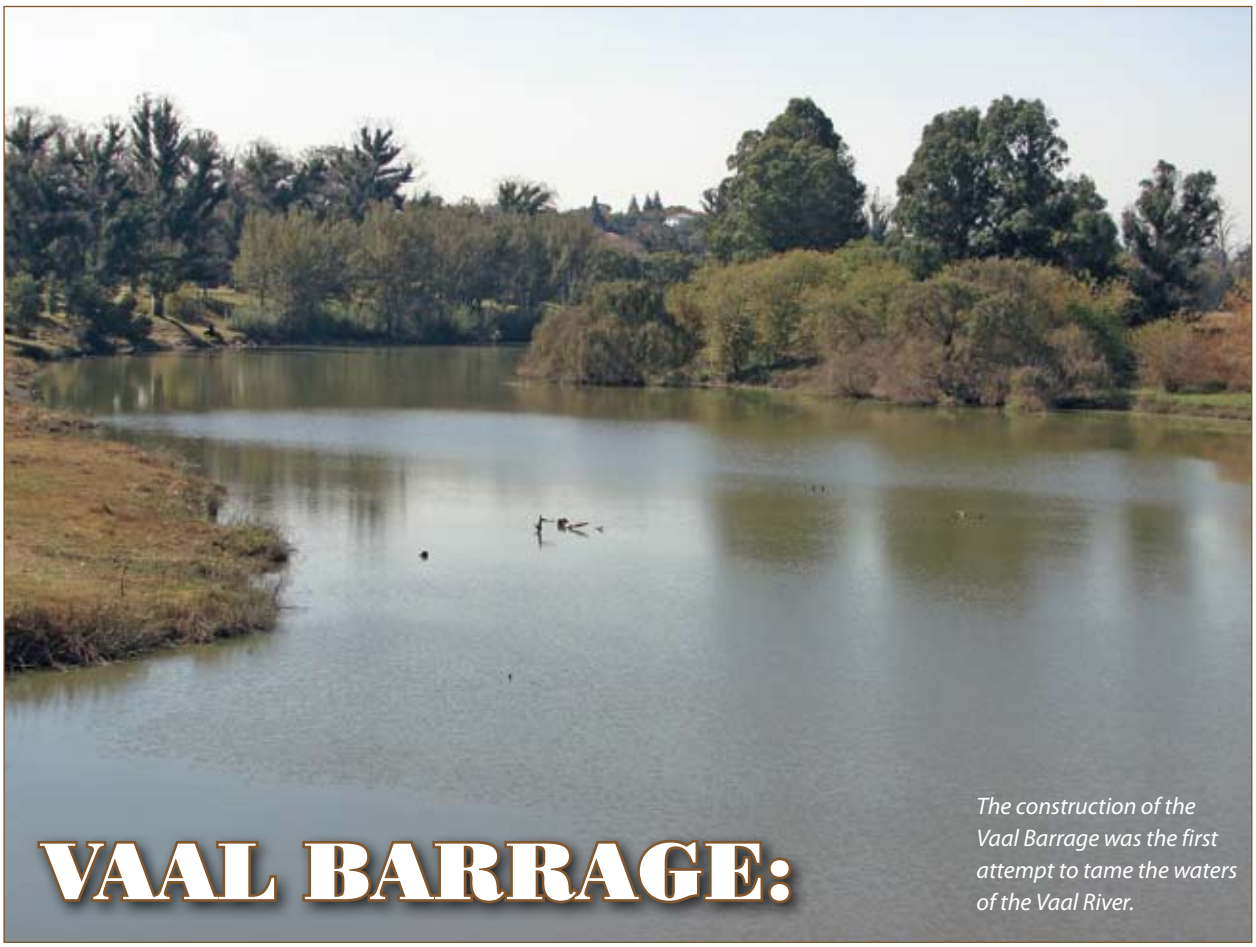


The construction of the Vaal Barrage was the first attempt to tame the waters of the Vaal River.

Lani van Vuuren

VAAL BARRAGE: Storing Water for a Thirsty City

Completed in 1923, the Vaal Barrage, one of the earliest large dams to be constructed in the country, was one of the most ambitious water projects of its kind in South Africa at the start of the twentieth century. Lani van Vuuren reports.

Even before the official end of the Anglo Boer War in 1901, British authorities commissioned an investigation into the possible damming of the Vaal River. The gold mines and industries of the Witwatersrand needed water, and local sources (mostly groundwater) were diminishing at a rapid rate.

In its final report the appointed commission of enquiry was critical of the Vaal River, however. This was mainly because the river was still the de jure border between the two Boer republics at war with Britain. After the conclusion of the Anglo Boer War in 1902, the river was the border between two British colonies.

VAAL RIVER RE-INVESTIGATED

Shortly after South Africa became a Union in 1910, drought set in exposing the unstable foundations upon which the Witwatersrand's rapid expansion and growing prosperity was based. By 1911, the mines were the largest water consumers in the area. At the same time, the number of municipal authorities had increased considerably.

Rand Water instructed its chief engineer, William Ingham, to launch an investigation to find the most suitable water catchments within a radius of 80 km of Johannesburg to expand the board's sources

of supply. As many as 21 different sites and schemes were scrutinised before Lindeque's Drift, on the Vaal River, some 70 km from Johannesburg was settled on as the best solution.

The scheme was approved by the Board of Rand Water on 26 September 1913. As originally conceived the potential yield of water from the Vaal River and the four tributaries flowing into the barrage was estimated at 91 Mℓ/day, 45 Mℓ/day of which could be tapped.

"The Vaal Barrage was part of a novel and pioneering endeavour of farsighted engineers."

Ingham wrote in a report in February 1913: "The Lindeque's Falls site is situated about 24 miles below Vereeniging, and, by building a dam 30 feet high at the Fall, the water would be backed up the river to Engelbrecht's Drift above Vereeniging for a distance of 44 miles, and a pumping station could be erected at Vereeniging in the neighbourhood of the collieries."

The plan was essentially to dam up the Vaal River over a distance of 60 to 70 km. The water would then be extracted at a point well above the site where the major storage source was located. The deep river banks were to be used as a longitudinal storage passage extending from above Vereenging, at Engelbrecht's Drift, to the barrage.

THE SCHEME EXPANDS

In March 1916, the Board approved a plan to expand the capacity of the scheme further by 23 Mℓ/day. A further £758 000 was earmarked for the project. Interestingly, upon completion in 1923 it transpired that the construction of the barrage only cost £1,5-milion, much less than anticipated.

In his paper published in *History*, May 2001, Prof Johann Tempelhoff, Director of School of Basic Sciences in the Vaal Triangle Faculty of North West University writes: "In many respects the Vaal Barrage was part of a novel and pioneering endeavour of farsighted engineers who were cognisant of the leisure and aesthetic value significance of the (Vaal) river. It was one of the most ambitious water projects of its kind in South Africa at the start of the twentieth century."

The project was based on the latest technological developments in engineering. Before plans were drawn up for the barrage, Ingham and Donald Simpson, a member of the Rand Water Board, visited large dam projects in Egypt and Europe to become acquainted with the latest engineering technology. Leading British engineering firms were contracted to supply the necessary mechanical equipment to be used for the barrage.

DELAYED CONSTRUCTION

It was originally anticipated that construction of the Vaal Barrage would start in 1914. However, World War II broke out that year hampering not only the construction of the barrage, but all of Rand Water's operations. Firstly, this was due to financial reasons. Up until the 1950s South Africa had no domestic capital market, and had to raise all its loans overseas. As a result of the outbreak of war and the diversion of all financial and other resources to the war effort, Rand Water was unable to raise the necessary loan capital to finance the barrage. This would only become available in 1916.

Secondly, the Rand Water Board at that time had a distinctly British character, with practically all of its senior employees being either British or English speaking. As a result the water board lost the services of a substantial number of its employees as they enlisted in the war. In fact, between 1914 and 1918, 75% of head office staff, 57% of the officials of the Chief Engineer's Department and 33% of the ordinary employees of the Chief Engineer's Department enlisted in one or other war-related activity (on the understanding that their posts would

Wikipedia

Governor-general of South Africa, Prince Arthur of Connaught, was one of the guests at the inauguration of the Vaal Barrage in 1923.

be kept open until they returned). Inevitably, all aspects of the work of Rand Water slowed down.

INTERMITTENT LABOUR

In the end work on the barrage started in June 1916, and overnight the site took on the appearance of a small village. Between 1916 and 1923 the scheme employed about 300 black workers and 40 to 50 white workers. While many white workers comprised carpenters and other skilled trades, about 25 unskilled whites were employed as gangers in charge of squads of black labourers.

Interestingly, when construction work started the white employees were accommodated at a cooperative mess established by the Rand Water Board. Later the mess was dissolved and most of the men then took up residence with storekeepers and farmers situated close to the site. On the other hand, the black workers were housed in a compound with their own cooking house. Most were former mine workers.

Construction reports of that time indicate that labour shortages were an intermittent feature of the early years of construction of the Vaal Barrage. In November 1916, 50 black workers left the site to plough their lands. This was a common practice among migrant mine workers, and their return was confidently expected in January the following year.

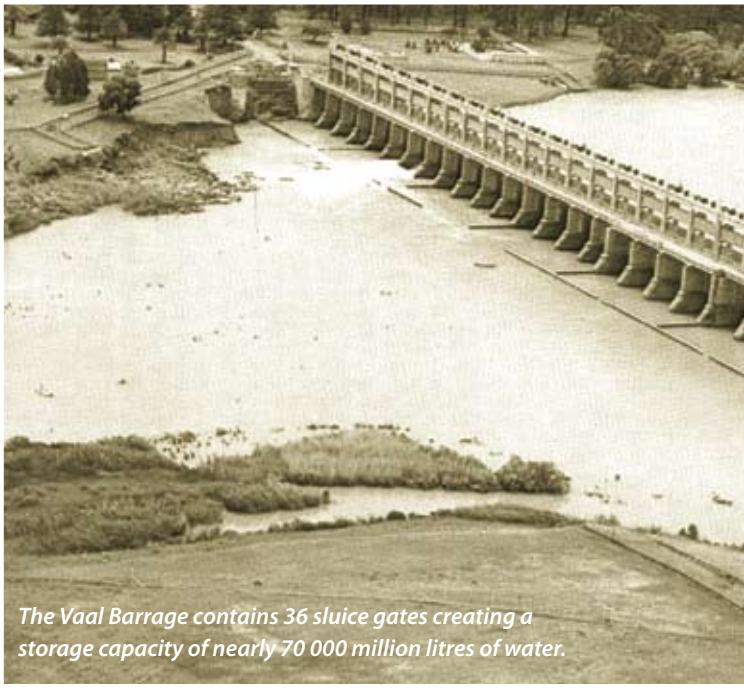
Again in June 1917 an abundant harvest in the African reserves prompted a significant drop in the number of black workers on site. Efforts were now made to attract new recruits from uMzkimkhulu in Natal and also from Herschel and Klerksdorp district. It is said that management even urged workers on site to write letters to their families asking the men to come work on the project.

THE VAAL FLOODS

Further delays in construction were experienced in late 1917 when major floods struck the Vaal. Water levels in January 1918 were recorded as shooting up six to seven metres. Even once the floods had passed their peak, water levels remained high

Rand Water

The Vaal Barrage at the time of its inauguration in 1923.



DWAF

The Vaal Barrage contains 36 sluice gates creating a storage capacity of nearly 70 000 million litres of water.

and it was recorded in May 1919 that since concreting had begun, it had been possible to work on the river bed for only 193 days due to its flooded state.

Next to strike was the worldwide epidemic of Spanish influenza in what became known as Black October in 1918. A total of 38% of Rand Water's white and 83% of the board's black employees were temporarily disabled by this debilitating disease. Of the 402 workers at the Vaal Barrage project 98% were incapacitated and nearly 10% died.

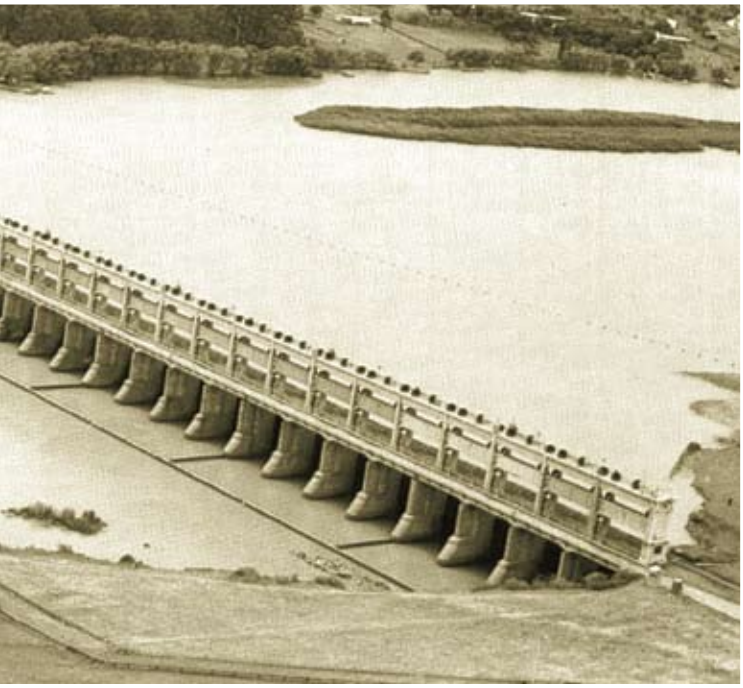
Other health problems experienced included food poisoning, and an outbreak of scarlet fever. Many of the war veterans who joined the project after WWI also suffered from malaria relapses.

MONUMENT TO ENGINEERING SKILL

The Vaal Barrage was finally completed in 1923. Spanning the Vaal River over a distance of about 400 m, it was as Prof Tempelhoff describes it "a veritable monument of engineering skill." More than 275 000 m^3 had been excavated in rock of which 43 000 m^3 had been cast in concrete.

By making use of the Duff Abrams method of steel-reinforced concrete the structure was strong and capable of withstanding all types of flooding conditions. It was constructed in a blend of art nouveau and classical styles. There were 36 sluice gates creating a storage capacity of nearly 70 000 million litres of water.

In grand style the Vaal Barrage was officially opened on 27 July 1923 by the then governor-general of South Africa,



Prince Arthur of Connaught. A train was chartered to convey guests from Johannesburg to Vereeniging whence they were conveyed to the site by buses and cars.

The water scheme was a proudly South African development. In many respects it brought about a tumultuous change in the environment along the Vaal River between the barrage and Vereeniging in the first quarter of the twentieth century. Prof Tempelhoff writes: "Without this source the development of the Witwatersrand and the economic progress of South Africa would have taken longer to materialise. The growth of the Rand created a demand for industrial support in the form of water, coal and electricity. The Vaal River… played a crucial role in satisfying the need… for the future Vaal Triangle the river would become the silent hard-working witness to rapid industrialisation."

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JOHANNESBURG – THE THIRSTY CITY

It is well known that Johannesburg is one of the few large cities in the world not sited close to a significant river. Instead it was the discovery of gold in 1886 on the farm Langlaagte and the promise of great wealth which drew people to the Witwatersrand. In the early days water was drawn from surrounding rivers and streams, as well as from groundwater sources, but droughts and water shortages were common, and the water resources were quickly polluted.

It is reported that during the severe droughts experienced in 1889 and 1895 the rich resorted to bathing in soda water while the poor had to disguise the smell of their unwashed bodies with toilet water and perfumes. Newspapers of that time reported women resorting to a mixture of ammonia and lavender water for washes.

After the appointment of various governmental commissions, the Rand Water Supply Board was constituted by legislation in 2003. Before then, water supply to Johannesburg was undertaken by several private water companies.

One of the most significant early policy decisions was that there would be a fixed rate per thousand gallons, irrespective of the point on the trunk lines from which the supply was drawn. This meant that the Witwatersrand could develop independently of where the source was. Another important decision was that the rate for water was not to yield any profit, but was calculated to cover working costs.

Raging demand and frequent droughts led the Board to cast its eyes away from groundwater sources and on to the murky Vaal River, and it was less than a decade after the formation of Rand Water that investigations which eventually led to the construction of the Vaal Barrage began.

NLSA

During the drought of 1895, water was sold for two shillings and sixpence per bucket.