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Provincial centres water supply - The Gambia

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Background

Water supply, sewerage and electricity supplies in The Gambia are all the responsibility of Gambia Utilities Corporation, based in the capital, Banjul, which together with neighbouring Serekunda is the main centre of population and well served.

The seven principal provincial towns in The Gambia are spread along the North and South banks of the river Gambia, the farthest, Basse, being 400km from Banjul. Although considerable improvements are now being made, communications generally are not good and public electricity supplies are limited and intermittent, being dependant on old diesel powered generators at each centre.

Water is obtained from borehole sources with a basic distribution system serving a limited number of service connections and stand pipes.

The systems in each of the towns, installed in the years since 1953, were, by 1987, breaking down due to lack of maintenance and spares, inadequacies in original design and remoteness from the only operational and maintenance facility, located in Serekunda.

Howard Humphreys were appointed in 1988 to undertake the upgrading and renovation of the system, from feasibility through design to supervision of construction, the project being financed by the European Development Fund (EDF).

Objectives

The objectives of the project were:

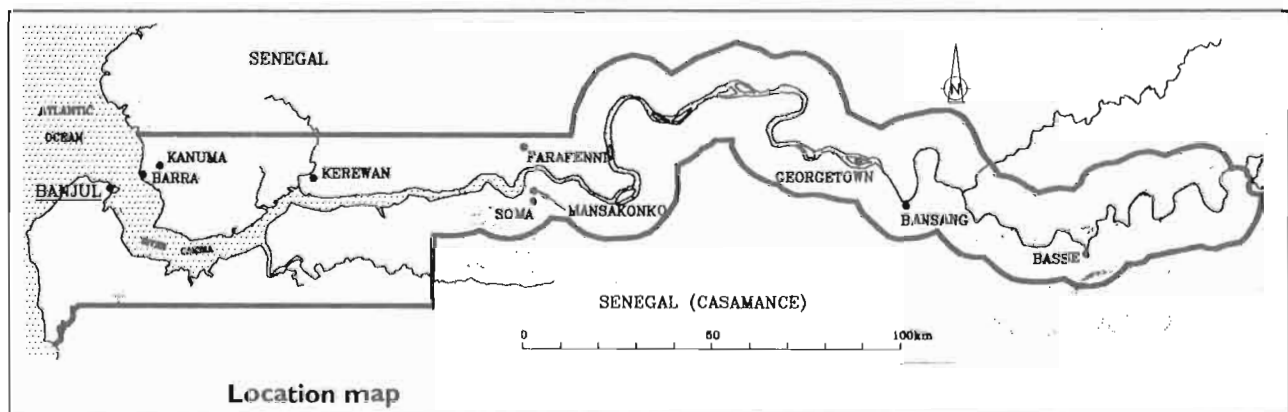
- To provide a potable water supply to a population estimated at 100,000 by the year 2,000.

- To provide safe drinking water 24 hours per day, and hence reduce dependence on wells.
- To reduce water-borne disease and improve public health and living conditions in the 7 provincial centres
- To improve the infrastructure in the provincial towns and hence reduce migration to the Banjul/Serekunda conurbation.
- To provide minimum-maintenance installations, with maximum standardisation of components.
- To provide upcountry maintenance facilities, and hence reduce dependence on the Serekunda facilities.

Study and design

The feasibility study took place between January and April 1988. It consisted of:

- An evaluation of current and forecast water demands;
- An evaluation of water resources;
- Appropriate technical proposals;
- Monitoring of water supply and preparation of a sampling programme;
- A thorough investigation of water quality in problem areas;
- An evaluation of GUC water production and management along with proposals for strengthening the organisation;
- An evaluation of capital investment and operational costs,
- Impact of the project on social and economic development.



Design and draft tender documents followed in May and June 1988 and the final tender documents were approved in July 1988, but only for an initial phase as the ECU 5 million being provided by the EDF was insufficient to implement the project in full.

The initial phase concentrated on the largest centres and included all the water supply systems in Basse, Bansang and Farafenni plus part of the system in Mansakonko and the depot at Bansang.

Engineering considerations

The quality of the water available is excellent at all centres except Bansang, where there is a very high iron content (20 mg/l), though all are corrosive owing to low dissolved solids and low pH. Corrosivity of the water could be reduced but this would introduce an additional complication which cannot be justified when all pipelines and tanks are of non corrodible material. Water corrosivity did affect pump material selection.

At Bansang, to remove the high iron content of the water, a cascade aerator, followed by a horizontal flow settlement tank and slow sand filters were installed. This arrangement requires no aids to flocculation, is simple in operation and maintenance, and being situated at high level, utilises gravity flow and is not dependant on electricity supply, the borehole pumps delivering to the head of the works.

Basic chlorination is provided at each borehole, to prevent contamination of water during transit from boreholes to the consumer. A system utilising hypochlorite solution was installed, the solution being pumped into the pumping main downstream of the well head. Chemical mixing and adjustment of dosing rate can be manually adjusted, with operation of the dosing pump linked to the borehole pump starter.

The existing water supply at each of the seven centres formerly relied on a single borehole equipped with an electro-submersible pump delivering to an elevated steel tank, from which water gravitated to parts of the centres through a limited distribution system.

No standby facilities were available and component failure could mean shut down of the local system, and, due to poor communications, often a bus journey by the operator to obtain assistance.

In the project, an additional borehole was provided at each centre, except Kerewan and Georgetown, and the range of size and type of pumps reduced to a minimum (if necessary by introduction of blank stages) to give interchangeability and reduce spares holdings.

Tank storage capacity balances the inequalities between varying hourly demand and the constant discharge from the boreholes. It also provides a reserve against pump stoppage or mains failure. Once in the tank, the system is entirely gravity-driven to overcome problems of intermit-

tent public power supply. The tank in each centre provides 24 hours supply following failure of one borehole.

Diesel generators, again reduced to a minimum of sizes for standardization, are provided for standby, and in the case of two sites also for primary power supply. All controls are designed for simplicity of maintenance and operation by staff who may have little specialist knowledge, to enable water supplies to be maintained with least possible recourse to central resources.

An operator/watchman is constantly in attendance at each site. Pump operation is manual with protective override devices, the emphasis being on a system that is easy to operate and maintain by the man on site.

Basic instrumentation is provided at each pumping station, comprising ammeter and hours-run counter at the control panel, flowmeter on the wellhead discharge line and a dip tube to facilitate well water level monitoring.

A simple float type level indicator is provided at the elevated tanks.

The former distribution system suffered from maintenance problems particularly at joints, and careful selection of materials and construction methods was essential. In accordance with World Bank Technical Note Number 16 cost savings on distribution were achieved by reducing minimum pipe diameters to 50mm. This enabled a more comprehensive distribution system to be installed for the money available. Provision for standpipes has been based on one double or two single taps for every 200 people without service connections. MDPE has been adopted for service pipes up to 50mm and PVC for larger sizes, purpose made connectors being used for jointing.

The local communities were involved in selection of locations for standpipes, and many have taken the responsibility for caring for them.

Maintenance depots have been established at two locations, Bansang on South Bank and Farafenni on North Bank, and a radio network provided to strengthen the organisation of the Provincial Supply Department and ease communications problems.

The facilities provided, covering the seven centres, include:

- 6 new boreholes and 11 sets of borehole equipment;
- 80km of 50m to 250mm diameter distribution pipe-work;
- 7 No. elevated aluminium rubber lined tanks of 300m³ - 800m³.
- 400 standpipes and 1200 service connections;
- 2 No. depots, with spares for 5 years service, 4 vehicles and materials for minor extensions;
- 1 No. treatment works (Bansang) for iron removal.

Implementation

Four companies tendered for the initial phase - Senegalese, British, Danish and a French/German joint venture who as lowest bidder were awarded the contract. As suggested in the tender documents, the building works were subcontracted to a Gambian company.

Construction was all completed on time. The system in each centre was put into use as it was available commencing with Basse in early 1991 and concluding with Bansang in July 1991. The total cost was slightly less than the budget.

During 1991, the EDF confirmed that a further ECU 4 million would be available in 1992 to complete the project as designed. EDF regulations allow for negotiation of additional works with the original contractor in cases such as this. This took place in time for commencement in April 1992 when funding became available.

Phase two was also completed on time and within budget. The whole project is now operating satisfactorily and supplying potable water for 24 hours a day to a total population estimated currently at 80,000.

The four largest centres in particular are experiencing rapid but planned growth. New areas have been subdivided around each centre and new houses are being constructed. Commerce and business is also increasing as demonstrated by the growth of banks and insurance companies. In 1988, there was only one bank in the whole project area. There are now five and each of the largest centres has at least one insurance company.

Indirect benefits

In 1988, Howard Humphreys proposal for the study and design included for all the work to be carried out in The Gambia in association with Gambian professionals.

When the study and design was awarded in late 1988, the Gambian associates set up a consultancy company to undertake the work with Howard Humphreys. This association continued throughout the project. At present, the Gambian Consultant has several contracts as an independent firm in addition to other subcontracts with international companies, including further work with Howard Humphreys.

During the initial implementation phase, the GUC Provincial Water Engineer was seconded to the supervision staff of Howard Humphreys for training and as the systems were put into use, he took over responsibility for the operation and maintenance. Training for other GUC engineers and technicians was provided under other projects.