism and Events Queensland

Other users of the bulk water supply sources

Agriculture

The agricultural sector, both upstream of and around Chinchilla, is already well established. In the case of irrigated agriculture, active strong use of the available water supplies is evident, including the use of both supplemented and unsupplemented water entitlements, as well as of other sources such as CSG water.

It is anticipated that the water needed to support further growth in irrigated agriculture will need to come from more efficient use of existing water entitlements and or alternative sources. There are no reserves of unallocated surface water in the Condamine and Balonne Water Plan, and although there are general reserves of groundwater, including sediments above the Great Artesian Basin (3000 ML/a) and Condamine fractured rock (660 ML/a), these are limited.

Industry

Future growth in industry, and associated industrial water demand, is largely subject to changes in population and/or changes in the global economic environment that could lead to increased demands for exported products from the region. Council actively promotes the development of industry and manufacturing in the Western Downs Region, and works with industry leaders, prospective developers and new businesses to encourage growth in this sector. However, at this stage, there are no anticipated large-scale industrial developments or changes that are considered likely to increase demand from the Chinchilla Weir WSS.

Water supply system capability

Hydrologic assessments have been undertaken to determine the capability of Chinchilla's existing bulk water supply system to meet current and projected future water demands.

Hydrologic assessment of Chinchilla's water supply system

Both historical and stochastic modelling techniques were used to simulate the performance of Chinchilla's water supply from Chinchilla Weir. Historical modelling was used to demonstrate how the water supply would have performed under historical climatic conditions for a range of demand levels and operating arrangements. Stochastic modelling was used to demonstrate how the water supply may perform under a wider variation of potential climatic scenarios, including during more severe droughts than those in the historical period of record.

Stochastic modelling involves generating data sequences that incorporate key statistical indicators from the historical data. One hundred replicates of 10 000 years of stochastic rainfall, evaporation and streamflow data were generated for Chinchilla Weir's catchment area, and hydrologic modelling of each of the 100 replicates undertaken. Median outputs from the stochastic modelling have been presented in this assessment. Use of median outputs means that half of the replicate sequences had a lower frequency and half had a higher frequency of an event occurring.

The hydrologic assessments assume that all existing water entitlements from the dams or watercourses that support the system are fully developed and operational, with the exception of the water entitlements used to supply Chinchilla's reticulation network. Chinchilla's water demands were represented at various total annual demand levels up to a demand of 1660 ML/a (equal to council's existing 1160 ML/a entitlement from the Chinchilla Weir WSS plus the 500 ML/a of CSG water).

Consideration has been given in this assessment to both the capability of Chinchilla's supply from the Chinchilla Weir WSS with supplementation by CSG water from the Kenya Water Treatment Plant, as well as its capability if its supply is limited to the Chinchilla Weir WSS as a stand-alone system. For the stand-alone system the maximum water demand assessed for Chinchilla was 1160 ML/a. For the augmented supply system, the hydrologic assessment assumed that CSG water would always meet 1.37 ML of Chinchilla's daily demand (equivalent to a rate of 500 ML/annum).

In an effort to reduce water consumption and extend the duration of the available water supply during extended dry periods, council has established a water restriction

Image courtesy of Tourism and Events Queensland

Image courtesy of Tourism and Events Queensland

regime for Chinchilla based on the storage volumes in Chinchilla Weir. The water restrictions primarily target outdoor water uses including watering of gardens, irrigation of sports fields and swimming pool use. Further details on water restriction rules are available on council's website.

Table 2 shows the storage volumes in Chinchilla Weir that trigger the various water restrictions, and the modelled reductions in Chinchilla's total urban demand for each water restriction level. The hydrologic assessment assumes that anticipated savings from the water restrictions will actually be achieved.

Table 2: Chinchilla's water restriction levels

Restriction level	Trigger levels (% of storage volume in Chinchilla Weir)	Volume in Chinchilla Weir (ML)	Trigger levels modelled (% of storage volume in Chinchilla Weir)	Percentage reductions applied to total demands modelled
Level 1	80% and above	Above 7824 ML	80% and above	0%
Level 2	On at 80%. Relaxed to previous at 90%	On at 7824 ML Relaxed at 8802 ML	On at 80%. Relaxed to previous at 80%	12.5%
Level 3	On at 60%. Relaxed to previous at 70%	On at 5868 ML Relaxed at 6846 ML	On at 60%. Relaxed to previous at 60%	37.5%
Level 4	On at 35%. Relaxed to previous at 45%	On at 3423 ML Relaxed at 4401 ML	On at 35%. Relaxed to previous at 35%	50%
Level 5	On at 20%. Relaxed at council's discretion	On at 1956 ML Relaxed at council's discretion	On at 20%. Relaxed to previous at 20%	62.5%
Level 6	On @ 15%. Relaxed at council's discretion	On at 1467 ML Relaxed at council's discretion	On at 15%. Relaxed to previous at 15%	75%

Note: Trigger levels and reduction targets are subject to review and amendment as determined by Western Downs Regional Council from time to time.

Frequency of water supply shortfalls and water restrictions

For this assessment, Chinchilla is considered to have experienced a water supply shortfall when its water supply system (either Chinchilla Weir WSS as a stand-alone system, or Chinchilla Weir WSS augmented with 500 ML/a of CSG water) is unable to meet the water demands placed on it by Chinchilla's community. This could, for example, be as a result of Chinchilla Weir reaching its minimum operating level due to severe or extended drought, or as a result of the demand on the available supply source(s) exceeding the entitlement volume. The frequency of water volumes in Chinchilla Weir falling to low levels (e.g.15% of full supply volume—the Level 6 water restriction trigger) is also important, because the system becomes a series of isolated water holes when water levels in the weir fall below about 19% of the full supply volume.

As this assessment is about the capability of the existing bulk water resource, there is no accounting for potential water supply shortfalls resulting from other factors, such as an inability to meet demand as a result of water quality issues, or a pump, pipeline or treatment plant failure.

Historical modelling assessment

The historical modelling undertaken for the 121 year simulation period (1895–2015) indicates that Chinchilla Weir WSS as a stand-alone system (i.e. without the availability of CSG water) would have been capable of meeting a demand of 1160 ML/a for Chinchilla (representing council's current allocation from Chinchilla Weir, and around Chinchilla's projected 2041 demand) without Chinchilla experiencing any supply shortfalls, whether water restrictions were imposed or not. However this modelling also showed that at this demand Chinchilla Weir would have fallen to quite low levels on a number of occasions during this period, including falling below 15% of the full supply volume (the Level 6 water restriction trigger) on average about 1 year in every 25 years without water restrictions, or 1 year in every 40 years with restrictions.

When augmented with 500 ML/a of CSG water, the modelling indicates that a demand of 1660 ML/a for Chinchilla (representing council's current water allocation from Chinchilla Weir plus 500 ML/a of CSG water) could also have been met throughout the historical simulation period without Chinchilla experiencing any supply shortfalls. Again, it was found that Chinchilla Weir would have however fallen to quite low levels on a number of occasions.

Stochastic modelling assessment

As outlined earlier, stochastic modelling accounts for a wider variation of potential climatic scenarios than the historical modelling. This makes it a useful tool for improving our understanding of the water supply system's capability, including the likelihood of events that have not occurred during the historical period but may be possible in the future.

Figure 6 shows the indicative performance of Chinchilla's water supply system under water restrictions, in particular the frequency of water levels in Chinchilla Weir being below the various water restriction trigger levels for Chinchilla's urban water supplies for a range of annual water demands. Information about the performance of Chinchilla's supply system for both the augmented system and the stand-alone system is shown.

For water demands of up to 1660 ML/a (with restrictions in place and the supply augmented with 500 ML/a of CSG water) the stochastic modelling showed that Chinchilla should not experience a water supply shortfall (provided the CSG water was available), primarily because council's CSG water supply is able to meet Chinchilla's demand under Level 6 restrictions (75% reduction in the unrestricted demand). For a water demand of 1160 ML/a (again with restrictions in place and the supply augmented with 500 ML/a of CSG water) the modelling showed that Level 6 water restrictions (triggered when water levels fall below 15% of the full supply volume) might be experienced on average about once in 92 years, increasing in frequency to about once in 64 years under a demand of 1660 ML/a.

With the Chinchilla Weir as a stand-alone source and with a demand equal to the surface water entitlement of 1160 ML/a (around the projected average demand by 2041) with water restrictions in place, the modelling showed that Chinchilla might experience a water supply shortfall on average about once in 2083 years (assuming all water could be accessed down to the minimum operating volume of 120 ML in Chinchilla Weir), and Level 6 restrictions on average about once in 47 years. The modelling showed that storage volumes in Chinchilla Weir might be below council's Level 3, Level 4 and Level 5 water restriction trigger levels on average about every 1.4, 4 and 22 years, respectively. The relatively high frequency of water levels being below the Level 3 and Level 4 trigger levels reflects that medium priority water allocations can be accessed until around the same level that the trigger for Level 4 restrictions is reached.

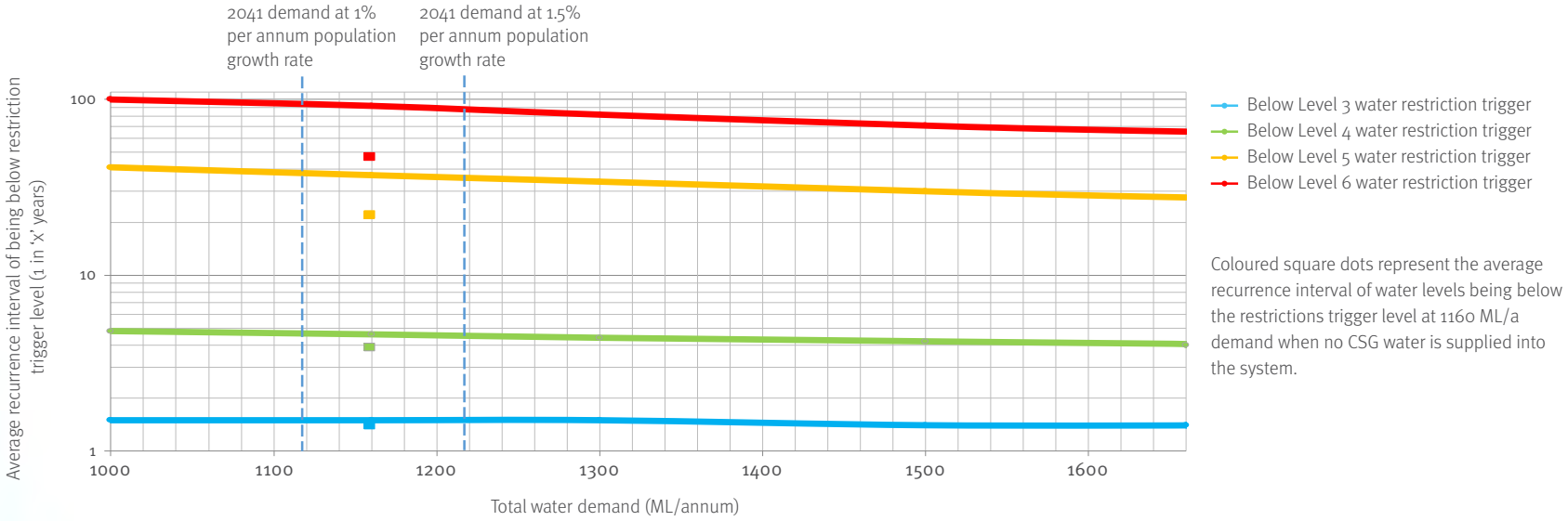

Figure 6: Frequency of being below water restriction trigger levels against total annual water demands (Chinchilla Weir WSS augmented with 500 ML/a CSG water)

Duration and severity of water restrictions

Although the frequency of water restrictions is an important consideration, the duration and severity of each restriction period may be more important for many water users. For example, it may be more acceptable to experience less severe and shorter periods of water restrictions more frequently, than to experience more severe and longer periods of water restrictions less frequently.

Figure 7 shows, for supply augmented with 500 ML/a of CSG water, the number of occurrences of the water level in Chinchilla Weir being below the trigger level for Level 4 water restrictions for durations longer than 1 month, 3 months and 6 months over a 10 000 year period. At a water demand of about 1160 ML/a (around Chinchilla's projected 2041 demand) there are approximately 1300 occurrences of Level 4 water restrictions (or more severe) lasting longer than 1 month, of which about 60% last longer than 3 months and 35% last longer than 6 months. Figure 7 also shows the extent to which increasing demand increases the occurrence of water restrictions.

Figure 8 similarly shows the occurrences of the weir volume (when augmented with 500 ML/a of CSG water) being below the trigger for Level 5 water restrictions for durations longer than 1 month, 3 months and 6 months over a 10 000 year period.

Together, the frequency, severity and duration of water restrictions, along with the ability to prolong supplies during drought, are fundamental parts of water supply planning and form part of the 'level of service'. The appropriate level of service for Chinchilla is a matter for council to determine, in discussion with the community. Considerations such as determining an acceptable frequency of the various restriction levels and the underlying likelihood of not being able to meet demand are critical parts of the water supply planning currently being undertaken across Queensland.

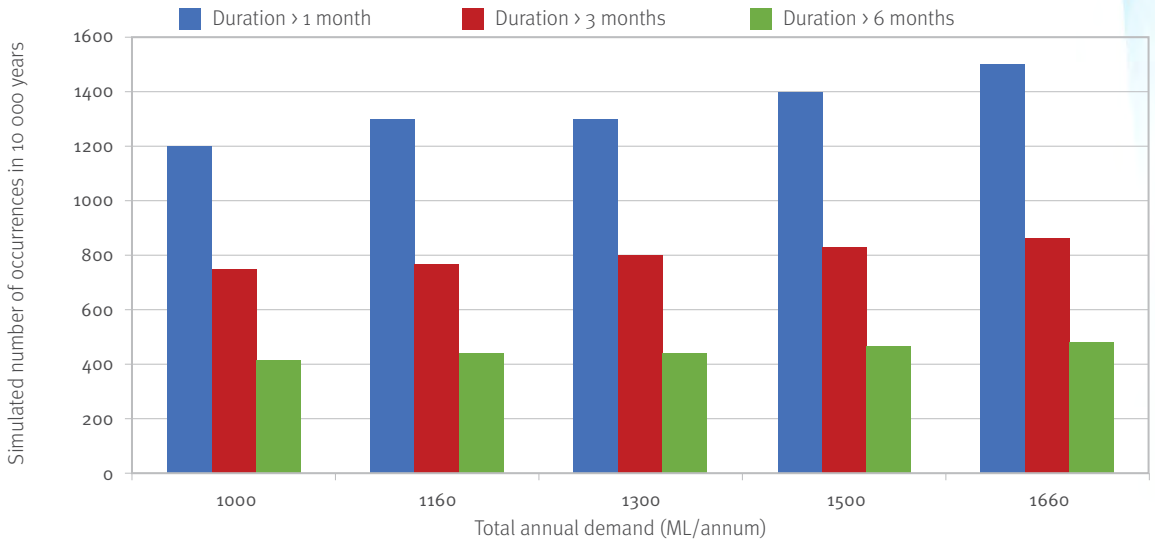

Figure 7: Number and duration of events where the water level in Chinchilla Weir augmented with 500 ML/a of CSG water is below the trigger level for Level 4 water restrictions at various annual water demands

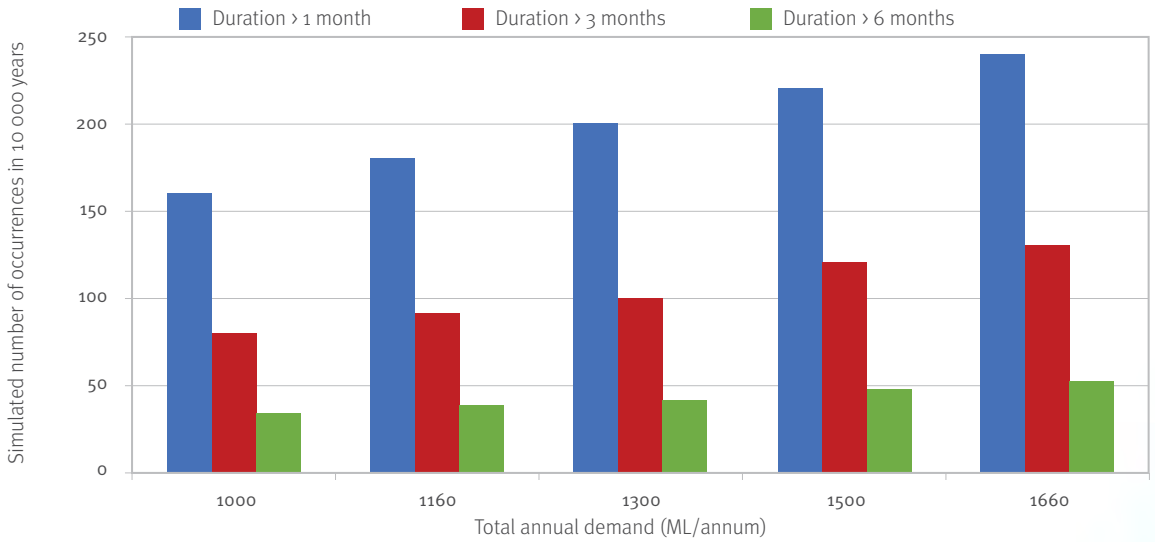

Figure 8: Number and duration of events where the water level in Chinchilla Weir augmented with 500 ML/a of CSG water is below the trigger level for Level 5 water restrictions at various annual water demands

Image courtesy of Tourism and Events Queensland

Conclusions

Based on an average urban water demand of 397 L/c/d, Chinchilla's water demand is projected to increase from the recent average (2015–16 to 2016–17) of about 882 ML/a to an average of about 1160 ML/a by 2041, but may be higher during prolonged hot dry periods or under higher population growth. Council currently has sufficient water entitlements to meet Chinchilla's projected water demand to 2041 and beyond. However, if higher water demands are experienced (for example, associated with new or increased CSG operations), meeting these demands will be dependent on the availability of other water supply sources—for example, continued access to the 500 ML/a of CSG water supplied from the Kenya Water Treatment Plant, which is a significant contributor to Chinchilla's water supply. Without access to this CSG water supply or some alternative source into the future, Chinchilla's average water demand may exceed council's existing water allocation of 1160 ML/a from the Chinchilla Weir water supply before 2041 (for example, by around 2038 under a higher annual population growth rate of 1.5%, or earlier under higher per capita (L/c/d) water use). Although commencement of the CSG operations were initially based on a project life until at least 2038, continuing availability of the CSG water to Chinchilla is not guaranteed. Chinchilla's current dependence on the CSG water therefore necessitates regular monitoring of the situation by council and planning for contingency supplies.

The assessment showed that council's existing supply system is able to meet Chinchilla's urban water requirements with a low likelihood of supply failure to at least 2041. However achieving this level of supply security out to 2041 is dependent on the application of water restrictions and the continuing availability of the CSG water to council. Under the council's existing water restriction regime, it is likely that moderate to severe restrictions could be experienced relatively frequently. At the projected 2041 average water demand of about 1160 ML/a, the frequency of water levels in Chinchilla Weir falling below 15% of the weir's full supply volume (the Level 6 water restriction trigger level) is on average about once in 92 years when the system is augmented with CSG water, or once in 47 years as a stand-alone system.

Moving forward

This RWSSA represents a collaborative approach between the Queensland Government and Western Downs Regional Council to establish a shared understanding of the existing security of Chinchilla's water supply and its capacity to support future growth.

Western Downs Regional Council is committed to ensuring the long term security of Chinchilla's water supply. The process of developing the RWSSA in conjunction with the Department of Natural Resources, Mines and Energy has provided a better shared understanding of the existing and future performance and security of Chinchilla's water supply from the Chinchilla Weir Water Supply Scheme, augmented with CSG water.

Council has identified a number of actions for ensuring the future security of Chinchilla's water supply, including:

- Continuing to monitor and review the ongoing availability of CSG water.
- Investigating potential alternative supply options to prepare for when the supply of CSG water to Chinchilla is either reduced or is no longer available.
- Investigating options to reduce losses associated with Chinchilla's water supply from the Chinchilla Weir Water Supply Scheme.
- Reviewing the existing water restrictions regime for Chinchilla, with a view to simplifying the water restriction levels to improve the ease and practicality of putting water restrictions in place when required.
- Reviewing existing demand management measures, with a view to improving the efficiency of water use in the community and providing incentives for those people in the community who are wise water users.

Council is proactively working to achieve sustainable outcomes for its communities, and will continue to work with the Chinchilla community to improve water security through promotion of water efficiency and water conservation initiatives.

The Chinchilla regional water supply security assessment has been adopted by council and will be used to assist council in planning for meeting Chinchilla's future urban water requirements.

Image courtesy of Tourism and Events Queensland

For more information on the Regional Water Supply Security Assessment program please visit

www.dnrme.qld.gov.au