



## The day the Vaal flowed backwards

The Vaal River in Mpumalanga.

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***Thirty years ago, while the country found itself in the grips of a crippling drought, South Africa's water engineers achieved an incredible feat – they reversed the flow of the Vaal River.***

South Africa's first large-scale water transfer schemes were undertaken almost exclusively to meet the growing need for electricity. Eskom saw its power stations double in capacity between 1954 and 1955. New power stations had to be constructed to meet the country's insatiable hunger for electricity and Eskom initially focused on the Eastern Transvaal (Mpumalanga) because of its rich coal reserves. However, electricity generation requires water in addition to coal, and so Eskom also started consulting with the Department of Water Affairs (DWA) to gain access to the necessary water supplies.

The Komati and Usutu-Vaal schemes were designed in such a way that most of the power stations could receive water from alternative sources during emergency situations. For example, the Matla and Kriel power stations can receive water from either the Usutu pipeline or the Usutu-Vaal water lead. The system's inherent flexibility proved its worth in the early 1980s.

In the autumn of 1983 South Africa was faced with an economic catastrophe – the projected demand of most of the country's power stations and of Sasol II and III showed that by September, before the normal onset of the rainy season in that area, the five dams of the Komati and the Usutu, as well as the Grootdraai Dam on the Vaal, would run dry. This would be an unthinkable situation, as 80% of the country's total electricity output is dependent on the availability of water in the Usutu-Vaal-Komati system.

The DWA faced a dire situation. Although the Vaal Dam itself was also virtually empty (it was only 38% full) there was the water that was pumped from the Thukela River into Sterkfontein Dam [via the Thukela Vaal scheme] in reserve. This could be let out by gravity to the Vaal Dam, but how to get it from the vicinity of Villiers from where it could be distributed via the Usutu-Vaal link project?

The department had but 20 weeks in which to implement a project to transport some 1 million m<sup>3</sup>/day over a distance of 90 km (at its shortest). A conventional pipeline of some 2 m in diameter and pumping station would not be feasible in such a short time. The only solution was the one that was subsequently adopted, namely constructing a chain of seven temporary earthen weirs in the Vaal River, each with a pumping station at its downstream toe.

Said to be the brainchild of geologist David George, who was a consultant for DWA at that time, this effectively amounted to putting the Vaal River in reverse. The Vaal River's water was, in turn, supplemented by water from the Thukela-Vaal scheme. In this way, the Komati, Usutu, Vaal and Thukela rivers were connected to keep the 'energy heart' of the country beating.

The Grootdraai Emergency Scheme was approved by Parliament on 18 April, 1983. Work started on the scheme the very next day. This scheme is quite remarkable that, apart from a few aerial photographs and 1:50 000 maps, there were no detailed survey data available, and there was no time for geological or detailed design investigations. Everything had to be done on site as the project progressed.


More than a 1 000 DWA workers laboured on the project day and night. In addition, more than 40 contractors were employed on various aspects of the scheme. The seven weirs that had to be built ranged in height from 8,7 m to around 13,5 m and were placed in such a way that the reservoir formed by each weir would stretch to the toe of the weir upstream of it. Two of the weirs were constructed in the Vaal Dam basin. The total distance along which the water had to be transported was 208 km at a static height difference of 61,5 m between the Vaal and Grootdraai dams. Although engineered by DWA, the scheme was constructed in close collaboration with Eskom and Sasol who, as the main users requiring this water, were responsible for the financing of this project. Eskom also supplied and installed all the necessary pumps.

By 26 July all seven weirs had been completed, and by 18 August the pipelines were finished. The scheme became operational on 18 September, 12

days before the deadline. As it turns out the pumps were not required for a long time because shortly after the onset of the rainy season, heavy rains restored dam levels to normal – ironically, some of the weirs were damaged by the resulting floods. The scheme received an award for the Most Outstanding Civil Engineering Achievement of 1983 from the South African Institution of Civil Engineers.

The scheme was one of the most adrenaline producing schemes ever constructed by water engineers in South Africa. Former Minister of Water Affairs Sarel Hayward related in a department newsletter how a group of dignitaries visited the site via helicopter to check on its progress. Upon landing they were greeted by Resident Engineer Adam Botha who, after showing them around briefly for 15 minutes, coolly informed them that he had no more time to spend with them as he had work to do!

When the scheme was inaugurated the same Botha and his team decided to present the minister with a gift. The speeches were made, the obligatory buttons were pushed, but when Botha had to hand over his gift he was so overwhelmed he could not get out a word. Hayward stepped forward to shake Botha's hand. He had just thanked the engineer when his eyes too started welling up with tears! "So there we stood both with tears in our eyes and all we could do was look at each other. I hope the audience understood," said Hayward of what he called "his most tearful speech".

- This article has been an extract from the book, *In the Footsteps of Giants – Exploring the History of South Africa's Large Dams*, available from the Water Research Commission at a cost of R150. 

*The Grootdraai Emergency Scheme. This scheme effectively reversed the flow of the Vaal River.*

