3. **DEMAND FORECASTS**

This section documents Umgeni Water’s water demand forecast review that was completed in September 2016. This process:

- Reviewed the figures for the financial year ending in June 2016 (2015/2016).
- Assessed and revised the short-term forecast for the financial year ending in June 2017 (2016/2017);
- Compiled short-term forecasts for the financial years ending in June 2018 (2017/2018), June 2019 (2018/2019) and June 2020 (2019/2020); and
- Extended these short-term forecasts to a long-term forecast (30-year forecast) to the end of June 2047 (2046/2047)

All data presented has been updated to include the November 2016 sales figures and all statistics and trends have been based on the moving annual average and year-on-year growth figures as determined at 30 November 2016.

3.1 **Review of 2015/16 Sales**

The initial forecasted water sales value for the financial year ending in June 2016 (2015/16), as determined in September 2014, was 1 229 Mℓ/day. In September 2015 this figure was revised to 1 240 Mℓ/day after updated discussions with customers. Total sales recorded for the 2015/16 financial year averaged 1 191 Mℓ/day (434 764 Mℓ). This was 4.0% lower than the September 2015 projection and can mainly be attributed to the decrease in sales as a result of drought curtailments.

Total average water sales for the 2014/15 financial year was 1 216 Mℓ/day, and hence the 2015/16 sales are 2.1% year-on-year lower than the 2014/15 financial year. As discussed above, this decrease in demand is as a direct result of the drought curtailments and initiatives that had been imposed on the systems. A recovery in overall demand is expected once the effects of the drought have been mitigated although the exact timing of this recovery is unknown at this stage. Figure 3.1 shows the 12-month moving average of Umgeni Water’s total average daily water sales for the past 10 years.

Bulk water sales to eThekwini Municipality constituted by far the largest percentage (74.4%) of Umgeni Water’s total water sales for 2015/16. Their proportion of the total sales increased slightly from the previous year (74.2%). The Msunduzi Municipality is Umgeni Water’s second largest customer, accounting for 15.2% of the organisation’s total sales. The remaining customers make up the balance of the sales. Figure 3.2 illustrates the average daily sales volume distribution per customer for the financial year 2015/16.
Figure 3.1 Umgeni Water Total Average Daily Sales.

Figure 3.2 Distribution of Sales Volumes for 2014/2015.
3.2 2015 Short-Term Bulk Water Sales Forecasts

Curtailments to mitigate the current drought effects are expected to suppress overall demand until April 2017 at the earliest. The consequential result is a suppressed demand growth of 1 191 Mℓ/day for the 2016/2017 financial year following which demand growth is expected to increase to 1 222 Mℓ/day in 2017/2018, 1 249 Mℓ/day in 2018/2019 and 1 279 Mℓ/day in 2019/2020 (Figure 3.3).

![Graph showing demand growth over financial years](image)

Figure 3.3 Total Average Daily Sales Volumes - Annual short-term forecast comparison.

### 3.2.1 eThekwini Municipality

In the 2015/2016 financial year, the year-on-year growth in sales to eThekwini Municipality decreased significantly by -3.95%. The decline in sales is attributed to the drought, with consequential water restrictions being imposed on the Mgeni Supply System. During December 2015 a Drought Joint Operations Committee (JOC) was established, resulting in forced curtailments in sales from the various Water Treatment Plants (WTPs). Based on the December 2015 twelve month moving average water demands, the JOC phased in the forced curtailments per WTP which varied monthly based on prior successes, storage volumes and location of the dams within the Mgeni system. The decline in sales is shown in Figure 3.4, where the twelve-month moving average of sales decreased from 906 Mℓ/day in July 2015 to 872 Mℓ/day in June 2016.

The impacts of these curtailments on proposed developments and the associated demands within the eThekwini area of supply were discussed with the municipality during September 2016. The subsequent demand projection scenario was based on the effect and impact of the drought. At
present there is a 15% curtailment on all Water Treatment Plants and this will have an impact on the demand forecast until such time as restrictions are lifted.

The weather outlook predicts a low probability of significantly above-average rainfall. Projections are that it will take two rainfall seasons to emerge from the effects of the current drought. The earliest possible lifting of restrictions may be considered depending on rainfall figures and the level of Albert Falls Dam.

As a result eThekwini Municipality have predicted an optimised demand scenario where the current curtailment of 15% remains (at the time predicted to April 2017); thereafter demand is anticipated to increase to pre-drought conditions by April 2018. Beyond April 2018, normal growth of 1.5% is to be expected until June 2022. The predicted decrease in demand is from 872 Mℓ/day to 785 Mℓ/day over the 2016/2017 financial year. This is then anticipated to revert to 872 Mℓ/day in 2017/2018 (pre-drought demand). The historical sales and future demand projection for eThekwini Municipality are presented in Figure 3.4.

Figure 3.4  eThekwini Municipality Total Volumes - Annual short-term forecast.

3.2.2 The Msunduzi Municipality

The water sales to Msunduzi Municipality decreased by 1.04% from 192 Mℓ/day in the 2014/2015 financial year to 190 Mℓ/day in 2015/2016.

Umgeni Water has implemented drought mitigation measures to protect the resource, i.e. Midmar Dam by curtailing supply by 15%. It is also projected to take at least two seasons of average
rainfall to recover the raw water supply system. This is reflected in the demand being constant for the 2016/17 financial year.

It is envisaged that it will take two rainfall seasons for the Mgeni system to recover and that the 15% curtailment will be retained until at least June 2018. Zero growth in demand is expected during this period. Msunduzi Municipality has estimated a 0.5% per annum growth in demand for the period 2018 - 2020 and that thereafter the demand is predicted to grow at 1.0% per annum.

The Msunduzi Municipality is implementing water demand management (WDM) initiatives within the Vulindlela area. It is estimated that savings from these initiatives will offset the growth in sales in the near future for the area.

The projection for Msunduzi Municipality is reflected in Figure 3.5.

![Figure 3.5 Msunduzi Municipality Total Sales Volumes - Annual short-term forecast.](image)

### 3.2.3 uMgungundlovu District Municipality

The water sales to uMgungundlovu District Municipality (UMDM) increased sharply from 45 Mℓ/day in the 2014/2015 financial year to 58 Mℓ/day in 2015/2016.

The projected demands for 2016/2017 were determined in consultation with the municipality and it was agreed that the demand would remain constant for the short term forecast.

The 15% curtailment in supply discussed above has also been applied to uMgungundlovu District Municipality. If the drought is partly broken during the next rainfall season, it would take at least two
seasons of average rainfall to recover the raw water supply system. This is reflected in the demand being constant for the 2016/17 financial year.

uMgungundlovu District Municipality is currently implementing an Asbestos Cement Pipe replacement initiative in the Howick and Merrivale area to minimize the municipality’s Non-Revenue Water (NRW) component, which would result in a reduction in demand as reflected by the 2017/18 projected demand.

Umgeni Water is in the process of commissioning Phase 1 of the uMshwathi Regional Bulk Water Supply Scheme (MRBWSS) and it is anticipated to be fully operational by mid-2017. In conjunction with this, Umgeni Water is implementing the upgrade of the Wartburg to Bruyns Hill supply system. The commissioning of these systems will ensure a sustainable supply to uMgungundlovu District Municipality in the areas of Wartburg, Albert Falls, Mpolweni and Swayimana by the end of 2017, which will meet the growth in demand for these areas as shown in Figure 3.6.

The expected demand for 2016/2017 is 58 Mℓ/day and in 2017/2018 a projected amount of 57 Mℓ/day due to WDM initiatives.

The projection for uMgungundlovu District Municipality is reflected in Figure 3.6.

Figure 3.6  uMgungundlovu District Municipality Total Sales Volumes - Annual short-term forecast.
3.2.4 iLembe District Municipality (including Sembcorp Siza Water)

Sales to iLembe District Municipality can be described as follows:

- Sales to the Coastal Area of iLembe through Sembcorp Siza Water.
- Sales to the Coastal Area of iLembe through iLembe District Municipality.

Due to the drought conditions historical demands have been declining over the past two years. This is clearly reflected in Figure 3.7 and Figure 3.8.

The demand projections were determined in July 2016 and at the time, the restrained demand due to the drought was assumed to be maintained up to January of 2017. When the drought restrictions are lifted, it is anticipated that the likely effect on the demand will be as follows:

1. In rural areas, the demand will rise to pre-drought demands within three months;
2. In urban areas, the demand will rise to pre-drought demands over a period of 3 years.

It is predicted that Sembcorp Siza Water’s demand will grow at a rate of about 2% on the currently restrained demand. The balance of the demand, to take it up to pre-drought demands, will be made up using waste water recycling. Sembcorp Siza Water has implemented a waste water recycling plant that injects up to 3 M\(\ell\)/day into its potable water system. The demand for Sembcorp Siza Water is expected to be 9.3 M\(\ell\)/day in 2016/2017, 9.5 M\(\ell\)/day in 2017/2018 and 10.0 M\(\ell\)/day in 2018/2019. The historical and future predicted increase in demand for Sembcorp Siza Water is presented in Figure 3.7.

iLembe District Municipality intends operating the Mvoti WTP to supply about 10 M\(\ell\)/day to KwaDukuza. The balance of the demand (5.5 M\(\ell\)/day) will be supplied from Lower Thukela WTP. The demand for iLembe District Municipality is expected to be 29.6 M\(\ell\)/day in 2016/2017, 32.3 M\(\ell\)/day in 2017/2018 and 34.6 M\(\ell\)/day in 2018/2019. The historical and future predicted increase in demand for iLembe District Municipality is presented in Figure 3.8.
Figure 3.7  Siza Water Total Sales Volumes - Annual short-term forecast.

Figure 3.8  iLembe District Municipality Total Sales Volumes - Annual short-term forecast.
3.2.5 Ugu District Municipality

Total sales to the Ugu District Municipality increased during 2016 following the coastal drought experienced in the 2014/2015 financial year. During the same period the E.J. Smith Dam water level reached full supply level on 19 March 2016. The recovery of sales shows a marked increase of 10.6% (28.5 Mℓ/day to 30.9 Mℓ/day) during the 2014/2015 financial year.

The expected growth in sales to the Ugu District Municipality is estimated at 2.8% in the 2016/2017 financial year and 6.2% in 2017/2018 (Figure 3.9). The current water resources are insufficient to meet the projected water demands. Furthermore, the water requirements exclude an estimated 25 Mℓ/day suppressed demand within the supply area, due to infrastructure constraints. Although the water resources within the local rivers and dams have recovered, the area is still augmented by up to 70% from the Mgeni System via the South Coast Pipeline.

The subsequent demand projection scenario was based on the effect and impact of the drought on the Mgeni System, as well as operating the local Water Treatment Plants limited to the design capacity. The increase in supply forecast assumes the construction and commissioning of Phase 2b of the South Coast Pipeline during 2017/2018.

The recommended augmentation for the Upper and Middle South Coast Supply area (refer to Section 8) is the Lower uMkhomazi Bulk Water Supply System (LUBWSS). A shortfall in water supply is projected from 2017 until the LUBWSS is implemented.

![Figure 3.9 Ugu District Municipality Total Sales Volumes - Annual short-term forecast.](image-url)
3.2.6 Harry Gwala District Municipality

The Ixopo WTP supplies the Greater Ixopo area. Average daily sales from the WTP are normally approximately 2.4 Mℓ/day. There was a decrease in the monthly sales from July 2015 to June 2016, due to the drought interventions that were implemented. The supply to Ixopo was reduced to 1.2 Mℓ/day i.e. 50% of the normal supply. Discussions with the municipality resulted in the growth in the demand projected for Harry Gwala District Municipality being assumed at 0% (Figure 3.10) until April 2017. The demand was thereafter assumed to gradually return to the normal supply over the following year (until April 2018) and that the demand projection will return to a normal growth of 1.5 % per annum thereafter.

![Figure 3.10 Harry Gwala District Municipality Total Sales Volumes - Annual short-term forecast.](image)

3.3 Long-Term Forecast

The 30-year long-term sales forecast for Umgeni Water’s supply area (Figure 3.11) has been based on the reduced sales as a result of the recent drought, anticipated natural growth from the existing supply system, and bulk sales from new supply infrastructure that would extend the area supplied. The base projection has been developed from the short-term forecasts described in Section 3.2 of this report and then extended at a compounded 1.5% per annum growth rate until 2045/2046. This growth rate has been agreed to by the major water users in the region and is considered acceptable for this long-term forecast as it closely matches the forecast that was independently derived as part of the “Water Reconciliation Strategy Study for the KwaZulu-Natal Coastal Metropolitan Areas” recently completed by DWS, which used a population projection technique to estimate demand forecasts.
Previous projections have shown a drop in sales in the 2021/2022 and 2025/2026 financial years as a result of the anticipated commissioning by eThekwini Municipality of their Northern and KwaMashu wastewater reuse plants. eThekwini Municipality has now stated that there it is very unlikely that these plants will be implemented and as such have been removed from future projections.

![Graph showing Umgeni Water Long-Term Bulk Water Sales Forecast.](image)

**Figure 3.11** Umgeni Water Long-Term Bulk Water Sales Forecast.

### 3.4 Impact of the 2014/15/16 Drought

Large parts of KwaZulu-Natal have experienced an extended dry period as a result of the effects of El Niño. Some areas in the Umgeni Water Operational Area have experienced the lowest recorded total rainfall, over the 2014/2015 years, when compared against any previous 24 month period. The current standardised precipitation index map (**Figure 3.12**) shows that severe to extreme drought conditions have occurred over the central to northern parts of KwaZulu-Natal over a 24 month time scale. The southern parts of the country (Southern Cape) show relatively wet conditions over the same time scales.
3.4.1 Mgeni System

The 2014/15 drought depleted the resources of the Upper Mgeni System (Spring Grove, Midmar and Albert Falls dams). Levels improved in 2016 but, at the time of writing this report, were still concerning (Figure 3.13). The cumulative impact of this has meant that there was (as of March 2017) still a moderate risk of non-supply and hence a restriction of 15% on domestic and industrial supply and 50% on irrigation demands was being implemented. Pumping from the Mooi River (Spring Grove Dam and Mearns Weir) was being maximised to augment the Mgeni System during this period and the water resources of the Upper Mgeni System would have been in a worse state without them (Figure 3.13).
The storage level in the Lower Mgeni System (Inanda Dam) is not expected to fall to concerning levels in the short term (Figure 3.14). Pumping from Inanda Dam to Durban Heights WTP is being maximised to reduce the need for water from Albert Falls Dam. This pumping has been increased to 240 Mℓ/day for most of the 2016 calendar year. The level at Inanda Dam in November 2016 indicated that the water resource situation was acceptable whilst the level of the upper Mgeni dams was concerning.

**Drought mitigation measures**

The impact of pumping from the Mooi River and Inanda Dam is depicted by Figure 3.15 and Figure 3.16. The benefit of pumping from the Mooi River during the 2014/15 to 2015/16 period is shown in
Figure 3.15 where it is evident that the level of Midmar Dam would have been empty in May 2016 had pumping not taken place.

Figure 3.15 Benefit of pumping from the Mears Weir (Mooi River) to support Midmar Dam.

The Albert Falls/Nagle storage (Figure 3.16) indicates that, had the Inanda Dam pumping not taken place, the total storage of Albert Falls and Nagle dams would have fallen to dead storage in June 2016.

Figure 3.16 Impact of pumping from Inanda Dam to support the Albert Falls System.
3.4.2 North Coast System

The storage of the Hazelmere Dam has improved significantly from the sustained period of drought (Figure 3.17). As a result restrictions were lifted at the beginning of September 2016 and the uThongathi Emergency Scheme was stopped in August 2016 when Hazelmere Dam reached 60%.

![Figure 3.17 Storage trajectory for current Hazelmere Dam with restrictions.](image)

3.4.3 Middle South Coast System

The storage level of the Middle South Coast System (Umzinto and E.J. Smith dams) reached full supply in March 2016 as a result of rains and pumping from Mpambanyoni Emergency Scheme (Figure 3.18). The Mpambanyoni Emergency Scheme was stopped in March 2016. The improvement in storage minimised the risk of non-supply of water in the area.

![Figure 3.18 Storage trajectory for both Umzinto and EJ Smith dams.](image)
3.4.4 Ixopo System

The Ixopo System comprises of the Ixopo Dam and a borehole, which conjunctively supply the Ixopo Town. In January 2016 the demand from these resources was reduced from an average of 2.5 Mℓ/day to a restricted demand of 1.5 Mℓ/day. Various drought mitigation initiatives were implemented, including St. Isidore Dam emergency scheme, release of water from two farm dams upstream of Ixopo Dam and removal of alien plants above Ixopo Dam. These initiatives have resulted in the storage level of Ixopo Dam improving significantly reaching 90% in December 2016 (Figure 3.19).

![Figure 3.19 Ixopo Dam storage.](image)