Aqueducts to address Durban’s water needs

INTRODUCTION
The eThekwini municipality is throwing Durban two urgently needed water life-lines – the second phase of the Western Aqueduct (WA) which begins at Inchanga Station and ends at Ntuzuma with spur pipelines to Mount Moriah and Tshelimnyama, and the urgently needed Northern Aqueduct Augmentation (NAA) project, which will carry much needed water to the eastern and northern regions of eThekwini as far as Umhlanga, Phoenix and Waterloo.

Neil Macleod, head of eThekwini Water and Sanitation (EWS), has confirmed that the two long-term projects, which are expected to span at least seven years, are now officially under way, although at different stages of roll-out.

He says the initial studies carried out by EWS indicated that the optimal solution to address imminent capacity problems would be the installation of a new bulk supply pipeline from Umlaas Road through the outer and inner west areas, and terminating in Ntuzuma.

This became known as the Western Aqueduct.

THE WESTERN AQUEDUCT (WA)
The first phase of the WA project, which was completed at the end of 2010, followed a 20 km route close to the N3 highway from Umlaas Road Reservoir up to the railway station at Inchanga. However, the full effect of this pipeline is only expected to be realised when the 55 km long second phase of the project is commissioned.

This second phase was initially planned as a single mega water project. However, in the wake of unforeseen delays, EWS has now unbundled it into six individual contracts. Macleod says that, in light of the complexity of the two projects, and to expedite the tender process, EWS had called for expressions of interest last year. Sixteen contractors were selected for two different panels – one comprising companies qualified to deal with large-diameter pipes and another capable of working with pipes of a smaller diameter.

Cycad Pipelines (part of Stefanutti Stocks) was awarded the first contract for the seven km stretch from Inchanga Station to Alverstone Neck in April of this year, having won the tender on a competitive bid against the other pre-qualified contractors in the large-diameter pipe category. "The balance of the contracts

A substantial number of pipes will be needed in Durban for the second phase of the Western Aqueduct and the Northern Aqueduct Augmentation projects.
DURBAN FACES WATER SHORTAGES

With the democratisation of South Africa, the operational area of the eThekwini municipality increased tenfold, creating massive engineering challenges when it came to delivering safe water and sanitation. “The eThekwini region is still seeing increased migration from rural areas, so the population growth rate is above the national average. The year 2010 saw the highest growth in five years, with an additional 30 000 families in the city needing services,” Macleod explains.

This has not abated and he says that the city’s population is expected to increase by at least another 20% by 2030.

The threat of water restrictions is already very real. “We are at a point where our dams are unable to sustain the current demand over an extended period, and the risk of failure is one in 15 years – this means severe water rationing every 15 years as opposed to every 50 years in the past. Durban’s last water restrictions were in 1997 and they are now long overdue. The only reason why we have not introduced restrictions or rationing yet is because we have enjoyed above-average rainfall for a number of years. The situation can turn around very fast, though, and it could flip back to a dry cycle. The impact will be felt the moment we have a drier year,” he says.

Even without extreme weather conditions, Durban is heading for severe water shortages. If current consumption patterns continue, water demand in the city will outstrip supply within the next 15 to 20 years. The Umgeni is the only river in Durban which can provide significant quantities of potable water to the city. The full potential of this river has, however, already been harnessed by its four dams – Nagle, Midmar, Albert Falls and Inanda. In addition to practical conservation measures, EWS is looking at the most effective way to optimise the water that is accessible to Durban residents.

The Western Aqueduct project has been conceived not only to alleviate the water supply problems of the western regions of Durban (Hillcrest/Kloof), but also to inject additional potable water capacity into the strategic focal points of other areas of the Durban region, such as Ntuzuma/Inanda, Westville, Southern Pinetown, Tshelimnyama and, eventually, the Northern Aqueduct supplying Umhlanga, Phoenix and Waterloo.

Macleod points out that unprecedented growth in water demand in the western and northern supply areas was already leading to infrastructure capacity problems and placing extreme loading on the existing bulk water supply infrastructure. In particular, the pipeline infrastructure of the western regions of eThekwini, supplying potable water from Umgeni Water’s Umlaas Road Reservoir, is currently operating at maximum capacity and at times is unable to meet peak demands, resulting in interruption of service to consumers.

EWS is also experiencing problems when it comes to providing a reliable supply of water to the Ntuzuma area, north of Durban. Ntuzuma presently receives its water supply from the Durban Heights Waterworks. The Durban Heights purification works draws water from the Albert Falls and Nagle dams and supplies about 93% of total water demand for the entire northern area. However, it has reached its maximum treatment capacity, and the aqueducts that convey raw water from the Nagle Dam to the waterworks are presently operating at close to maximum capacity as well.

Because planned developments in the northeast are expected to add a substantial new demand at the tail end of the Northern Aqueduct, exacerbating its existing capacity problems, Macleod says that there has already been a negative impact on planning approvals for massive new developments, including further construction at the King Shaka airport and the Dube Trade Port. In addition, water shortages are also likely to impact on further development in the La Mercy and Westbrook areas.

However, the greatest concern is that a lack of adequate water infrastructure could completely stall the proposed multi-billion rand mixed-use Cornubia development. In addition to housing the next major industrial area in the north with linkages to the new international airport, it will also provide approximately 24 000 homes, of which 15 000 are proposed for subsidised housing and the...
balance for a wide range of affordability levels. It is envisaged that Cornubia will create substantial housing, employment and economic opportunities.

**TAKING WATER TO THE NORTH**

Macleod says that water supplies to both the western and northern reaches of the city are closely linked. The NAA is expected to be built in three phases, with the first phase beginning in September this year. At this point, the project is expected to be completed by June 2015. The final stages of the project will link the NAA and the WA.

Macleod presented a massive R3.6 billion 10-year master plan for augmentation of water supply to the northern areas of the city, to the eThekwini municipality. This includes transferring surplus water from the WA to the northern areas and enhancing surplus capacity at the Durban Heights Waterworks which can be used to augment the existing northern aqueduct.

He says the main functions of the WA pipeline would be to service the natural growth in water demand in the western areas of Durban and shed demand to the Ntuzuma, Mount Moriah, KwaDabeka and Pinetown South areas, which are currently supplied by the Durban Heights Waterworks. By including off-takes to the Mount Moriah, KwaDabeka and Pinetown South areas, some of the operational pumping costs to these areas can also be avoided.

Umgeni Water is expected to play an integral part in this project, as their infrastructure between Midmar Dam and Umlaas Road will be augmented to cope with the increased demand of the WA pipeline. The WA will tie into Umgeni Water’s infrastructure at the Umgungundlovu eThekwini boundary.
Senzokuhle, which are supplied from the Ntuzuma system, have to be manually isolated on a daily basis so that the Ntuzuma system does not run out of water. The Umhlanga region, which receives water at the tail end of the aqueduct, suffers from low residual pressures as a result of friction losses in the trunk mains,” Macleod explains.

Based on the existing operating criteria of the existing Northern Aqueduct system, and because the Durban Heights Waterworks is presently at capacity and unlikely to acquire additional capacity due to space constraints, EWS has decided not to duplicate or triplicate various existing trunk mains.

Instead, they will inject water from the Western Aqueduct into the Northern Aqueduct system via an off-take at KwaDabeka, as well as through a pipeline from Emachobeni to Umhlanga via the proposed Blackburn Reservoir. An additional branch pipeline from Kwadabeka to Ogunjini in the north will inject water northwards, whilst minor augmentations at Phoenix 1 and 6 Reservoirs and Nyaninga Reservoir will increase the capacity of the Northern Aqueduct system.

The NAA project has been divided into three phases in order to highlight and prioritise urgent sections of the project. Phase one, which will provide water to the first stages of the Cornubia housing development, will comprise the laying and commissioning of a section of pipeline linking Phoenix 2 Reservoir to the proposed Blackburn Reservoir, the laying and commissioning of the section of pipeline from the Blackburn Reservoir off-take to Umhlanga 2 Reservoir, and the upsizing of the existing inlet main to Phoenix 1 Reservoir.

The second phase of the NAA will include the laying and commissioning of a section of pipeline between the Emachobeni off-take and the Ntuzuma 2 Reservoir, the laying and commissioning of sections of pipeline linking the Ntuzuma 2 Reservoir and Phoenix 4 Reservoirs, and the Phoenix 4 Reservoir and Phoenix 2 Reservoir, as well as new pipelines to the Ntuzuma 7 Reservoir and Waterloo Reservoir. This phase also includes the construction and commissioning of the proposed new inlet main to Nyaninga Reservoir from the existing Hazelmere Dam.

“This phase of the project provides the much needed link network to where most of the new developments are planned to take place between the Western Aqueduct and the northernmost portions of the eThekwini water supply,” Macleod says.

The third phase of the NAA provides for the construction of a pipeline from the Ntuzuma 5 Reservoir inlet main to the proposed Ntanda Reservoir, construction of the reservoir itself, as well as construction of the proposed booster pump station at the reservoir, a pumping main from Ntanda Reservoir to the Kwa Silwane surge tank, and the construction of a pipeline from the Kwa Silwane surge tank to the existing Ogunjini 4 Reservoir.

Source: