**PONGOLAPOORT DAM TEXT**

**PROJECT LOCATION: KWA ZULU NATAL**

**PROJECT VALUE: R 1.9BN**

**PROJECT SUMMARY:**

**PROJECT BACKGROUND**

LTE was appointed by the Department of Water and Sanitation (DWS) to refurbish the Pongolapoort Dam and address the issues raised during the 2004 and 2008 dam safety reports. The dam safety issues include the rehabilitation of the hydromechanical components of the dam, including the radial gates, the canal inlets and outlets, sleeve valves, and civil modifications to improve operations there-of. Concerns about the dam being able to pass the dam Safety Evaluation Flood (SEF) event were raised, and this will require further investigations / clarifications and may require further civil engineering interventions.

**CONTINUE TO DETAILED PROJECT SUMMARY**

The original scope of works for this project was based on the works required to address the risks identified in the last Dam Safety Evaluation (DSE) as well as its Addendum. The focus in addressing the dam safety issues will be on the following aspects:

* Early warning system(s) of incoming floods to the Dam Operators
* Effectiveness of the current warning system to downstream residents of unexpected flood releases
* Reliability of the operation of the radial gates, and to confirm the size and speed of opening needs annually
* Risk analysis, i.e. a detailed probabilistic evaluation of the realistic consequences to the dam and downstream area of various full supply level (FSL)
* Insufficient spillway capacity, with various options including an emergency spillway

**PROJECT LOCATION**

The Pongolaport Dam is situated in Northern Kwa-Zulu Natal some 30 km east of the town of Pongola (280 km north-east of the port city of Durban). It is positioned in the valley where the Pongola River, passes through the Lebombo Mountain range. The Pongola River is an international river, affecting not only South Africa, but also the kingdom of Swaziland and Mozambique.

**PROJECT OBJECTIVE**

The DWS have defined their desired project objectives as follows:

* To present feasibility studies of the modification required to increase the spillway capacity, as well as the dam safety deficiencies identified during the last dam safety inspection
* Complete detailed design, specifications and bid documents for the accepted option(s)
* Feasibility studies of any geotechnical investigations envisaged
* Timeous environmental authorisations and water use licences required
* Operational and maintenance (O&M) manual and emergency preparedness plan (EPP)
* Carry out construction supervision and contract administration of the works

DAM DESIGN AND PHILOSOPHY

The Pongolapoort Dam is a double curvature concrete arch dam, designed and constructed by the then Department of Water Affairs (now DWS), and was completed in 1973. With a wall height of 89 m, the dam is the third highest dam in South Africa. Taking into consideration the full supply capacity of 2 400 million m3 (the fifth largest in South Africa). The dam is a Category III dam as per the South African Dam Safety Legislation.

The dam was developed to provide water supplies to the agricultural developments and the various villages on the Makathini flats and the Pongola flood plains

PROBLEM STATEMENT

According to the addendum to the 2008 Dam Safety Evaluation of Pongolapoort Dam (Beukes: 2008) the maximum combined spillway capacity of the dam’s uncontrolled ogee spillway and radial gate-controlled chute spillway is 8 460 m3/s. The recommended Safety Evaluation Flood (SEF) peak from the Dam Safety Evaluation report (Brink: 2004 is 18 484 m3/s. According to Beukes (2008) overtopping of the Non-overspill Crest (NOC) can be expected when operating the dam at a maximum water level of 66% of the original Full Supply Level (FSL) and assuming that 2 of the 3 radial gates will be operational during the SEF. Uncertainty further exists on the erodibility of the downstream foundation rock during overtopping and its effect on the possible failure of the arch as a result of this erosion

PROJECT DEFINITION STAGE

The Concept and Viability Phase was concluded by April 2019. The series of reports addressing the project definition stage of the proposed betterment works of Pongolapoort Dam were presented to the DWS.

The work described in the various volumes was used to develop a number of appropriate betterment options to address the dam’s identified shortcomings, leading to seven proposed primary betterment options to create the necessary spillway capacity, all of which are compared in terms of impact, hydraulic efficiency and cost against a primary option (Option 1) of providing appropriate betterments to allow overtopping under the SEF.

An eighth option denoted “Option 0” describes the status quo scenario in which the non-overspill crest of the dam is allowed to overtop with no betterments. This scenario is not supported.

The range of options considered appropriate for review are as follows:

Option 0 Allow overtopping with no betterments

Option 1 Allow overtopping of the NOC, with betterments

Option 2 Widen the ogee spillway

Option 3 Raise of the NOC and remove the spillway bridge

Option 4 Solid raising of bridge and NOC

Option 5 Replace the ogee spillway with a labyrinth or PK-weir

Option 6 Additional tunnel spillway on right flank

Option 7 New side channel/gate structure on left flank

…and combinations of the above.

The preferred betterment option to be taken to the next phase is Option 4, which includes raising the existing bridge, providing a solid NOC raising, new instrumentation and rehabilitating the civil, mechanical and electrical components, including providing upstream stoplogs. During the further development of this option, the existing apron must be inspected and the scour potential downstream of the dam must be evaluated. The apron may require additional anchorage and/or concrete protection, which has not been considered at this stage.

On the basis of practicality and relative capital costs, additional options that warrant further consideration in the next phase of the project are:

Option 1d: Concrete flood wall (3.2 m high) over full length of dam

Option 3a: NOC raise with concrete flood wall (2.1 m high), removal of bridge and piers, and construction of a new downstream road and bridge.

**DETAILED DESIGN PHASE**

Considering the nature of the work envisaged, the development of the further stages of the project should be separated to provide three independent implementations:

**Package A:**  Dam Safety Recommendations, general Civil and M&E Works and Geotechnical studies

This package will comprise a number of separate activities/contracts to address the general recommendations of the Dam Safety Evaluation Report, each with their own procurement requirements. It will entail the design development of these requirements, preparation of tender documentation and procurement of a contractor.

**Package B:**  Gated Spillway Betterments Design

The aim of this package is to design an upstream stoplog system that will facilitate complete and up to date rehabilitation of the radial gates, which will also facilitate future maintenance and inspection of the radial gates. This task will entail the design development of the upgrade, the preparation of tender documentation and procurement of a contractor.

**Package C:** Betterments Options Reduction

This package will entail:

* The preliminary design of the three betterment options discussed above, namely, Option 4, Option 1 and Option 3a.
* Detailed design of the approved solution.
* The preparation of tender documentation and procurement of a contractor for the approved solution