

Botswana's North-South Carrier Water Transfer Scheme

a strategy for ensuring economic growth

INTRODUCTION

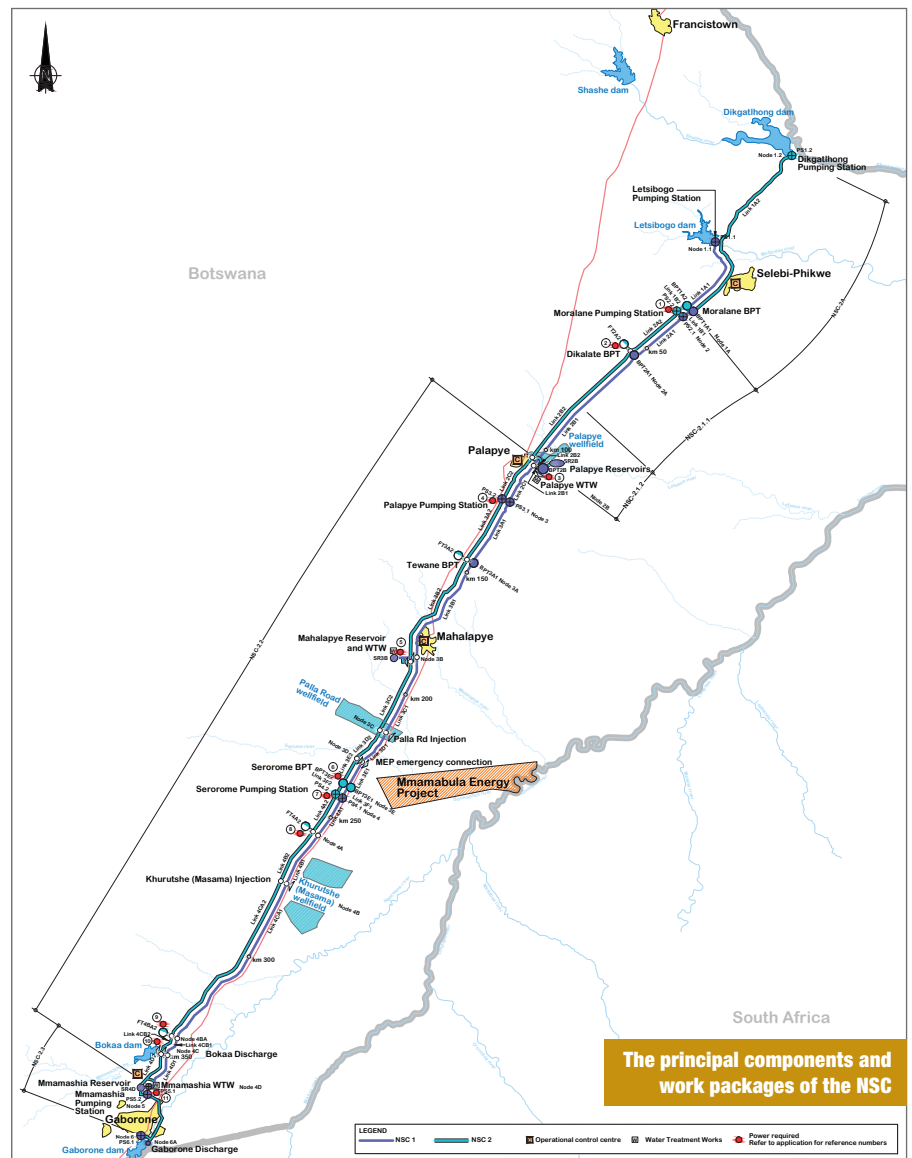
Increasing mining activities and an expanding population in eastern Botswana mean a growing demand for water. This need has been anticipated by the Botswana government, and its long-term strategy is now facing its second phase with the development of the North-South Carrier water transfer scheme by the country's Ministry of Minerals, Energy and Water Resources (MMEWR). Leading infrastructure development firm Bigen Africa has been appointed as the MMEWR representative.

EMERGING ECONOMY

An emerging economy in the SADC region, Botswana is strongly reliant on its mining activities, especially of diamonds, which are focused in the eastern area around the capital of Gaborone. This area is also the most populated region in the country. Increasing water utilisation here is being addressed by the North-South Carrier (NSC) water transfer scheme, initiated by the Botswana government, not only to meet a fundamental human need, but also as a key requirement for infrastructure development and economic growth.

THREE-PHASE WATER SUPPLY PLAN

The implementation of the NSC upgrading works, a three-phase plan, is being led by the MMEWR, with



The principal components and work packages of the NSC

responsibility for water resource planning, control, legislation and regulation, while the Water Utility Corporation is participating as operator and key technical partner.

The second phase of the NSC (NSC-2), of which the planning stage commenced in 2007, is aimed at completing a water transfer strategy that feeds on various dams, existing or newly emerging from the first phase (NSC-1, completed in 1999). Second-phase construction is set to commence in the second quarter of 2012, with Bigen Africa acting as the MMEWR representative.

In the mid-1990s, the Botswana government adopted a national water supply plan which identified the need for the NSC to connect Letsibogo Dam on the Motloutse River to the Mmamashia water treatment works in northern Gaborone, and to supply the Palapye and Mahalapye water treatment works. Mmamashia is also supplied from the smaller Bokaa Dam, directly north of it. The first phase included the importation of raw water into Gaborone from the Moletedi Dam in the North West province of South Africa, and the construction of the Letsibogo and

Shashe Dams which feed on three tributaries of the Limpopo River in central Botswana – the Motloutse, Shashe and Tati Rivers. Construction of the Dikgathong Dam also commenced, along with its connection to the first-phase break pressure tank number 1. This dam is at present nearing completion and should be substantially filled by the time the NSC is commissioned. Upgrading of various aspects of phase one is still to be commissioned.

Pumping stations are located at Letsibogo, Moralane and Palapye (with another envisaged for Seroroue) and deliver from 1 175 l/s to 2 300 l/s, with operational capacity of between 2 MW and 3 MW respectively. The first-phase pipe varies in diameter from 1 400 ND to 1 100 ND and was constructed from a combination of materials, including GRP and steel. Further pipes will be constructed from either steel or ductile iron, while consistency in other principal plant and material selections, including the key requirement of local maintainability, is required by the government. Communication and control signals will mainly be by fibre-optic cable with backup by wireless radio data link.

In order to protect and control access to the NSC, the MMEWR has resolved to acquire and register rights to the NSC corridor from Dikgathong Dam to Mmamashia. A single corridor, varying between 50 and 70 m in width, will be acquired to accommodate each of the three phases, the fibre-optic communication backbone and the maintenance road. Environmental investigations have been undertaken for the primary corridor, and a management entity is in place. Further investigation and authorisations were pursued on bedding and gravel-wearing course materials along the route of the second phase. Borrow pit leases and mining licences are also a requirement.

In phase two, the direct water transfer route will run primarily alongside north-south traffic route A1 and pass the demand nodes of Palapye, Mahalapye and Mmamabula, where raw water is treated, en route to Mmamashia in northern Gaborone. National electricity generation occurs at Morupule within the Palapye complex, and potential export generation can be established in the future on the Mmamabula coal field between Mahalapye and Gaborone. Water reclamation from



the Gaborone water treatment works at Glen Valley is also planned to supplement local water resources.

Eutrophication of local Gaborone resources in the Bokaa and Gaborone Dams (and in future of the Dikgatlhong Dam) is a technical matter that requires management and design consideration.

As far as phase three is concerned, the MMEWR has initiated environmental scoping and prefeasibility planning. An overall NSC transfer decision support system, factoring in current resource storage levels, water quality, treatment demands and pumping and treatment costs, will be established to determine water source and transfer requirements from local resources, and via the three phases of the NSC.

The NSC is expected to deliver 45 Mm³ of water per annum and costs were estimated, in 2010, to amount to P5.5 billion. The summarised yield of the eastern Botswana dams is calculated at 95% assurance, and is expected to meet the demand until 2035 or so, after which further aug-

mentation will be needed, most likely from the Zambezi River in the Kasane area where the Botswana government has a significant allocation for both primary use and agriculture.

It is anticipated that second-phase construction will be completed within 24 months, with commissioning and trial operation expected by mid-2014.

UPGRADING STILL IN THE PIPELINE

For purposes of effective management and redundancy, the three phases of the NSC have been planned as separate, independent delivery systems within a single corridor, but operating under an integrated communication and control system.

Upgrading work which still needs to be done includes the introduction of variable speed drives at some of the dams, the construction of a new dam, and the adjustment of the main transfer link between the Bokaa Dam, the Mmamashia water treatment works, the Gaborone water treatment works and the Gaborone Dam. The Palapye water treatment works need to be doubled and at Mmamashia,

pre-treatment and secondary treatment works need to be added. At Gaborone, treatment works for raw water and other process upgrading must be undertaken, with construction of further secondary treatment works to follow.

Second-phase implementation follows a three-stage bid procedure, namely pre-qualification, pricing and EPC design, and bid development. Local content is a key requirement of the Botswana government to ensure a direct contribution to the growth of the national economy. The preferred bidder for stage 2.1 of the NSC is CWJV (WBHO and CCC) and the professional service provider for Dikgatlhong Dam and NSC-2A is the Bergstan, Gauff and Jeffares & Green joint venture. For stage 2A of the NSC, the civil contractor is the China State/Excavator Hire joint venture.

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