Status Quo and Limitations

Durban Heights Water Treatment Plant
The Northern Aqueduct from Durban Heights WTP, which is owned and operated by eThekwini Municipality, serves as a key bulk water main supplying the municipality. Currently the aqueduct conveys 47% (226.3 Ml/day) of the total volume sold to eThekwini Municipality and it serves the major northern growth areas of Newlands, KwaMashu, Ntuzuma, Phoenix, Durban North and Umhlanga.

With the increasing growth in demand in the supply areas of the Northern Aqueduct over the past two years, particular branch nodes off the system experience low residual pressures. The Durban Heights Booster Pump Station, immediately downstream of Durban Heights Reservoir 3, ensures that a minimum pressure of 272 mASL is maintained at all of Reservoir 3 sales points, whilst Reservoir 3 is allowed to operate within reasonable levels. However, hydraulic analysis suggest that this measure may not prevent the problematic downstream reservoirs from running empty, as eThekwini Municipality’s secondary booster pump stations and pipelines serving these areas (e.g. Ntuzuma NR2 Reservoir, Durban North High Level Reservoir and Umhlanga 2 Reservoir) are currently undersized.

Compounding this problem is the fact that eThekwini Municipality expects water demand growth along the Northern Aqueduct to grow substantially with the commissioning of the Dube Trade Port and the King Shaka International Airport (Section 2.5 and Section 3.3.1). eThekwini Municipality has identified this area as a major growth area and is planning to augment the supply in the Northern Aqueduct System from the proposed WA.

Whilst eThekwini Municipality plan to transfer the current demands of KwaDabeka and the NR2 (Inanda) supply zones off Durban Heights WTP and onto the proposed Western Aqueduct, the approximate 70 Ml/day that will initially be freed up may be required to meet the increasing demands of other nodes in the northern areas. These include the demands of new housing developments in the Verulam/Tongaat area, the Grange and that of the proposed Dube Tradeport (12 Ml/day). eThekwini Municipality expect the Northern Aqueduct demands to peak at 240 – 250 Ml/day (post WA load shift).

An analysis of daily historical production for the Durban Heights WTP (October 2009 to October 2010) is presented in Figure 5.24, and shows that for 76% of the time the WTP was being operated above the optimal operating capacity (80% of design capacity) and 6% of the time the WTP was operated at above design capacity.
Over the past 36 months eThekwini Municipality have made significant investments in various water loss reduction projects, with further spending planned in the future. Among their 16 dedicated interventions for curtailing water loss is the Asbestos Cement Pipe Replacement Programme. A new pressure management system and improved customer billing have also been introduced. Also lowering water demand are the increased sewer tariffs which are based on water consumption. The reduction in water purchases from Umgeni Water has become evident in the 2009/2010 financial year. This is noted in the downward trend of the 12-month moving average in Figure 5.25.

**Wiggins Water Treatment Plant**

Due to a water resource constraint at Nugwane Dam (Section 4.4.5) and the limited capacity of Amanzimtoti WTP, it is necessary to augment the supply to areas downstream of the Amanzimtoti WTP with potable water from Wiggins WTP via the SCA Pipeline, until such time as a new regional
bulk water supply system is developed on the lower reaches of the Mkomazi River (Sections 4.4.6 and 7.2.1). In the interim, the Wiggins WTP sub-system should have sufficient treatment and distribution capacity to meet the long-term demands of Amanzimtoti and the SCP.

Figure 5.26 shows the current configuration of the existing SCA pumped supply infrastructure linking the Wiggins WTP sub-system to Amanzimtoti WTP.

Hydraulic analysis has confirmed that the existing SCA Pipeline has adequate capacity to meet current and projected demands up to the year 2020, provided that a new in-line booster pump station is installed along the SCA Pipeline to replace the existing Umlazi Pump Station. Umgeni Water is in the process of constructing a new SCA Booster Pump Station to address this constraint. This will serve as a medium-term infrastructure development strategy to meet current and projected demands off the SCA Pipeline up to the year 2021.

An analysis of daily historical production at the Wiggins WTP (October 2009 to October 2010) is presented in Figure 5.27 and shows that for 28% of the time the WTP was being operated above the optimal operating capacity (80% of design capacity) and 0% of the time the WTP was operated at above design capacity.
The load shedding from Durban Heights WTP onto Wiggins WTP has had a significant impact on the Wiggins High Lift Pump Station as these pumps were not designed to handle high flow rates. A visual inspection of damaged pump sets has revealed that the pumps fail on bearing seizure due to high thrust load. The cause of the higher thrust load is due to the greater demand on the system causing lower suction and therefore greater load on the thrust bearing. This will be minimised if the main pump is used as the primary unit.

The historical and projected water demand from the Wiggins WTP is presented in Figure 5.28.

Maphephethwa Water Treatment Plant
Maphephethwa WTP was originally commissioned as a rural scheme under a turnkey contract. The works is located in the Inanda Dam area and draws water off one of the Nagle Dam raw water aqueducts supplying Durban Heights WTP. The raw water is filtered through a set of four Slow Sand Filters. The filtered water is chlorinated and supplied into a 1000 kilolitre on-site storage/distribution reservoir. The original works occupies approximately 800 m² and has a treatment capacity of 0.75 Ml/day.

The original design did not provide for pre-treatment but there is allowance on site for the duplication of the slow-sand filter plant to meet future demands. The raw water to the WTP is drawn from Aqueduct No. 2, which delivers water to Durban Heights WTP, via a 160 mm ID PVC pipe. The take-off point of the Aqueduct is located 260 m from the WTP. The raw water supply pipeline to the waterworks is fitted with a pre-chlorination unit, flow meter and a flow control valve.

There has been increased demand from the waterworks in recent years and the works currently produces an average of 1.7 Ml/day (in excess of its design capacity of 0.75 Ml/day). As an interim measure, two package plants consisting of Autonomous Valve-less Gravity Filters (AVGFs) with an aluminium sulphate dosing system have been installed at the site with a combined additional capacity of around 0.5 Ml/day.

The plant still operates substantially above its total design capacity of 1.2 Ml/day (including AVGFs). The upgrade of the plant to a conventional water treatment works with chemical house/control room, flocculation channels, cylindrical clarifiers with sludge scrapers, rapid gravity filters,
automated chlorine dosing system, and 2.5 ML reservoir is currently being implemented. As such, there are construction activities and modifications currently occurring at the site.

The context of the upgrading of the works and the fact that the plant is currently operating far beyond its design capacity needs to be taken into consideration at all times when analyzing the performance of the WTP.

**Figure 5.29** depicts the distribution of the demands in the Lower Mgeni System as at October 2010.
Recommendations

The projects recommended to address the above-identified issues are:

- Undertake an investigation study for the augmentation of the Wiggins High Lift Pump Station to meet existing and projected demand.
- Optimise the shared demand between the proposed Western Aqueduct and Durban Heights WTP to ensure the optimal operation of Durban Heights WTP.
- Upgrading the Maphephethwa WTP to a capacity of 5MI/day.