

Bedford and Bramhoek Dams (Ingula Pumped Storage Scheme)

The Ingula Pumped Storage Scheme, a project in which the construction of the upper and lower dams, Bedford and Bramhoek Dams respectively, was undertaken by BDJV, a joint venture between Concor Roads & Earthworks, WBHO, Edwin Construction and Silver Rock. The Scheme straddles the provincial boundary of the Free State near Harrismith and KwaZulu-Natal near Ladysmith. The dams are 4,6 km apart and connected by underground waterways through an underground powerhouse which houses four 333 MW pump turbines. Together, the dams will have an approximate water capacity of 22 million cubic metres.

The upper dam, Bedford, is a 49 metre high, 770 metre long concrete-faced rock-filled dam with a total reservoir volume of 22,4 million m³. It has a 42 metre high intake tower with a 2,5 metre diameter reinforced concrete outlet conduit and a 15 metre high by 45 metre energy-dissipating base. The rock-fill embankment is 480 metres long.

The lower dam, Bramhoek, is a roller-compacted concrete (RCC) dam with a wall 330 metres long and 39 metres high. Approximately 100 000 m³ of concrete was used to construct the wall. It is the first dam in Africa to have upstream and downstream faces with grout-enriched RCC (GE-RCC), a construction method which fast-tracked construction significantly.

Bedford Dam

The first challenge to be overcome was that the contract was awarded six months later than anticipated which meant that the project had to be fast-tracked despite various complicating factors.



The JV confronted considerable geological and climatic challenges. One of the challenges was the removal of 80 000 m³ of peat prior to actual foundation excavation from the Wilge River that the dam straddles.

The area's wetlands are home to over 200 species of birds. The BDJV co-operated closely with Eskom, Birdlife South Africa and the Middelpunt Wetland Trust to conserve the site and transform the project into a protective nature reserve on completion, rehabilitating over-grazed and eroded land and removing all exotic fauna and flora. It will be known as the Bedford Wetland Park.

Bramhoek Dam

Unexpected geological conditions combined with adverse weather caused considerable delays to progress at Bramhoek Dam. The project had to be fast-tracked through implementing double-shifts and applying new technologies. The dam had to be completed before the underground works and Bedford Dam.



Project information

- **Name of project:** Bedford and Bramhoek Dams (Ingula Pumped Storage Scheme)
- **Name of company entering:** BDJV (a joint venture between Concor Roads & Earthworks, WBHO, Edwin Construction and Silver Rock)
- **Project start date:** April 2008
- **Project end date:** August 2011
- **Client:** Eskom
- **Main contractor:** BDJV (joint venture between Concor Roads & Earthworks, WBHO, Edwin Construction and Silver Rock)
- **Project manager:** Eskom
- **Consulting engineers:** BCJV (Arcus GIBB, SSI, Knight Piésold)
- **Contract value:** Approximately R1,8-billion

Early impoundment of the dam was successfully achieved on programme and the dam overflowed for the first time in January 2011.

Due to the delays in awarding the contract, pouring of concrete could not commence in winter as planned, but was undertaken in summer in high humidity and high summer temperatures of up to 30 °C. It was agreed that instead of pouring concrete at a temperature of 20 °C as originally intended, the maximum temperature of the concrete could vary between a minimum of 20 °C and a maximum of 27 °C. A chiller plant was installed in which water was cooled to 4 °C and sprinkled over the material.

The steep topography around the dam footprint restricted access to certain areas of the excavated dam footprint. One of the biggest advantages of the chosen GE-RCC was that it reduced the congestion of ready-mix trucks and ADTs at the dam wall. ●