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STAFF APPRAISAL REPORT

KADUNA WATER SUPPLY PROJECT

April 1979

Regional Projects Department
Western Africa Regional Office

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CURRENCY AND EQUIVALENTS

Currency Unit	=	Naira (₦)
₦ 1.000	=	US \$1.54
US \$1.00	=	₦ 0.649

UNITS OF MEASUREMENT

mm	=	millimeter	(1 millimeter = 0.039 inches)
cm	=	centimeter	(1 centimeter = 0.39 inches)
m	=	meter	(1 meter = 3.28 feet)
km	=	kilometer	(1 kilometer = 0.62 miles)
km ²	=	square kilometer	(1 km ² = 247.1 acres = 100 hectares)
ha	=	hectare	(1 hectare = 10,000 square meters = 2.47 acres)
m ³	=	cubic meter	(1 m ³ = 264.2 U.S. gallons = 35.3 cubic feet)

ABBREVIATIONS AND ACRONYMS

FGN	=	Federal Government of Nigeria
KCDB	=	Kaduna Capital Development Board
KSG	=	Kaduna State Government
KSWB	=	Kaduna State Water Board
LBIN	=	Louis Berger Incorporated Nigeria, Consulting Engineers
NEPA	=	National Electric Power Authority
NRBDA	=	Niger River Basin Development Authority
UNDP	=	United Nations Development Program
WAP	=	Ward, Ashcroft Parkman (Nigeria), Consulting Engineers
WHO	=	World Health Organization
FMAWR	=	Federal Ministry of Agriculture and Water Resources

FISCAL YEAR

Fiscal year ends March 31 for Kaduna State Water Board

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This report is based on the findings of a Bank appraisal mission which visited Nigeria in May-June, 1978, comprising Messrs. Buky (Sanitary Engineer) and Prenoveau (Deputy Division Chief) and Messrs. Grover (Consulting Sanitary Engineer) and Hutchins (Consulting Financial Analyst).

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I. THE WATER SUPPLY AND WASTE DISPOSAL SECTOR

Background

1.01 Nigeria, with a 1978 population of approximately 80 million, is the most populous nation in Africa. Kaduna State, formerly North Central State covers an area of 69,500 km² or 7.6% of the total area of Nigeria (see Map 13938). The estimated 1978 population of Kaduna State was just over 6 million. The last official census prepared in 1963 indicates that Kaduna was the fourth most populous of today's states. There are probably more people in Kaduna State than in some 36 of the 54 countries of Africa.

1.02 The Bank has not previously made a loan in the water supply and waste disposal sector in Nigeria and has not yet carried out a sector survey but such a survey is scheduled to start in 1979 under the WHO/IBRD cooperative program.

National Aspects of Sector Developments

1.03 Under Nigeria's federal system of government, individual states have the primary responsibility for the water supply and waste disposal sector. Nigeria's Federal Ministry of Agriculture and Water Resources (FMAWR) is responsible for the national and international aspects of water resources allocation and for approving large water projects for which federal government financing is requested. In 1976 eleven river basin authorities were created by Federal decree to plan and develop surface water resources on a national basis throughout Nigeria. The most important of these, as far as Kaduna State is concerned, is the Niger River Basin Development Authority (NRBDA), with headquarters at Ilorin in Kwara State. In July, 1977 this authority engaged a consortium of consultants ^{1/} to carry out a prefeasibility study for the Kaduna River Basin, the largest tributary in Nigeria to the Niger River. The draft report, made available in mid-1978, contained a useful compilation and analysis of existing information. In due course NRBDA will become responsible for the obtaining and recording of basic hydrogeological, hydrological and meteorological data and for the allocation of water resources for development schemes but at this stage it is not yet able to fully discharge these responsibilities.

1.04 Nigeria's plans for economic development are outlined in National Development Plans, the third of which covers the period 1975-1980. Each state has its own plan for the same period which is a component of the national plan. During the current plan period, the Federal Government set the following policy objectives regarding urban water supply:

^{1/} The consortium comprises Nigerian Agricultural Promotions Company Ltd., associated with Ward, Ashcroft and Parkman (Nigeria) (WAP) and Booker Agricultural International Ltd. Sections of the report dealing with water resources were prepared with the assistance of Parkman Consultants Ltd. (UK); the Institute of Hydrology (UK); and Water Surveys (Nigeria) Ltd.

- (1) To ensure that all communities of 20,000 or more people are provided with pipe-borne water by 1980; and
- (2) To provide 115 liters (25 gallons) per head per day in all urban centers.

However, to date sector developments have taken place largely in an uncoordinated manner as the state agencies proceed more or less independently following mostly local objectives and priorities.

International Drinking Water and Sanitation Decade

1.05 In March 1977, the United Nations Water Conference held in Mar del Plata, Argentina, declared the period 1980-1990 the International Drinking Water and Sanitation Decade. The Plan of Action adopted by the conference provides guidelines for governments and international organizations for action to be taken to achieve the provision of safe water supply and sanitation facilities for all by the year 1990. The period 1978-80 has been specified for the assessment of existing situations and the preparation of national plans and programs for achieving these goals. The World Health Organization's (WHO) Thirtieth World Health Assembly resolved to collaborate with member countries during this initial stage and one of the actions suggested was a rapid assessment of ongoing programs and their possible expansion. WHO staff and resources are made available to assist interested countries and the Bank is associated with this effort through the IBRD/WHO Cooperative Program (CP). The rapid assessment exercise has been underway in Nigeria with the assistance of WHO staff since July 1978 and the resulting reports are expected in April 1979. This exercise, together with a full sector survey planned to begin in 1979 are expected to increase sector knowledge and development activities significantly.

Sector Organization in Kaduna State

1.06 Kaduna State consists of 14 local government divisions including the Kaduna Capital Territory. These local governments are basically responsible for services of a local nature (town planning; local roads and drainage; disposal of solid wastes; town markets; etc.) but most lack the financial and human resources to be effective. The principal public authority is the Kaduna State Government (KSG) which is centered in Kaduna and is responsible to the Military Administrator.

1.07 In Kaduna State the main water resources agency is the Kaduna State Water Board (KSWB), whose basic function is the provision of water for domestic, industrial and agricultural purposes throughout the state. Before KSWB was created in 1971 public water supply was the responsibility of the Ministry of Works in Kaduna State Government (KSG). KSWB's organization and activities are discussed in more detail in paras 5.02-5.09. Kaduna's Ministry of Economic Development is concerned with the allocation of financial resources for KSWB activities. The FMAWR is responsible for the planning and development of irrigation projects. The Ministry of Health monitors the quality of water provided by KSWB to its consumers.

1.08 Until very recently there was no agency in Kaduna State with specific responsibility for wastewater disposal. The Ministry of Health is marginally involved (it has plans to build 150 public toilets throughout the state), as are the local authorities who are responsible for some sanitation measures. In the capital of Kaduna, the Kaduna Capital Development Board (KCDB), which is basically a planning authority (para. 2.03), has now also been made responsible for sewerage in addition to its responsibilities for the maintenance of roads and drains and for refuse collection and disposal. KCDB was designated by the government to be the executing agency for the ongoing Kaduna Sewerage and Drainage Project of the United Nations Development Programme (UNDP). Under this two-year project, which commenced in October, 1977, engineering consultants 1/ prepared a Master Plan and proposed immediate measures dealing with wastewater disposal, storm drainage and refuse disposal in Kaduna. Initial draft reports by these consultants were available at the time of appraisal. KCDB set up an advisory committee (which first met in May, 1978) of experts from various government departments and KSWB which reviewed the findings of the study as work progressed.

1.09 In the past there has been virtually no cooperation between KSWB and the authorities responsible for planning and developing infrastructure for Kaduna. KSWB had not been aware of revised estimates of present population or projections of future population and land development which were prepared by the UNDP consultants for KCDB. On the other hand, KCDB had not been kept informed of KSWB plans for future water supply facilities. It is clear that cooperation between these agencies needs to be greatly improved if proper and rational development of the water supply and waste disposal facilities is to take place in Kaduna.

Water Resources in Kaduna State

1.10 Kaduna State, extending from 9° to 13° north of the equator, has its northern border adjacent to the Sahel zone below the Sahara. The climate changes in a southward direction through semi-arid in the savannah areas of the center of the state to the sub-humid regions in the south. Average annual rainfall ranges from less than 700 mm in the northeast by the Niger border to more than 1600 mm in the southeast, adjacent to Plateau State, as shown on Map 13938. Most rainfall occurs in the months of May through September with virtually none in the winter. Although the rainfall increases from north to south in the state the population settlement pattern is almost the reverse. This seems to be due to a combination of factors, of which the most important may be the tse-tse fly infestation in the southern part of Kaduna State. However in recent years there has been a noticeable population movement southward, no doubt due to the devastating drought which struck the Sahel region earlier in this decade. Whether such population shifts will be permanent remains to be seen.

1.11 Runoff from the central (and major) portion of the state flows into the Kaduna River, which runs generally westward across the state and

1/ Two firms of German consulting engineers: Dr. G. Holfelder Ltd. (Freiburg) in cooperation with G.K.W. Ltd. (Mannheim). The UNDP project deals with both Kano and Kaduna, with a separate agency involved in Kano.

eventually empties into the Niger River near the town of Mureji. The river is perennial, with flows at the town of Kaduna averaging 166 m³/second. The highest flows occur in the months June through October, following the rains, and the low flows in the three months February through April, are of the order 0.6 m³/second or about 1% of flows in the wettest three months.

1.12 Smaller seasonal streams in the northern portion of Kaduna State flow either west into the Sokoto-Rima basin or north to the Lake Chad basin. The Mada River, a minor tributary to the Benue River, has its origins in the humid southeast of the state. Although groundwater resources have not yet been explored in detail, they are generally limited to low yielding shallow wells except for some fissure aquifers in the crystalline bedrock. Prospects for high yield wells, as would be required for irrigation or larger scale water supply, are bleak.

Water Supply in Kaduna State and Service Levels

Urban Supplies

1.13 Detailed and reliable information about present service levels for water supply in Kaduna State is difficult to obtain. Excluding the Kaduna urban area, the Kaduna state's population is in the order of 5.5 million. Of these less than 1.0 million have access to water supplied by KSWB and even these systems (particularly the rural ones) do not operate reliably. KSWB has not published any reports and estimates about individual systems had to be obtained from individual operating staff. In addition to the Kaduna urban system discussed subsequently (paras 2.09 to 2.11), KSWB presently operates nine urban water supply systems throughout the state, (see Map 13938). Approximate characteristics of each system follow:

<u>Location</u>	<u>Source</u>	<u>System Capacity (m³/day)</u>	<u>Estimated Total Population</u>	<u>Estimated % Served by System</u>
Zaria	Reservoir	27,300	200,000	50
Katsina	Reservoir	25,000	100,000	100
Dutsin-Ma	Reservoir	4,500	15,000	100
Funtua	Reservoir	4,500	50,000	100
Daura	Boreholes	450	25,000	100
Birnin Gwari	Reservoir	1,140	6,000	100
Malumfashi	Boreholes	450	25,000	40
Kafanchan	Spring	1,370	35,000	50
Manchok	Spring	680	<u>2,000</u>	100
			458,000	

These systems (except Manchok) essentially represent the eight Districts of KSWB outside Kaduna. With the exception of Zaria and Katsina the existing facilities in these districts are very small, mostly consisting of the single urban systems listed above. Most of the supply in these Districts is by public standpipes providing essentially free water to the people. Private connections are limited to industrial and public consumers.

Rural Supplies

1.14 KSWB also became responsible in the recent past for rural water supply, taking over these responsibilities from the Rural Development Board. A separate unit of KSWB carries out the work in this field. Most existing rural schemes are in the northern part of the state where people and animals suffered extensively during the previous Sahel drought. There are some 48 small dams or rain tanks, generally built very simply, without any design, and most require desilting and enlargement. There are also a total of 529 drilled boreholes, of which 485 are equipped with Mono hand pumps and 44 with motorized pumps. However, most of these pumps are broken and the majority of the people have to rely on traditional sources, mostly hand-dug wells which frequently dry up, causing long treks to alternative sources. There is no reliable estimate of the people served by these rural systems, but the number is probably less than 500,000.

Water Sector Developments

1.15 The Kaduna State 1975-80 Development Plan lists fourteen specific water supply projects for implementation including the towns of Kaduna, Zaria, and Katsina. Costs are estimated to total N 88.3 million (US\$136 million) representing 16.2% of the state's total planned expenditures of N 546 million (US\$841 million) in eighteen sectors, with only the education sector allocated more funds. All water supply projects in the plan were to be carried out by KSWB but by mid-1978 the rate of expenditure was apparently less than required to commit all budgeted funds within the present plan period. It is clear that KSWB places great emphasis on developing supplies for the population in the secondary urban centers and the rural areas throughout the state as roughly half the proposed expenditures in the current plan are for schemes outside the capital city of Kaduna.

1.16. In order to improve its sectoral planning, KSWB (with Bank encouragement) engaged consultants in 1977 to prepare a master plan for water supply for most of the state. MRT Consulting Engineers Limited ^{1/} completed their report in June, 1978. It covers some 88% of the area of the state, excluding the following two areas where comparable exercises were already completed or underway:

- (a) Katsina Emirate in the north of Kaduna State for which in 1973 a German consultant (Wakuti Consulting Engineers) had submitted a master plan for the development of the areas water resources, and
- (b) the Kaduna capital area for which another firm of consultants, WAP, continue to plan water supply developments.

^{1/} A consortium of UK firms, composing: Sir M. Macdonald & Partners; Mott, Hay & Anderson International Ltd; Rendell, Palmer & Tritton; and John Taylor & Sons.

The state wide master plan, excluding Katsina Emirate and Kaduna calls for capital expenditures totalling N 131 million (US\$202 million) for new water supplies in the period 1980-1985.

1.17 Although the next development plan for Kaduna State is not yet prepared, the estimated cost of KSWB's plans for specific water supply projects during its fiscal years 1979-1985 may be summarized as follows:

	<u>N million</u>	<u>\$ million</u>
Kaduna Capital Area	129.6	199.6
Other urban and rural areas	<u>146.0</u>	<u>224.8</u>
Total expenditures	275.6	424.4

Projected expenditures for Kaduna are discussed in paragraph 3.10. The estimates for the other areas were provided by KSWB's planning staff as representing the proposed developments in the state outside Kaduna. The successful execution of this program will depend on the required financing being made available by KSG and on KSWB's ability to complete the necessary design work for the various projects (some of these are in progress). The improvements in service levels in Kaduna State resulting from these projects cannot be determined until a more advanced state of preparation is reached. Successful state-wide water supply developments will depend on the improvement and possible reorganization of KSWB's management of the Districts outside Kaduna, which are not capable of properly operating and maintaining existing systems, let alone implementing new ones (para. 5.06).

Wastewater Disposal in Kaduna State - Service Levels

1.18 Wastewater disposal is rudimentary throughout Kaduna State. Apart from the systems servicing a few institutions, mostly in Kaduna City (para. 2.25), there are no piped sewerage systems in the State. Town populations mostly rely on latrines, or septic tanks, but many people simply defecate or urinate in the open. Not surprisingly the level of public health is low, particularly in the high density urban areas where such practices are prevalent.

1.19 Sewerage and drainage is one of the sectors with the smallest budget allocation in the State's current Development Plan, i.e. a mere N 13.2 million (US\$20.3 million) - 15% of the budget for water supply - of which very little has so far been spent. The primary problem is that the agency responsible for sewerage and drainage on a state-wide basis has only recently become active. There are no sector objectives or policies. The Ministry of Health and Social Welfare and the Ministry of Local Government and Community Development both have marginal roles in this sector. The disposal of various types of wastes is generally regarded as a local government responsibility (para. 1.06) but this service has received limited attention so far, except in Kaduna City, where a thorough UNDP-financed study of waste disposal will be completed in the second half of 1979 (para. 1.08).

II. THE PROJECT AREA

Location

2.01 Kaduna, the capital of Kaduna State and site of the proposed project, is a relatively modern city located on the Kaduna River, some 600 km northeast of Lagos, Nigeria's federal capital. (See Map 13938.)

2.02 The Kaduna urban area does not have official boundaries. Historically, city development has concentrated within the Capital Territory, an administrative division (one of fourteen in the state), extending from the airport in the north to the industrial area on the south side of the river. (See Map 13939.) This Capital Territory covers about 127 sq. km and is surrounded by the local government divisions of Zaria on the north and Kachia on the south. For practical purposes the Kaduna urban area now extends considerably beyond the Capital Territory boundary, with development tending to follow the highways. The Kaduna urban area, served by the Kaduna District section of KSWB, effectively consists of the contiguous urban area centered on the Kaduna Capital Territory.

2.03 A comprehensive town plan prepared for Kaduna in 1967 by a British consultant, Max Lock and Partners, has guided recent developments but not all proposals have been fully implemented. The entity currently responsible for land use planning is the Kaduna Capital Development Board (KCDB) which was created by government edict in 1971. The planning area for which KCDB is responsible was extended in 1975 from the Kaduna Capital Territory to the circular area within a 40 km radius of Kaduna. However land use controls are formally vested in the local government districts and the State Ministry of Lands and Surveys, with KCDB only responsible for approving developments on the land in accordance with the town plans. Implementation of the urban development plans has been somewhat haphazard, although improving. A revised town plan is under preparation by KCDB and the Ministry of Lands and Surveys.

Population and Regional Development Prospects

2.04 Three types of development have occurred in Kaduna. From its origin some sixty years ago the town has been a government capital as well as a garrison town, with associated administrative functions. Within the past twenty years Kaduna has also become a major industrial area. Its location and history cause Kaduna to be, along with Kano ^{1/}, one of the two dominant centers in Northern Nigeria. However, it is estimated that, at present, only 15% of the state's population is urban. This means that Kaduna is likely to be a focus of continuing growth as further urbanization occurs in Nigeria.

2.05 The population has grown more or less steadily from its founding, but there is some uncertainty about its present size. Public estimates of the present population prepared by the Kaduna State Ministry of Economic Development indicate that Kaduna's 1977 population would have been 386,600

^{1/} Capital of Kano State.

if growth since the 1963 census had been constant at 7% per year. Most local officials however estimate that Kaduna's present population is considerably higher. Engineering consultants working for UNDP in Kaduna (para. 1.08) have prepared an independent estimate of the population at the end of 1977 on the basis of land use analyses including recent air photos and a sample survey. Their estimate, which has been carefully prepared and is acknowledged by local officials to be realistic, suggests a total population of about 598,000 including some 70,000 personnel at military bases. Using this estimate, population growth has been updated as follows:

<u>Year</u>	<u>1931</u>	<u>1952</u>	<u>1963</u>	<u>1977</u>
Total Population (000)	10	39	150	598
Average Annual Growth Rate	6.7%	13.0%	10.0%	

On the basis of available figures, the mission prepared a range of possible future population forecasts for Kaduna, depicted on Chart 2-1.

2.06 The infrastructure to support industrialization and urban growth in Kaduna is apparently as well developed as in any other city in Nigeria, despite acknowledged deficiencies in housing, electricity, water and sanitation. Future urban growth will obviously be affected by the extent to which the basic services are provided, so that in turn the provision of necessary infrastructure is likely to contribute to additional growth. A factor which could influence the development of Kaduna in the longer term is the proposed creation of a new federal capital near Abuja, some 170 km to the south. However, with the planned schedule of this development no effects are likely to be felt in Kaduna for several years.

2.07 The future spatial development of the town will depend primarily on the future application of land use controls and on transportation developments. Most industries are located on the south side of the river, including the new oil refinery, and this concentration is likely to persist. Growth to the north is restricted by the airport and military camps. Residential growth is likely to continue to infill the present urban area and overflow to the west. When the several planned bridges over the Kaduna River are built there could be significant expansion of the town to the south side of the river.

Residential Patterns

2.08 The central areas of Kaduna consist mostly of large plots accommodating civil servants and other relatively high income residents. Accommodation for low income residents is generally laid out in the Kaduna Capital Territory in plots of standard size, but outside the Capital Territory, uncontrolled development has also taken place and plots are not organized. The UNDP consultants estimate that some 64% of Kaduna's total population lives in high density areas, averaging 350 people/ha. The plots are mostly compounds, which contain separate buildings (almost all single story) housing several households. A comprehensive housing survey was recently undertaken in the high density areas of Kaduna. Although full results are not yet available one sample of 36 compounds in four different high density areas found an average

of 4.9 households and 17 persons per compound. This pattern of individual compounds accommodating large numbers of low income residents is the predominant form of residential settlement in Kaduna.

Existing Water Supply Facilities and Standards of Service

2.09 The first public water supply was constructed in 1929 in Kaduna South to serve the railway, workshops and the military bases as well as domestic consumers. Water was pumped from the Kaduna River and provided with classical treatment (coagulation, sedimentation, filtration and chlorination) in the nearby plant before being pumped into a limited distribution system, including a line serving the residential area north of the river. The south waterworks (Map 13939) were expanded in stages to their present capacity of 31,800 m³/day. This plant is in very poor condition today but cannot be taken out of service because its output is continuously required due to the current shortage in overall production capacity.

2.10 The Kaduna North waterworks began operating in 1964. Its present capacity is 45,500 m³/day and the plant is currently being expanded by KSWB under its Emergency Works Program (details in para. 2.21 and Annex 1).

2.11 The two treatment plants supply a transmission and distribution system which includes almost 300 km of pipes. There are four separate pressure zones in the distribution system of Kaduna north and one in Kaduna south. Until the early 1970's KSWB's two treatment plants were able to meet all demands from the distribution system, which probably served about 70% to 80% of the population. In recent years, however, both the domestic and the industrial demands have accelerated and KSWB has not augmented the system to keep pace with these demands. Consequently there have been increasing water shortages in Kaduna in the past two to three years.

2.12 Present patterns of water consumption have not been thoroughly analyzed, making it extremely difficult to discuss standards of service. KSWB has records of some 9,000 private connections, all nominally metered, but consumption data are deficient. Industrial consumers (primarily the textile mills) apparently accounted for some 50% of water sold by KSWB in 1976/77. Almost all of these industries are located in Kaduna south but KSWB's available water supply is so limited that one large textile mill pumps most of its water directly from the river to meet its requirement. KSWB recently authorized construction of another independent water supply, also from the river, by the oil refinery currently being built because the public supply cannot meet its demands. All consumers and KSWB suffer frequently from interruptions in the electricity supplied by NEPA but significant early improvements are anticipated in this situation under NEPA's current development program.

2.13 The vast majority of KSWB's private connections are for domestic consumers. In addition to the 9,000 registered connections (increasing by some 700 per year) there are 95 public standpipes. There are also an estimated 3000 additional connections to the system which have been made privately and unofficially by residents.

2.14 The exact number of people served by KSWB is difficult to establish. The UNDP study estimates that some 22% of the present population of 600,000 live on military bases, in civilian institutions or in low density housing areas, which are generally occupied by higher income residents. A further 14% live in medium density areas. Apart from frequent interruptions of supply, this 36% of Kaduna's population appears to be relatively well served.

Operation and Maintenance

2.15 The standard of maintenance of plant, equipment and structures is generally very poor. Treatment plant and equipment are improperly operated and ill maintained. Laboratory control is minimal and as a result, filters have to be washed with undue frequency. Several pumps are broken down and new equipment has not been properly installed. The cause of this unsatisfactory situation is largely inadequate supervision. The new management of KSWB has already taken steps to provide more dynamic and effective operating and maintenance personnel. As part of its Management and Operations Improvement Plan (MOIP) KSWB will carry out a comprehensive rehabilitation of the existing Kaduna North Water Works after consultation with the Bank regarding its proposals.

Service to the Urban Poor

2.16 Reliable data are not available to identify the urban poverty group in Kaduna. Generally speaking, the low income residents live in the high density residential areas, which are estimated to accommodate some 64% of Kaduna's total population (para. 2.08). These areas, including Kawo Sabon Gari, Tudun Nupawa, Tudun Wada, Abakpa, Makera, Kakuri and Nassarawa (see Map 13939) receive poor service from KSWB. Many areas have no distribution systems at all and others have only a skeletal network, with some private connections and a few public standpipes. This situation encourages the residents to independently arrange for private and unauthorized connections, frequently involving considerable lengths of small diameter pipes.

2.17 Distribution system deficiencies in the low income areas are due to several factors:

- (a) much residential growth has occurred in peripheral areas and KSWB has been reluctant to expand its distribution system in recent years since there were already supply shortages. No major extensions of the water supply system to high density areas have taken place since 1975, despite the substantial growth which occurred in these areas;
- (b) in some areas (e.g. Nassarawa) the lack of formally organized plots makes it very difficult for KSWB to lay distribution pipes; and
- (c) the residents of poorly served areas have not been able to enunciate their demands clearly or to bring political pressure to support their requests for improved services.

2.18 In 1975 KSWB carried out a water usage survey which found that only 53% of the population living in high density areas were adequately served by private connections or public standpipes. The situation has probably deteriorated since then, particularly in the newer areas. A 1978 pilot housing survey in four of the older high density areas (Tudun Nupawa, Kano, Kakuri and Abakpa) found that 72% of the residents had access to piped water through private connections (of which about half were for compounds) or from public standpipes. Residents unable to obtain water directly from the KSWB system are forced to rely on shallow wells (most of which are polluted) or water carriers who transport buckets of water from more distant parts of the distribution system, at relatively high prices. It is estimated that the number of people who presently lack proper access to public water supply facilities in Kaduna is of the order of 200,000, or roughly one third of the total population. Most of these people are in the high density areas inhabited predominately by low income residents.

2.19 On the average day in 1977-78 KSWB produced 68,100 m³ of water. With physical losses estimated at 20% of production (a reasonable estimate) the per capita consumption for the total population would apparently average 91 liters daily. Excluding industrial consumers which use 50% of the available water, the actual average per capita consumption would amount to about 45 liters daily for the total population or somewhat more for those actually served by KSWB. These relatively low water consumption figures are one indication of low standards of service, as is the unreliability of the supply caused by a shortage of production capacity and frequent breakdowns due mostly to electric power failures.

2.20 Another deficiency concerns water quality. In part this is due to increasing pollution of the Kaduna River, so that in low flow seasons the inflow at the downstream south works of KSWB is mostly wastewater and the imperfections of the treatment process result in periodic contamination which has, in the past, been confirmed by analysis of samples from the distribution system. Furthermore, the interruptions in supply cause pressure reductions in the distribution system which permit the infiltration of contaminated surface and groundwater where pipes are damaged or leaking.

2.21 KSWB is already proceeding with an emergency works program which is intended to provide additional supplies of water through the construction and expansion of the following facilities:

- (i) additional treatment capacity of 50,900 m³/day at the existing treatment plants (45,500 at North and 5,400 at South);
- (ii) additional pumping capacity at the north treatment works and in the transmission and distribution system; and
- (iii) installation of some 17 km of transmission and distribution lines plus an elevated storage reservoir.

This emergency works program, estimated to cost a total of N 12.6 million (US\$19.4 million) in 1978 prices (excluding price contingencies), is described in detail in Annex 1 and is expected to increase KSWB source capacity by 65% by 1981. The Bank has not been asked to assist in financing these works, procurement for which commenced before appraisal and therefore these works do not form part of the project. The civil engineering works for the emergency program are being carried out by KSWB's own work force (work started in October 1978). A special project management unit has been set up within KSWB with exclusive responsibility for these works.

Future Water Demand

2.22 Since Kaduna's present population and water consumption patterns are not known accurately, projections of future demand for services are necessarily uncertain. Nevertheless it is clear that there is already a large unsatisfied demand for water and that the continuing rapid growth of Kaduna will require much more water in future.

2.23 Population forecasts for Kaduna prepared by the mission, based on the present population estimates of the UNDP consultants, are shown on Chart 2.1 and can be summarized as follows:

	<u>Population in Thousands</u>		
	<u>1980</u>	<u>1990</u>	<u>2000</u>
High Projection	836	2,109	4,511
Medium Projection	762	1,473	2,233
Low Projection	667	936	1,259

In the medium projection, on which subsequent demand estimates are based, the population growth rate reduces gradually from 8.6% in 1978 to 7.0% in 1985 and eventually 3.0% in the year 2000. On this basis Kaduna's present population of 600,000 would double by 1987 and triple by 1995.

2.24 Future water requirements have been estimated for various categories (based on housing densities) of domestic consumers as follows: High - 270 liters per capita per day (lpcd), Medium - 125 lpcd, Low - 70 lpcd and Public Standpipe users - 40 lpcd. Although actual consumption at present averages only 45 lpcd (para 2.19) the calculated average demand is 111 lpcd (assuming full supply to all). This is expected to increase to about 122 in 20 years because of assumed improvements in the standard of living. Industrial demand, prepared on the basis of projections by the UNDP consultants, is expected to grow less rapidly than the population, accounting for roughly 30% of consumption in future years (compared to an estimated 50% in the recent past). In the near term, water sales by KSWB will be limited by available supplies and, in the intermediate term, by weaknesses in the distribution system. Projections of future capacity, production and sales are shown on Chart 2.2 and further explained in the project file. These projections indicate that KSWB water sales in Kaduna should double within four years and double again five years later. The Table below summarizes the Projected future average/peak daily water demand and production/service capabilities in Kaduna.

KADUNA URBAN AREA POPULATION PROJECTIONS

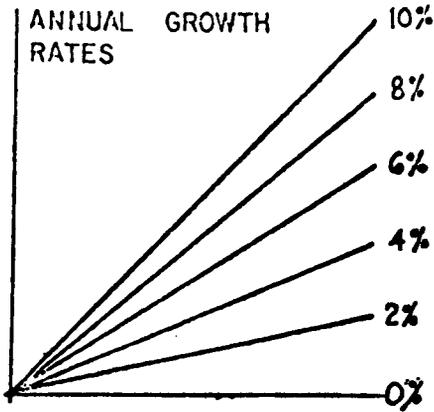
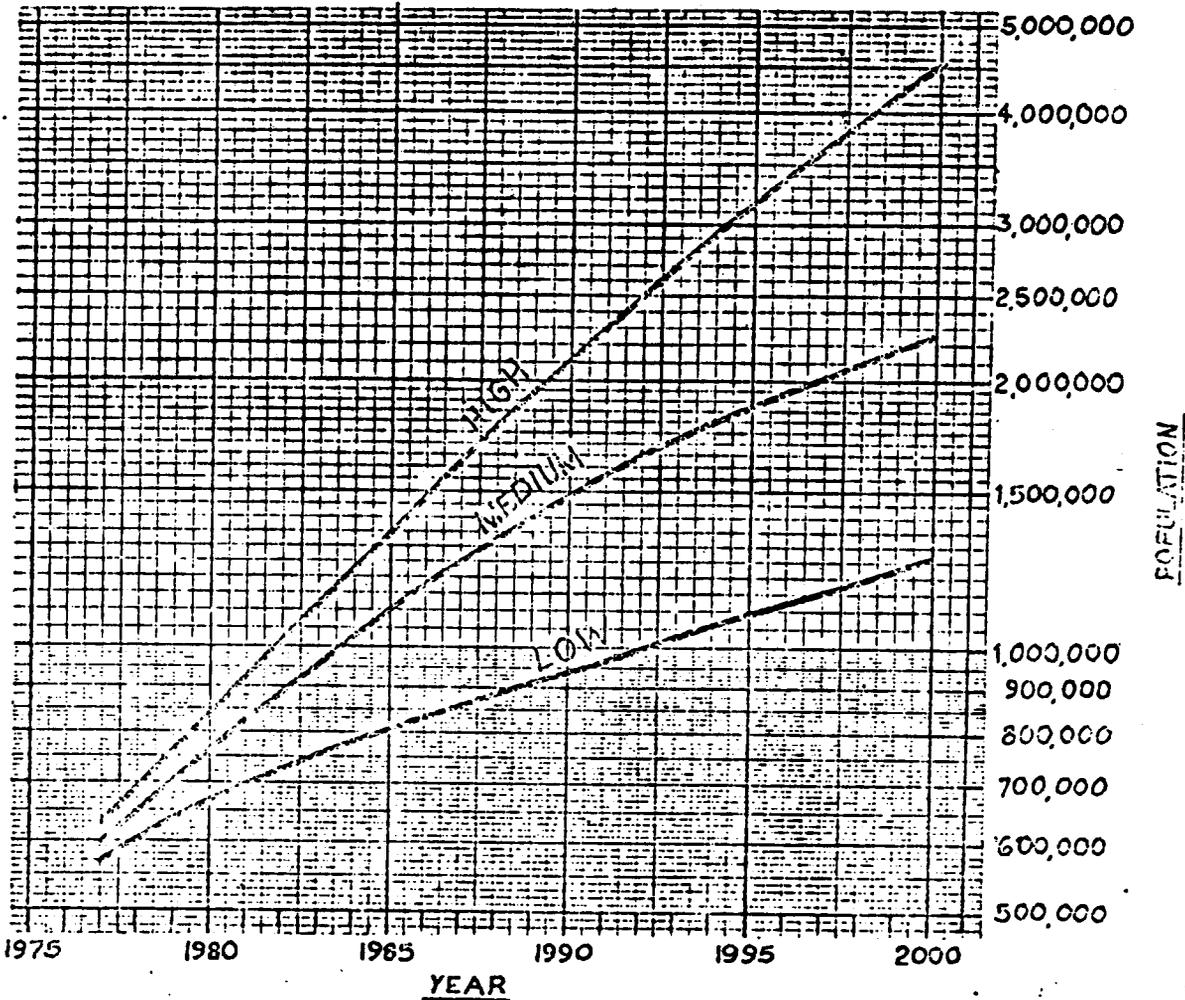


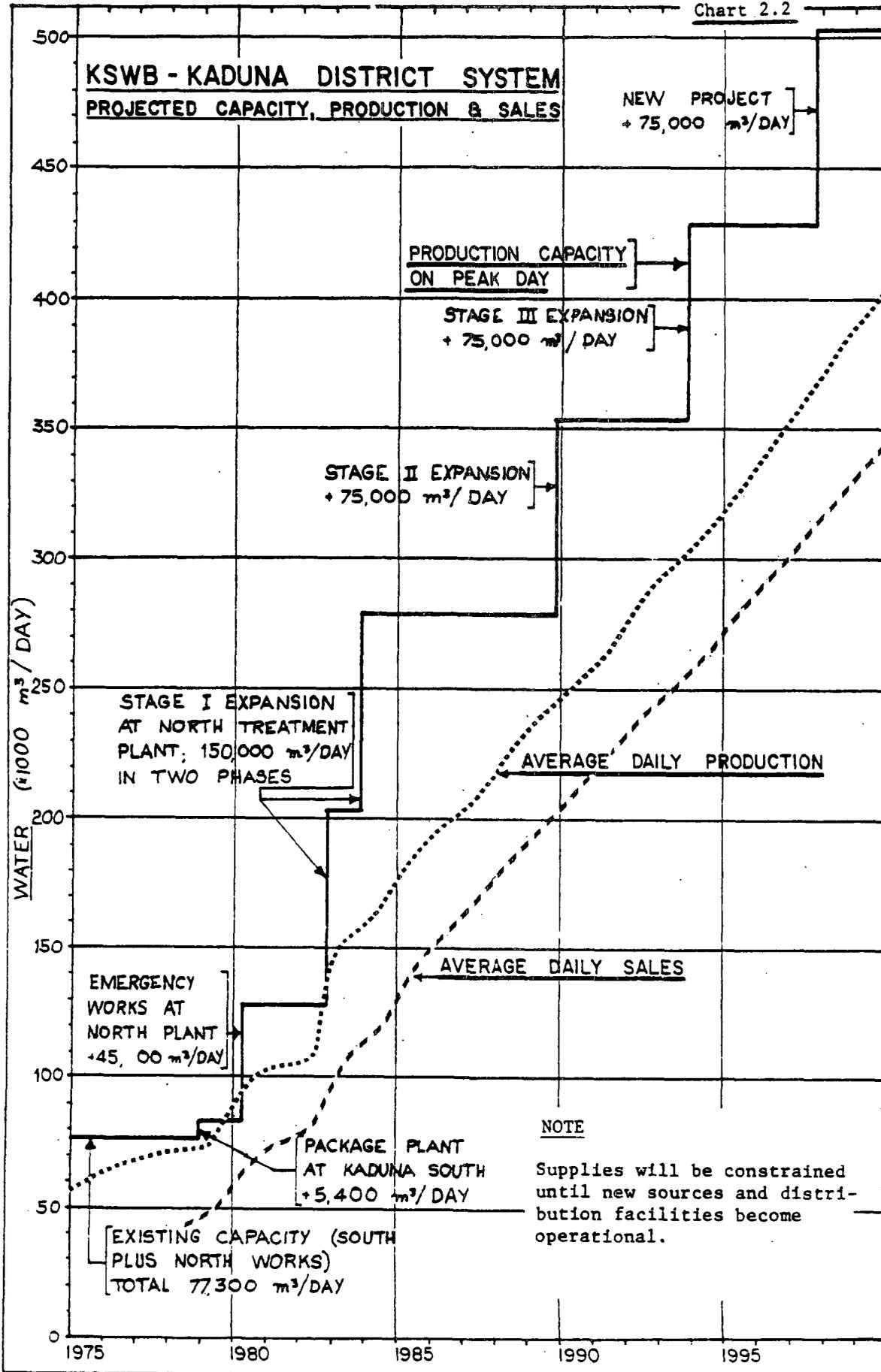
CHART 2.1



NOTES:

1. POPULATION IN LAST OFFICIAL CENSUS OF 1963 WAS 149,900.
2. POPULATION PROJECTIONS BY APPRAISAL MISSION, BASED ON ESTIMATE OF TOTAL POPULATION IN KADUNA OF 598,200 IN 1977 BY UNDP CONSULTANTS.

Chart 2.2



	<u>1980</u>	<u>1985</u>	<u>1990</u>	<u>1995</u>
	-----000 m ³ /day-----			
<u>Demand Forecast</u>				
Average Daily	133	185	256	326
Peak Daily	153	213	294	375
Production/Service Capacity <u>1/</u>	128	246	321	396
Total Population (000)	762	1,096	1,473	1,872
% Population Served	68 <u>2/</u>	85	87	90

1/ Assumes Kaduna South Works taken out of service by 1985.

2/ Due to inadequacies of the distribution system.

Existing Waste Disposal Systems and Standards of Service

2.25 The lateritic soils which predominate in Kaduna are basically tight soils which make the disposal of wastewater difficult. In low density residential areas, wastewater is disposed of by means of septic tanks which require periodic emptying, not always practiced. Pit latrines and/or night-soil collection have been used historically in the high density areas but these also require routine maintenance and this service is usually deficient. Plot layouts in such areas provide a "sanitary lane", a few feet wide between the plots, to provide access for nightsoil collection, but such lanes are in many cases little more than open, nearly stagnant ditches. Waterborne sewerage in Kaduna is restricted to civilian and military institutions and modern housing estates which have independent sewerage systems. Each of these small schemes has its own sewage treatment plant but none of the 18 plants inspected by the UNDP consultants was fully operational in 1977/78 and during negotiations, the KSG indicated that pressure is to be brought to bear on the owners to restore the operation of these plants to improve the effluents. All effluents, whether treated or not eventually flow by open ditches and drains through Kaduna into the river, mostly upstream of the intake to the south water treatment plant.

2.26 Estimates of the population served by the various methods of wastewater disposal were prepared in 1967 by town planners and in 1977 by the UNDP consultants, with results as follows:

<u>System</u>	<u>% of Population Served</u>	
	<u>1967</u>	<u>1977</u>
Pit latrines	33	41
Bucket latrines	43	16
Septic tanks	9	34
Piped sewerage	<u>15</u>	<u>9</u>
	100	100

During this ten-year period the population almost tripled, from about 200,000 to 600,000. Bucket latrines were formerly emptied and the excreta eventually disposed of in compost pits on the western edge of Kaduna, with property owners paying annual charges which partially covered the costs of this service. However, in recent years operation of this system has virtually ceased to function. The reported substantial increase in the use of septic tanks needs to be confirmed since this method of wastewater disposal is only effective in the low density areas of Kaduna; this increase may, in fact, reflect growing reliance on even ineffective septic tanks, and pit latrines, because no practical alternative exists. It is expected that a clearer picture will emerge with the completion of the UNDP master plan studies.

2.27 Large water-using industries in Kaduna south, particularly the textile factories and brewery, discharge their wastes without treatment and these flow in open drains through populated areas into the Kaduna River, with an oxygen demand equivalent to the sewage of about 300,000 people. These discharges, containing dyes, acids and alkalis, occasionally exceed the natural flow in the Kaduna River and have reportedly caused massive fish kills in the past.

2.28 The consequences of the poor standards of wastewater disposal are obvious. Most drains carry noxious wastes which grossly pollute the river as well as causing odor and other aesthetic problems throughout the city. Farmers and gardeners use polluted water from the drains for irrigation of crops which are eaten locally, with associated health hazards. The high density residential areas, where drainage is frequently poor, are contaminated by pools of filth and open drains full of excrement and other domestic wastes.

2.29 Health statistics are sparse and cannot readily be used to document the problems caused by poor sanitation. However according to the public health authorities, mortality records for 1976 from the Kaduna General Hospital indicate that the proportion of deaths caused by infective parasitic disease is very high (34%), specially for children under four years old, whose deaths account for 80% of mortality attributed to parasitic diseases. The low standards of hygiene no doubt contribute to this situation.

Future Developments in Waste Disposal and Public Health

2.30 On completion of the UNDP financed Master Plan Studies, Kaduna City will have a comprehensive planning document for the long-term development of its present rudimentary and inadequate waste disposal services (paras. 1.18 and 1.19). The implementation of this program will require fairly lengthy preparation, securing of financing and the strengthening of the implementing authority, KCDB. However, as part of the Master Plan an Immediate Measures Program is being prepared by the consultants, proposing limited, but manageable, high priority measures which appear to offer quick and substantial benefits in eliminating or, at least, reducing public health hazards in critical areas of Kaduna. In the first instance, the KSG intends to use its own resources to execute immediate measures concentrating on improving drainage and solid waste disposal facilities as first priority. KSG have agreed to keep the Bank informed on the progress of these and subsequent works for improving sanitation in Kaduna city.

2.31 As noted in para. 2.29, low standards of hygiene presently contribute to a number of diseases, especially those of parasitic origin. Adequate supplies of water, even when coupled with improved sanitation facilities, may not greatly improve this situation unless the population is aware of the personal measures to be taken to break the chain of infection. During negotiations, KSG agreed to intensify its public health information campaign and to execute a sanitation improvement program in Kaduna city.

III. THE PROJECT

Genesis

3.01 Nigeria originally sought Bank support for a water supply project in Kaduna in 1974. Following two preparation missions in 1974, a project was first appraised in April, 1975. Thereafter the Bank advised the Nigerian authorities of basic conditions for the proposed loan and requested Government confirmation that Bank assistance was still required. The management of KSWB which was changed late in 1975 introduced such substantial changes in the original project that the resulting major revisions in project documentation were not available until early in 1978, after several visits to Kaduna by Bank staff. The present project was appraised in May/June, 1978. The chronology of the project's development is outlined in the project file.

3.02 For many years KSWB has employed the engineering consultants Ward, Ashcroft & Parkman (Nigeria) (WAP) to assist in project planning and design. Following the appraisal of the original project in 1975, KSWB engaged additional consultants to address issues which had been raised during that appraisal. A consortium of British consultants, MRT Consulting Engineering Ltd., completed a master plan in 1978 for water supplies for the entire Kaduna State, except for Kaduna itself and the region around Katsina in the north where the situation had already been analyzed. An American firm, Louis Berger Incorporated Nigeria (LBIN), was engaged in 1977 to examine water quality problems caused for Kaduna by pollution of the Kaduna River (with particular reference to the utilization of the Kaduna South Work) and to analyze the existing water distribution system in Kaduna and prepare a master plan for its enlargement. Both activities were completed in December 1978. Available reports from the various consultants are listed in the project file.

3.03 The Bank engaged two sets of consultants to participate in the appraisal of the project. In April/May, 1978 Messrs. Lawrence Cutler and Ike Enyobi and Ms. Ijeoma Ohaeri, all of Concept Ecodesign International, worked in Kaduna to identify the urban poor and the features of their water supply. In May/June 1978, two consultants, Mr. Brian Grover (Sanitary Engineer) and Mr. David Hutchins (Financial Analyst) completed the appraisal. Finally, Messrs. Jozsef Buky (Sanitary Engineer) and J.A.C. Guy Prenoveau (Deputy Division Chief) of the Bank participated in the closing sessions of the appraisal in Kaduna and in the preparation of this report.

Objectives

3.04 The first project objective is to improve and expand the water supply system so that adequate supplies of safe water are provided. Ideally the distribution system should be extended to serve 100% of the population but this is not feasible within the short term, since a considerable backlog of work must be done to satisfy suppressed demands (approximately one third

of the population is not currently served by KSWB) and major efforts are required to cope with anticipated growth (the population will probably double by 1987). To meet this objective in the project area, KSWB will have to:

- (a) eliminate by 1982, the production constraints causing supply shortages;
- (b) extend the distribution system so that at least 85% of the total population are served by the network by the end of the physical execution of the project in 1983. This will mean providing water to an estimated 800,000 people by 1983 compared to roughly 400,000 people in 1977; and
- (c) improve KSWB operating standards during the project period so that all connected consumers can expect to receive uninterrupted supplies of safe water by end 1983 at the latest.

3.05 Reported 1977/78 water sales in the project area represented only 54% of water produced and covered only some 9000 connections, there being an estimated 3000 additional unregistered and unbilled connections. The aim is to reduce unaccounted-for water to not more than 25% of production and to identify and regularize at least 90% of the unregistered connections during the project period. By the end of 1983 KSWB is projected to have a total of more than 18,000 metered connections. The second objective is to improve KSWB's operating and financial performance. A program of actions to be taken by KSWB for this purpose has been included in a "Management and Operations Improvement Plan" (MOIP) (see para 3.06 and Annex 6). Financial objectives are detailed in Chapter 6.

Management and Operations Improvement Plan (MOIP)

3.06 In order for the project components listed in para 3.09 to be effective and properly integrated, it is necessary for KSWB to take complementary action in various areas to improve its management and operations. These several activities, of which some are covenanted and others are understandings reached during negotiations, are fully listed in Annex 6. They include, among other matters:

- (i) KSWB taking specific actions to strengthen its management and organization to ensure efficient project implementation, operation of its facilities and improvement of the services rendered to its consumers within Kaduna and the extension of these principles to Zaria and Funtua and then in accordance with a programme to be agreed for other districts;
- (ii) KSWB submitting to the Bank, not later than July 1, 1979, a comprehensive plan and implementation schedule for the mechanical, electrical and structural rehabilitation of its Kaduna North water works. The program to be implemented by December 1980; and

- (iii) KSG will actively support these actions and assist KSWB in the coordination of these actions with other Authorities.

Technological Alternatives and Service Standards

3.07 Groundwater resources are so limited that the only practical source for expanding the existing supply is the Kaduna River which flows through the town. The water is turbid and heavily polluted but the conventional treatment process already used in two existing plants is appropriate. For topographical reasons all water supplied must be pumped. The question of how much elevated storage is appropriate for a given level of supply reliability is discussed in para 4.06.

3.08 KSWB's present policy is "private connections for all consumers", implying relatively large per capita water usage, but this policy needs to be reconsidered when the detailed design for the distribution system extensions is prepared. If the standard of service is to be related to basic needs and the standards of sanitation and wastewater disposal, increasing reliance on public standpipes may be more appropriate in low income areas. Decisions on these standards will be taken by KSWB, and reviewed by the Bank, in the light of further analysis by the consultants working on the water supply system and by those of KCDB working on the wastewater study. These studies will also attempt to define design concepts to optimize the health benefits which should accrue to the population from the project. KSWB will follow a policy to provide water to meet the basic needs of all residents of the Kaduna area at affordable prices as part of its MOIP (Annex 6).

Description of Project Components

3.09 The proposed project, the physical aspects of which are depicted on Map 13939 and described in detail in the project file, consists of:

A. Water Supply Facilities in Kaduna District

- (i) Raw water intake and pumping station on the Kaduna River at the existing north water works. Intake to be constructed for ultimate capacity of 300,000 m³/day, with pumping facilities for 150,000 m³/day installed initially;
- (ii) Water treatment plant with capacity of 150,000 m³/day (50% to be commissioned in 1982 and the rest in 1983). Land acquisition and design to provide for ultimate expansion to 300,000 m³/day;
- (iii) About 37 km of transmission mains, ranging in diameter from 400 mm to 1,000 mm;
- (iv) Three ground level and three elevated storage reservoirs with a total capacity of about 64,500 m³;

- (v) Raw and treated water pumping stations with a total of 16 pump sets of varying capacity; and
- (vi) Reinforcement and expansion of the distribution network. Preliminary estimates indicate that some 300 km of pipelines may be required over the project period and the final designs will be completed gradually as the project proceeds. In conjunction with the distribution system expansion, public standpipes will also be installed at about 300 m intervals in presently unserved areas.

B. Operating Facilities

- (i) The construction of new headquarters offices in Kaduna City;
- (ii) Construction and equipping of new central workshop and meter repair facilities in Kaduna City;
- (iii) Provision and installation of radio communication facilities in the Kaduna district and between the Kaduna headquarters and other regional offices of KSWB; and
- (iv) Expansion of the KSWB training facilities in Kaduna City.

C. Institutional Support and Technical Assistance

- (i) Design and construction supervision of the water supply and operating facilities outlined above;
- (ii) Preparation of master plans for the water supply sector throughout Kaduna State, the study of the pollution in the Kaduna River and the analysis of the Kaduna distribution system (recommended by earlier Bank missions and now virtually complete);
- (iii) Provision of training and management advisors; and
- (iv) Tariff study.

Cost Estimates

3.10 The total estimated cost of the project is N 102.8 million, including taxes and duties (US\$158.4 million), with a foreign exchange component of N 59.6 million (\$92 million), representing 58% of total costs. The summary cost estimate is shown in Table 3.1.

KADUNA WATER SUPPLY PROJECT
SUMMARY COST ESTIMATES

DESCRIPTION	COST IN N(000)			COST IN US\$(000)			% OF TOTAL
	LOCAL	FOREIGN	TOTAL	LOCAL	FOREIGN	TOTAL	
A. SUPPLY OF PLANT AND METATERIALS							
1. Treatment Plant (Supply & Erect.)	200	1860	2060	308	2864	3172	2
2. Pumping Plant (Supply & Erect.)	200	1800	2000	308	2772	3080	2
3. Transmission Pipes	530	4790	5320	816	7377	8193	5
4. Distribution Pipes (Prim. & Sec.)	468	4207	4675	721	6479	7200	5
5. Distribution Pipes (Tertiary)	285	2565	2850	439	3950	4389	3
Subtotal Supply	1683	15222	16905	2592	23442	26034	17
B. CIVIL WORKS CONSTRUCTION							
1. Treatment Works	3940	5920	9860	6068	9117	15185	9
2. Intake and Weir	720	1080	1800	1109	1663	2772	2
3. Transmission Pipelines	1150	1730	2880	1771	2664	4435	3
4. Service Reservoirs:							
(i) Kakuri, Rigyasa	1840	2760	4600	2833	4250	7083	4
(ii) Barnawa, Mando Road, Kudenda	1360	2040	3400	2094	3141	5235	3
(iii) Polytechnic Road	840	1260	2100	1294	1940	3234	2
5. Pumping Station (Polytechnic)	70	100	170	108	154	262	-
6. Distribution Pipelines (Prim. & Sec.)	1232	2593	3825	1897	3993	5890	4
7. Distribution Pipelines (Tertiary)	665	285	950	1024	439	1463	1
8. New Connections & Conversions	230	670	900	354	1033	1387	1
9. Standpipes	60	180	240	92	277	369	-
Subtotal Civil Works	12107	18618	30725	18644	28671	47315	29
C. MISCELLANEOUS CONTRACTS							
1. KSWB Headquarters - Building	1200	1800	3000	1848	2772	4620	3
2. KSWB Headquarters - Equipment	30	270	300	46	416	462	-
3. Workshop & Meter Repair Facility	200	300	500	308	462	770	1
4. O&M Equipment and Rehabilitation	130	420	550	200	647	847	1
5. Communications Facilities	30	270	300	46	416	462	-
6. Training Facilities	80	340	420	123	523	646	-
7. Consulting Services	1520	2250	3770	2341	3465	5806	4
Subtotal Miscellaneous	3190	5650	8840	4912	8701	13613	9
TOTAL BASE COSTS	16980	39490	56470	26148	60814	86962	55
TOTAL PHYSICAL CONTINGENCIES	2223	4798	7021	3423	7389	10812	7
TOTAL PRICE CONTINGENCIES	20944	15353	36297	32254	23644	55898	39
TAXES AND DUTIES	3045	-	3045	4689	-	4689	3
GRAND TOTAL PROJECT	43192	59641	102833	66514	91847	158361	100
% OF TOTAL	-	-	-	42	58	100	-

3.11 Project costs are based on preliminary designs. As a result of recent competitive bidding for the emergency works program (para. 2.21), KSWB and their consultants had up to date (March 1978) information on unit prices for most items of work proposed in the project. Cost estimates have been updated to reflect end of 1978 unit prices. Prices resulting from competitive bidding in accordance with World Bank procedures might actually be somewhat lower if contractors anticipate less risk, but this possibility has not been reflected in the cost estimates. Planning is generally well advanced and bids have already been called for equipment for the new treatment plant, the most critical element in the project since it provides the necessary additional water and requires longer to construct than any other item. Detailed site investigations still need to be carried out for all structures but as all project components are essentially extensions of existing facilities in the Kaduna urban area, the basic design information is reasonably reliable. Although the distribution system has to be both substantially extended and reinforced to meet the project objectives the, so far, incomplete planning of these components made it necessary to prepare cost estimates on the basis of preliminary layout plans only. The cost estimates for KSWB operating facilities, consulting services and technical assistance are reasonable. Background information and assumptions for all estimates are recorded in the project file.

3.12 The foreign exchange component of project costs was estimated assuming that virtually all equipment supply contracts, apart from some small diameter pipes which are manufactured in Nigeria, would be won by foreign firms. Foreign but locally established contractors are expected to win all civil works contracts. Nevertheless the foreign exchange component of these works will still be high, estimated at 58%, because the contractors likely to be involved will rely extensively on imported equipment and expatriate supervisory staff. KSWB, under "Approved Users Certificates" generally enjoys significant reduction and, in some cases, exemption from applicable import duties on goods imported for its operations. The relevant regulations frequently change and based on the currently payable duties an allowance of 10% was made in the project cost estimates for duties and taxes on all directly imported goods.

3.13 Allowance has also been made on each component for physical contingencies ranging from 10% to 20%, depending on the probability of unforeseen additional work. Overall physical contingencies amount to 12.4% of basic costs. In addition, allowance has been made for price contingencies, at the rate of 8% p.a. and 20% p.a. respectively for foreign and local cost components. The price contingencies for the foreign components are slightly higher than the current Bank guideline figures to compensate for special conditions such as the tendency (indicated by experience) of higher prices for goods shipped to Nigeria due to special requirements such as import inspection and payment conditions. Because of the extended duration of the project and the high rates assumed for increases in local prices, the total allowance for price increases effectively increases the estimated costs (expressed in December 1978 price levels) by 57%.

3.14 Project costs and price contingencies have been calculated on the assumption that the exchange rate between the naira and the dollar will remain fixed at 1.54 throughout the project period. This closely reflects the experience of recent years during which time the exchange rate changed relatively little despite a rate of domestic inflation in Nigeria which consistently exceeded international inflation by a significant margin. The estimates of project cost in dollar terms would be affected by a change in exchange rate policy. If, for example, there were to be a 25% devaluation to compensate for the system of import duties and export incentives currently in force and if the exchange rate were to be adjusted thereafter to compensate fully for the relatively high rate of domestic inflation projected for future years, then the local component of project costs would be lower when expressed in dollar terms. Under these assumptions the local component of project costs would amount to \$46.6 million compared with the \$66.5 million estimated on the basis of the present exchange rate. Total project cost would, therefore, amount to only \$138.4 million (compared with \$158.4 million estimated on the basis of the present exchange rate) and the share of total project cost financed by the Bank loan would be 66 percent (compared with 58 percent estimated on the basis of the present exchange rate.)

Project Financing

3.15 The proposed financing of the project would be as follows:

	<u>N million</u>	<u>US\$ million</u>	<u>% of Total</u>
Proposed IBRD loan	59.6	92.0	58
Government (State)	24.7	38.0	24
Internal Cash Generation	<u>18.5</u>	<u>28.4</u>	<u>18</u>
Total	102.8	158.4	100

The proposed loan would cover 100% of the foreign exchange component of project costs. KSG and KSWB would provide all additional financing or it would be provided by the FCN in the event of their failure to do so. KSG attaches very high priority to the project and agreement was reached during negotiations that it would provide all necessary counterpart funds including those required to meet any possible cost overruns.

Implementation

3.16 Tender documents for the equipment contract were issued to bidders on September 1, 1978 following a detailed Bank review. The civil works contract would start sometime in 1980 since the final designs will have to follow the award of the equipment contract in 1979. Initial operation of the first half of the treatment plant is scheduled for late 1982, with final completion in 1984. The implementation schedule, Chart 3.1, shows the various activities associated with the construction of all project components.

KADUNA WATER SUPPLY PROJECT — IMPLEMENTATION SCHEDULE

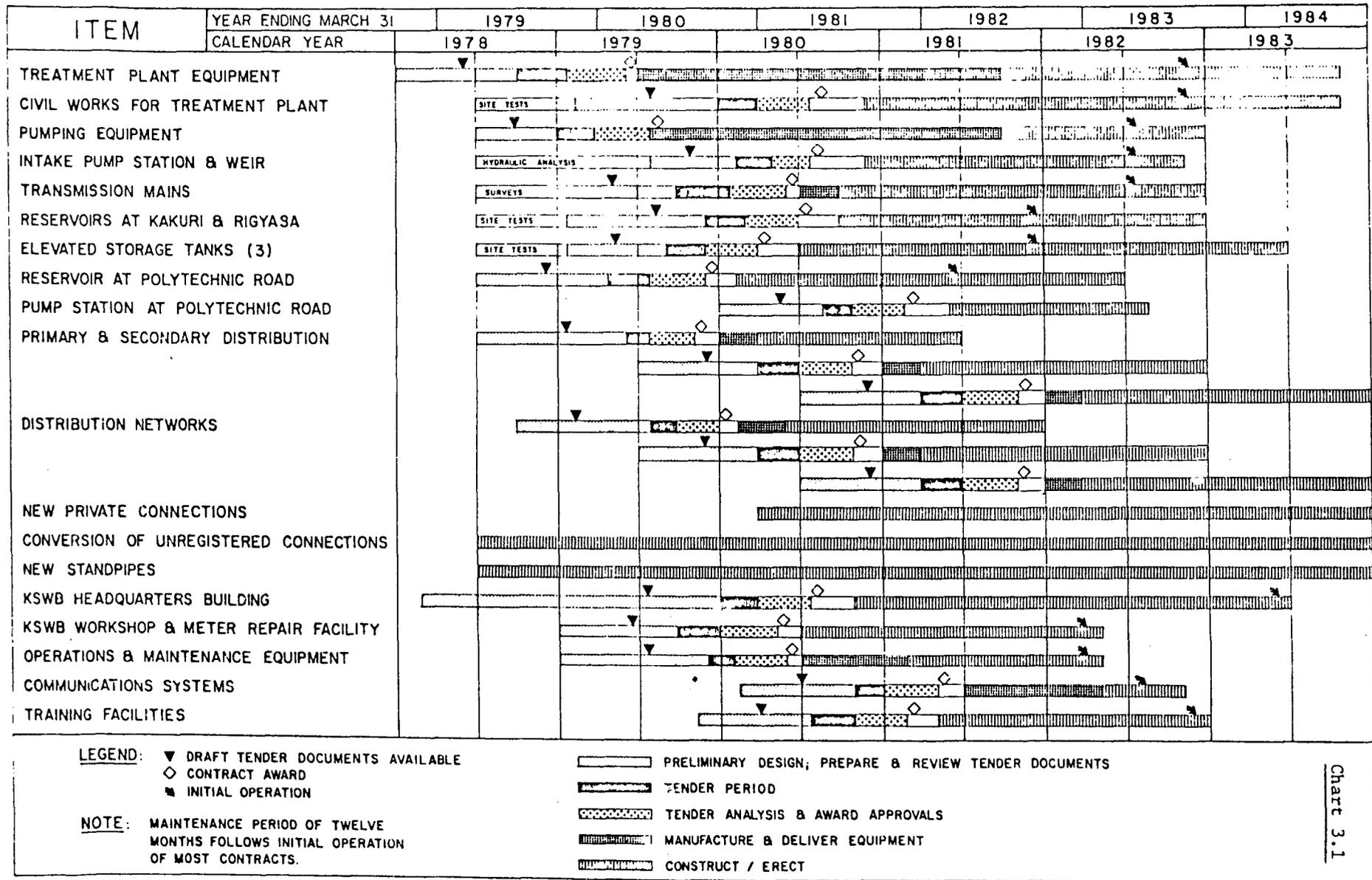


Chart 3.1

3.17 The entire project will be implemented by KSWB, who have agreed to engage engineering consultants for the design, procurement and construction supervision of the various project components. WAP will be responsible for the source works, (including treatment and pumping facilities), transmission mains and storage reservoirs and concluded an agreement for this work with KSWB in 1977. The current assignment of LBIN concerning the distribution system involves the analysis of the existing system and the preparation of a master plan but will not provide the detailed design and recommendations needed for immediate implementation. The Bank was advised during negotiations that LBIN had been appointed to prepare final designs, tender documents and to supervise construction of the proposed distribution system expansions. KSWB through its Project Manager will ensure that there is close and continuing cooperation between the consultants responsible for these major elements of the project (transmission and storage facilities and the distribution system) since the final location and capacity of the transmission and storage facilities will have a major impact on the distribution system design, and vice versa.

3.18 KSWB and its distribution system designers should also liaise closely with KCDB and their consultants who are concerned with waste water disposal since construction priorities, standards of service and specific location of the water supply networks and standpipes and proposals for waste water disposal are interdependent. Measures to ensure this cooperation are included in the MOIP (Annex 6).

3.19 KSWB requires further consulting assistance to finalize designs, prepare tender documents and supervise construction of the operating facilities included in the project (headquarters building, workshop, training facilities and communications system). A competent firm of Nigerian architects has already been appointed for the design of the proposed KSWB headquarters buildings. The agreement of terms of reference for consultants and their acceptability to the Bank are included in the MOIP (Annex 6).

3.20 The cost estimates provide a sum of ₦ 3.8 million (US\$5.8 million), before contingencies, to cover anticipated consulting services and technical assistance. This sum, which represents about 6% of basic project cost (including physical but not price contingencies), would pay for approximately 75 man-years of foreign expertise at current rates (about US\$80,000/ year). The scope and estimated associated cost of the various assignments were agreed during negotiations. A tentative allocation of this consulting assistance is as follows:

	<u>Man-years</u>
Design and Supervision of Water Supply Facilities in Project	42
Design and Supervision of Operating Facilities in Project	5
Kaduna State Master Plan, Kaduna Distribution and Kaduna River Pollution Study	10
Training Program (technical assistance and scholarships)	5
Management Assistance	8
Miscellaneous Studies, including Tariffs	<u>5</u>
Total	75

3.21 In order to expedite new connections, contracts for distribution pipes should include the laying of service pipes to the boundaries of all adjacent properties but KSWB would remain responsible for installing the metered connections between the distribution system and the private plumbing at each property and will have to make special efforts for the conversion of many hundreds of existing unauthorized connections. KSWB prepared a detailed program for this work and the necessary steps to significantly increase its capacity for providing public and private water connections would be part of the MOIP (Annex 6).

3.22 All land in Kaduna State is legally owned by the Government and it is only the developments on the land which can be privately owned and transferred. This makes it relatively simple for KSWB to obtain the land necessary for the project structures, although compensation must be paid for existing crops or buildings. Agreement was obtained from KSG and KSWB during negotiations that all necessary land and right of way will be acquired by December 31, 1979.

3.23 A particular problem exists with respect to pipeline locations. The concept of rights of way or easements for such pipelines is apparently unknown in Kaduna. KSWB has no difficulties in obtaining access for installing the pipelines but subsequent maintenance of the lines becomes difficult since developments can take place which may severely restrict access. There are several examples where structures have been built directly on top of distribution pipelines and the precise location of some of the older pipelines is difficult, if not impossible, to identify. KSG gave the assurance that, in future, KSWB will have the right to prevent developments over or alongside of all pipelines and that appropriate legal and other arrangements will be made to permit KSWB to have constant access for its staff and equipment to operate and maintain all pipelines. As part of the MOIP, KSWB will ensure that all pipelines are suitably marked on the ground and recorded on maps (Annex 6).

Kaduna South Waterworks

3.24 The project facilities should provide sufficient additional water to meet the anticipated requirements of Kaduna until about 1989 (see Chart 2.2) providing that the Kaduna South plant continues to operate at its present capacity. Until the new plant begins to operate, the old plant at Kaduna South will be required to operate continuously. Thereafter this plant can be taken out of service on a care and maintenance basis with Kaduna being supplied entirely by the Kaduna North plants (old and new). The Kaduna South plant is in poor condition now and it will not be easy to prevent its further deterioration in the next few years. Its location downstream from most of Kaduna causes it to receive polluted water at all times, and particularly during low flow periods. This situation is likely to further deteriorate in the near term, due to increasing abstractions upstream (including the new oil refinery) and increasing pollution entering the river. The magnitude of the river pollution is currently under study by KSWB's consultants (LBIN) and the UNDP consultants working for KCDB should also provide further information on probable future pollution loads by the time their study is completed in 1979. In the future it may be appropriate to abandon the Kaduna South plant completely, but in this case Kaduna's entire water supply system would have to be considerably modified, including the early further expansion of the Kaduna North plant. Alternatively it might be appropriate to completely overhaul the Kaduna South plant, with possibly the construction of a new intake upstream (since much pollution enters the Kaduna River from a creek directly opposite the present intake). A third option would be to create an independent industrial water supply system of reduced quality standards to serve the textile mills and other industries requiring large quantities of process water in Kaduna South using the existing water treatment plant suitably renovated. This matter merits detailed analysis and KSWB will, with the help of consultants if necessary, by mid-1980 carry out a comprehensive study and make recommendations concerning the future utilization of the Kaduna South treatment plant as part of the MOIP (Annex 6).

Water Resources Aspects

3.25 The Kaduna River has a catchment area of 18,410 km² upstream of Kaduna and an average annual flow of 166 m³/second. There are no reservoirs on the main stem of the river and flows are very seasonal, with the lowest flows occurring between January and April. Flow data have been recorded since 1947, with some gaps in the records. In 1966 engineering consultants (Scott, Wilson, Kirkpatrick & Partners U.K.) recommended that a storage reservoir should be built on the river system upstream of Kaduna which could release water into the Kaduna River during low flow periods and prevent the possibility of water shortage for the town's water supply system and to provide irrigation water for 4,000 acres of land.

3.26 The Kangimi reservoir, some 15 km upstream of Kaduna, was completed in 1978 and the reservoir is operated by KSWB. The Kaduna State Ministry of Agriculture and Natural Resources provided some of the funds for building the Kangimi dam and has engaged local consultants (Enplan Group) to plan the irrigation facilities. Funds are budgeted in the present 1975-80 plan to construct

the first stage of the irrigation scheme (tentatively 2,000 acres, or half the total scheme) which would require some 11,600 m³ of water annually from the Kangimi Reservoir.

3.27 Revised urban water demand estimates prepared by the mission (Chart 2.2) indicate that KSWB will have to pump much greater quantities of water from the Kaduna River in the next decade than was anticipated. Additional abstractions are also planned by the oil refinery (15,000 m³/day initially, rising to 23,000 m³/day) and KSWB has expressed its intention to maintain river flows of at least 45,000 m³/day below abstraction points in Kaduna for environmental reason. In these circumstances, it appears questionable whether the Kaduna River has sufficient water in periods of extremely low flow to meet the various demands. This topic was reviewed in a brief study prepared in June, 1978 by WAP at the mission's request. The study concluded that low flow in the Kaduna River with a probability of occurring once in 25 years would provide water to suffice until about 1995 under present projections (Chart 2.2), provided that the Kangimi Reservoir is operated to augment low flows and that only the proposed first stage of the Kangimi irrigation scheme (2,000 acres) is built. In any event additional storage will eventually be needed if Kaduna continues to rely on the Kaduna River as the sole source for its long-term water requirements.

3.28 Because the unregulated flows in the Kaduna River become quite low in dry years, Kaduna's water supply will be increasingly vulnerable to extended shortages of supply if upstream abstractions are not carefully controlled and the Kangimi reservoir operated judiciously. However these matters can be better analyzed in later years when more and better data are available on abstractions from the river and on natural flows under drought conditions in the Kaduna and Kangimi Rivers. KSWB's current plans to abstract a further 300,000 m³/day from the Kaduna River (including 150,000 m³/day for the project facilities have been approved by the Niger River Basin Development Authority (para. 1.03). During negotiations, KSG and KSWB agreed that:

- (a) Plans for irrigation at Kangimi will be reviewed in order to ensure that the minimum flow of 350,000 m³/day will be maintained upstream of the Kaduna North Water Works;
- (b) KSWB will continue to be responsible for the operation of the Kangimi reservoir;
- (c) No further abstractions will be permitted from the Kaduna River basin upstream of Kaduna without the consent of KSWB; and
- (d) Water availability from the Kaduna River system in low flow periods will be evaluated not less than once in every three years in reports prepared by KSWB and circulated by KSG for review by interested parties, commencing in 1984.

Environmental and Health Aspects

3.29 The construction of the project will have no significant environmental impact apart from the minor and temporary disruptions caused by building a few structures in Kaduna and the installation of pipelines.

3.30 Operation of the project facilities will result in substantial increase in the quantity of water supplied to the people and industries of Kaduna and the corresponding increase of waste water would aggravate the already poor waste disposal facilities. However, the UNDP-financed Sewerage and Drainage Master Plan soon to be completed, provides for the long (and short) term development of waste disposal in Kaduna. The Immediate Measures Program of the plan will be implemented by KSG (para 2.31).

3.31 The provision of safe water to hundreds of thousands of Kaduna residents, mostly in the low income areas, should permit substantial improvements in personal sanitation and hygiene, with obvious health benefits. These improvements could be expedited if the public were better informed of how water supplies can be utilized for their personal benefit. The Ministry of Health already has a health education unit whose activities could be expanded for this purpose. During negotiations guidelines for establishing an effective public health campaign were discussed with KSG and informal assurances were obtained from KSG that the public health information campaign will be intensified along the lines indicated in these guidelines to maximize the benefits of the water supply improvements in Kaduna.

Procurement

3.32 All contracts above value of US\$100,000 for the supply and erection of plant and the supply of materials will be awarded through international competitive bidding in accordance with Bank Group Guidelines. Contracts below US\$100,000, or equivalent, for equipment contracts and US\$200,000, or equivalent, for civil works will be let under local procedures with documents not requiring Bank preview. Major supply contracts with a total value of about US\$33 million will probably be awarded to foreign suppliers while local suppliers are likely to win contracts totaling about US\$10 million for small diameter pipes and other equipment. The value of major civil works, with contracts above the value of US\$1,000,000 is about US\$93 million. These contracts will be awarded through international competitive bidding and are likely to be won by foreign but locally established contractors. Nigerian contractors under local bidding procedures acceptable to the Bank would be competing for contracts below US\$1,000,000 for building and pipelaying works with an aggregate value of US\$5.5 million. KSWB would carry out works by force account worth about US\$3.3 million.

3.33 Nigerian law requires that foreign contractors operating in Nigeria be incorporated in the country with local ownership of 60%. Several large foreign contractors are already established on this basis in Nigeria and will be strong competitors for the project. However, the magnitude of a number of the contracts to be let is likely to attract additional foreign competition. During negotiations, assurances were obtained from the Federal Government of

Nigeria that foreign contractors awarded contracts under the project will, on application, be granted exemption from these incorporation requirements. Effective January 1, 1979 Federal Government regulations also require that all goods to be imported into Nigeria be inspected at the port of embarkation by the Societe Generale de Surveillance S.A. (SGS) Geneva, Switzerland. The quality and quantity of the goods is to be certified prior to shipment to Nigeria.

3.34 It is unlikely that any contracts will be signed before the proposed loan is approved, since the earliest contract for the treatment plant equipment will probably not be signed before June, 1979. Draft tender documents for this contract were provided for Bank review during the appraisal mission. However, the project does include ongoing consulting assignments which the Bank encouraged during the initial appraisal. It is proposed that the foreign exchange costs of these services be financed retroactively with the proceeds from the proposed Loan. The total estimated amount is about \$1.0 million covering consultancy work from November 15, 1977 to July 1, 1979.

Disbursements

3.35 The proposed loan would be disbursed as follows:

<u>Category</u>	<u>Amount (US\$ million)</u>	<u>Percentage of Expenditure Financed</u>
I Contracts for the supply of plant, equipment and materials	35.2	100% of foreign expenditure of plant and materials or 90% of local expenditures for items purchased locally.
II Civil works contracts	45.1	60% of total expenditures
III Consulting services and technical assistance	4.3	100% of foreign expenditures
IV Unallocated	<u>7.4</u>	
	92.0	

Disbursements will be fully documented except for work done by force account under Category II which would be against certified statements of expenditures documentation of which would be held by KSWB for review by Bank supervision missions.

The estimated schedule of disbursements is provided in Table 3.2.

Table 3.2

Estimated Schedule of Loan Disbursements

<u>Bank Fiscal Year</u>	<u>Loan Disbursements (US\$ million)</u>	
	<u>Quarter</u>	<u>Cumulative</u>
<u>FY 1980</u>		
Sept. 30, 1979	1.0	1.0
Dec. 31, 1979	1.5	2.5
March 31, 1980	2.0	4.5
June 30, 1980	2.7	7.2
<u>FY 1981</u>		
Sept. 30, 1980	3.0	10.2
Dec. 31, 1980	5.0	15.2
March 31, 1981	5.0	20.2
June 30, 1981	6.0	26.2
<u>FY 1982</u>		
Sept. 30, 1981	7.5	33.7
Dec. 31, 1981	7.5	41.2
March 31, 1982	7.8	49.0
June 30, 1982	7.5	56.5
<u>FY 1983</u>		
Sept. 30, 1982	7.0	63.5
Dec. 31, 1982	6.0	69.5
March 31, 1983	6.0	75.5
June 30, 1983	4.1	79.6
<u>FY 1984</u>		
Sept. 30, 1983	4.0	83.6
Dec. 31, 1983	4.0	87.6
March 31, 1984	3.0	90.6
June 30, 1984	0.5	91.1
<u>FY 1985</u>		
Sept. 30, 1984	0.4	91.5
Dec. 31, 1984	0.3	91.8
March 31, 1985	0.2	92.0
June 30, 1985		

IV. ECONOMIC AND SOCIAL ANALYSIS

Project Benefits

4.01 The principal benefits of the project will be the expanded coverage and improved quality of service provided by the Kaduna District water supply system. Expansion of the distribution network, including a two-fold increase in the total length of piping in the system, will permit KSWB to serve 400,000 additional people (including large numbers of new migrants) as well as new industries and institutions by the end of the project period. The production capacity of the system will more than double over the project period, ensuring sufficient quantities of water until about 1990. Moreover, operational standards are expected to improve substantially so that all consumers may anticipate an uninterrupted supply of safe water.

4.02 KSWB would give special attention to the basic water requirements of the urban poor as the distribution network is extended. Pipeline construction in areas which are at present critically short of water would be given priority. Public standpipes will be installed at convenient intervals (about 300 m) in low income areas where house connections are not yet appropriate. Final design details of the distribution system will be coordinated with ongoing planning for wastewater disposal in order to realize maximum improvements in sanitation and hygiene from the project.

4.03 Employment prospects in Kaduna will be enhanced by the project. At the peak of construction activity, the project construction force will comprise approximately 1,200 workers. KSWB will require about 150 additional permanent employees to operate and maintain its expanded system. More importantly, the provision of dependable water supplies to present and future industries will assist in creating long-term employment opportunities in the city.

Least Cost Solution

4.04 Groundwater in the quantities required is not available within the Kaduna region, so there is no alternative to the use of the Kaduna River as the source for the city's water supply. Water in the Kaduna River is heavily polluted and, because of the nature of the catchment area, naturally turbid. Treatment is required, and the classical process that has been used in Kaduna for the past fifty years remains appropriate.

4.05 Decision to locate the new treatment plant beside the existing one at Kaduna North followed careful evaluation by WAP of alternative sites. A possible location in central Kaduna near the old Kaduna South plant was rejected because of poor water quality at this point in the river and scarcity of land on which to build. The consultant also examined the possibility of locating the new treatment plant by the reservoir at Kangimi, upstream of all pollution originating at Kaduna. The Kangimi site was advantageous in that the reservoir could be used to settle some of the turbidity before treatment, resulting in lower operating costs. The Kangimi alternative

was rejected because of its excessive capital requirements, including a very large diameter transmission line to Kaduna; the present discounted value of the capital costs of this alternative was estimated to be ₦ 11.3 million (US\$18 million), or 36% higher than the Kaduna North solution. The present value of all costs of the Kangimi alternative exceed the Kaduna North solution by about ₦ 4.0 million (US\$6.4 million).

4.06 For topographic reasons all of Kaduna's water must be pumped to elevated reservoirs for distribution at high capital and recurrent costs. The Kaduna system involves a number of such storage tanks and three new ones (2,500 m³ each) are included in the project. It would be slightly cheaper to maintain pressure without elevated storage tanks by means of a sophisticated pumping and control system. However, the greater reliability and simpler pump operation and maintenance required by the elevated storage systems were deemed essential in Kaduna's circumstances. The proposed total capacity for treated water storage (to cover peak hour demand and security against breakdown) is 12 hours of average production. This is considered an adequate margin and, in any case, the large expenditures required to provide additional storage capacity could not be justified.

4.07 Tender documents for the transmission and distribution systems will call for alternative bids for various types of pipe materials as well as for supply and/or construct type of tenders to ensure the most economical solution for these works.

4.08 The project has been planned to provide minimum acceptable standards of service at the lowest possible cost. Nevertheless, the resulting investment costs are relatively high on a per capita basis due mainly to the following factors:

- (i) high unit construction costs due to Nigeria's economic situation generally, aggravated by Kaduna's distance from the ports through which all imported materials arrive; and
- (ii) the relatively large scale of the proposed facilities which are now required due to:
 - (a) inadequate investment in water supply facilities in recent years, resulting in large unsatisfied demand for water at present; and
 - (b) a projected high rate of increase in water demand owing to rapid urbanization and industrialization of Kaduna.

Pricing Considerations

4.09 The following water tariffs are in effect in Kaduna:

- (i) industrial and commercial consumers: N 0.31/m³
(US\$1.80/1,000 US gallons);
- (ii) all other consumers (except civil servants): N 0.17/m³
(US\$0.96/1,000 US gallons);
- (iii) civil servants in government housing: flat monthly rates
of N 4.50 (US\$6.93) for senior staff and N 3.0 (US\$4.62)
for junior staff;
- (iv) water provided through standpipes is free to the consumer,
but the standpipes are metered and KSWB is reimbursed by
KSG at the normal domestic rate.

A list of comparative water costs effective in other West African countries is shown in Annex 7.

4.10 The long run marginal₃ cost (average incremental cost) of water in Kaduna is estimated at N 0.22/m³, assuming a 10% opportunity cost of capital and a 10% time preference rate for water consumption. Details of this calculation are provided in the project file. Thus existing tariff levels already reflect the long run marginal cost.

4.11 Inadequate coverage by the distribution system (to some extent a deliberate policy of KSWB due to shortage of production capacity), supply interruptions and large connection charges are the principal reasons that many of Kaduna's low income residents lack access to piped water supplies at present. The mission could find no evidence that the current level of KSWB's water tariffs discourages minimum levels of consumption. The high cost of alternative supplies, including privately constructed, unregistered connections and reliance on water carriers (at about ten times the metered domestic tariff), exceeds KSWB's charges and is a cause of hardship to the poorest residents of Kaduna.

4.12 Appropriate water tariffs consistent with the criteria outlined above cannot be determined without further study. Draft terms of reference for such a study were prepared with Bank assistance. During negotiations, KSWB agreed to engage consultants under terms and conditions acceptable to the Bank by October 1, 1979, and complete the study within six months. On completion of the study KSG and KSWB, following discussions with the Bank, will restructure tariffs in accordance with the agreed recommendation of the study by October 1, 1980. Pending completion of the full study, tariff increases would be warranted on financial grounds (paras. 6.09 and 6.10).

Internal Economic Rate of Return

4.13 Since it is impractical to distinguish water production resulting from the project from that produced by other components of KSWB's ongoing and proposed system expansions the internal economic rate of return (IERR)

was calculated for the total investment program (excluding duties and taxes) to be carried out during the years 1978 to 1994. Details of the calculation appear in the project file. Benefits have been assessed as the value of water consumption calculated on present tariffs. With costs (capital and recurrent) valued at present market prices and foreign exchange valued at the official rate of ₦ 1.00 = US\$1.54 the resulting IERR is 9.5%. The Bank is currently reviewing the appropriate shadow exchange rate for economic analysis of projects in Nigeria. For illustrative purposes, if the project were analyzed with a shadow exchange rate of ₦ 1.00:US\$1.00 (rather than the official rate of ₦ 1.00:US\$1.54 used above) the economic rate of return would go from 9.5% to 6%.

4.14 The valuation of benefits is somewhat conservative because water supplies are insufficient to satisfy demands at the current level of tariffs, indicating that the current demand price (a more appropriate price for valuing consumption) is significantly higher than present tariffs.

4.15 The calculated IERR does not depend critically on the projected growth of demand for water in Kaduna. If demand is assumed to grow from 1982 onward at only one-half of the expected rate, the IERR is 8.5% provided that capital expenditures beyond 1983 are rescheduled appropriately.

4.16 The external economies which accrue from increased water consumption, such as improved community health and hygiene, cannot be measured and have not been included in the valuation of benefits.

Impact on the Urban Poverty Group

4.17 The impact of the project on the urban poor of Kaduna can be outlined only in qualitative terms as quantification is not possible due to lack of data. The government has no data on the poverty group. Nigerian consultants engaged by the Bank visited the project area to assess the situation of the urban poor, but were unable to fully define the poverty group. The UNDP consultants estimate that 64% of Kaduna's residents live in high density generally low income areas. Most of Kaduna's poorest residents, and perhaps 40 to 50% of the population, live in four areas of the city: Kawo, Abakpa, Tudun Wada and Kakuri-Makera and these areas are generally the most poorly served by the existing water supply system (see Map 13939).

4.18 The project will substantially improve the supply of water to the poverty group through the massive expansion of the distribution network and the concurrent and essential augmentation of source facilities. An estimated 400,000 additional consumers will have access to piped water supplies in the near term as a result of the project. It is reasonable to estimate that probably as many as 75% of these new consumers will be in the low income group. Therefore, together with the poor presently residing in Kaduna (and without service), nearly 500,000 low income residents would be provided with reasonable access to water by the end of the project period.

4.19 The proposed project includes improvement of all aspects of KSWB's water supply system. The distribution networks (including mains, connections and standpipes) account for an estimated 30% of basic project costs (before consulting services and contingencies), of which about half will serve the areas inhabited by the poverty group. Thus roughly 15% of total project costs will go directly toward the improvement of services to the poverty group. In addition, this group will benefit from investments in production, transmission, and storage facilities and more efficient system operation and maintenance.

4.20 Water supplies for the poverty group will be affordable for several reasons:

- (a) The residential pattern in low income areas consists almost exclusively of independent compounds containing several buildings which provide shelter for several households. A single tap in each compound (the most common standard of service) would provide water sufficient for basic needs at a low per capita cost;
- (b) KSWB's present policy of charging consumers the full cost for new connections would be revised so that connection costs (up to property boundaries) including the cost of a meter are regarded as system capital costs and amortized accordingly. The only initial cash costs to be borne by consumers are the costs of plumbing within the property and a minor charge for KSWB to complete the connections and turn on the water;
- (c) Public standpipes will be installed by KSWB in areas where house connections are, as yet, inappropriate and water supplied from standpipes will be free to the consumer; and
- (d) KSWB will ensure when revising tariffs that water required to meet basic domestic needs would be priced so as to be affordable by low income consumers.

V. THE BENEFICIARY

Lending Arrangements

5.01 In accordance with current arrangements the Federal Government of Nigeria would be the Borrower and the loan would be onlent first to the Kaduna State Government (KSG) and ultimately to KSWB, all on Bank terms. Accordingly, the Bank would enter into a loan agreement with the Federal Government, a special agreement with KSG and a project agreement with KSWB.

Organization

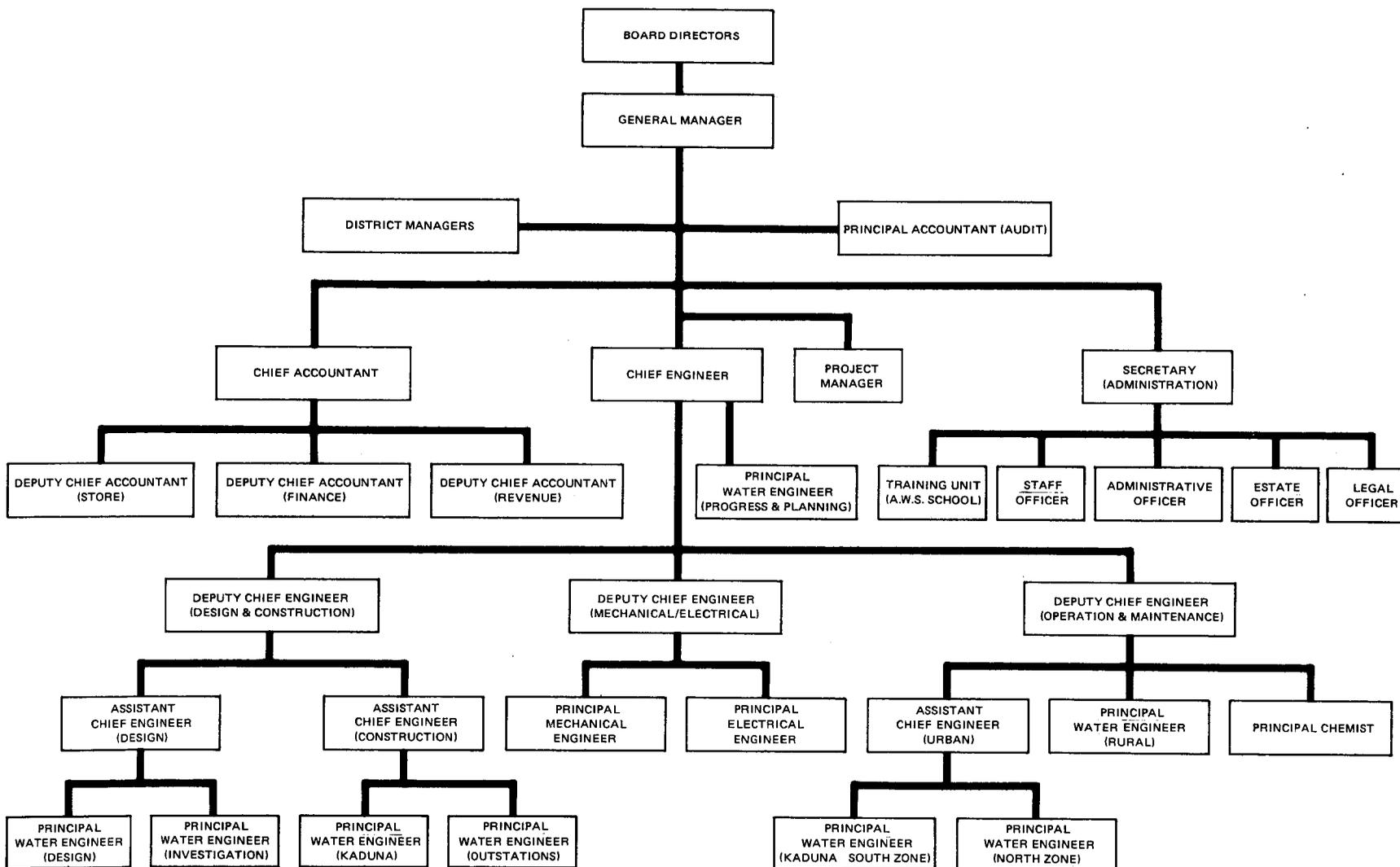
5.02 KSWB was created in 1971 to be responsible for the State's water supplies, when the State was known as North Central State. The 1971 edict, which provides KSWB's legal standing, has been provided to the Bank. On the basis of the 1971 edict, no changes would be necessary in KSWB's legal character to permit it to receive Bank funds or to implement the project in accordance with Bank requirements.

5.03 The organizational structure of KSWB was changed, with significant improvements, in October 1978. The reorganization was essentially based on the recommendation of the consultants (MRT) who prepared the state-wide water supply master plan (para 1.16). The new organization was reviewed by a Bank post appraisal mission in November 1978 and agreed in general. The new organization is shown on chart 5.1. Policies proposed by management are reviewed by a sixteen-member recently reconstituted Board which generally meets quarterly. Three board members represent KGS Ministries (Works and Housing, Agriculture and the Office of the Secretary to the Military Administrator one represents the Army, and three are Local Government Representatives. The remaining nine members are from the private sector (8) and the General Manager of KSWB. Unfortunately, at present, there is no one at the policy making level of KSWB who is specifically concerned with urban growth in the capital of Kaduna (as is KCDB) or with the questions of hygiene and sanitation which are so closely linked to water supply. KSG agreed during negotiations to appoint a KCDB representative to the Board of KSWB by December 31, 1979, and similarly a KSWB representative on to the KCDB Board.

5.04 All KSWB Board members and executives are appointed by Kaduna State's Military Administrator, the Head of KSG. KSWB management generally operates autonomously on routine matters but is subject to financial control by KSG requiring approval of: budget, water tariffs, and procurement on all contracts worth more than N 500,000 (\$770,000).

5.05 KSWB operations outside the capital area have been expanding in recent years and will continue to do so as increasing emphasis is placed on water supplies for the smaller urban and rural areas. The present organization caters for this expansion through the eight Districts Managers (effectively one for each urban supply including Kaduna) plus a separate unit for all rural water supplies under the Operations Department. A re-organization of these Districts into four regions is recommended in the state water supply

KADUNA STATE WATER BOARD
ORGANIZATION CHART



Master Plan (para. 1.16) to provide a more centralized and efficient management. This is still under consideration by KSWB but it may be some time before the present management is strong enough to undertake such a major exercise and before sufficient qualified staff are recruited to fill the proposed regional management positions. KSWB will consult the Bank prior to any proposed changes in its organizational structure.

5.06 Although the system maintenance and standard of service in Kaduna are poor (paras. 2.09-2.21), they are much better than in the eight other Districts where systematic maintenance is non-existent; there are no operating or financial records and there is little effort to recover the cost of water supplied. Assurances were obtained that, under the Management and Operations Improvement Plan (para. 3.06 and Annex 6), KSWB will introduce the same measures as those to be applied in Kaduna to other districts (para. 6.09).

5.07 The lack of continuing and competent team of senior managers has been the fundamental cause of KSWB's problems in recent years. System planning has been weak; the quality of construction of new facilities (mostly by force account) has been less than desirable; and the operation of the facilities has been particularly poor without effective maintenance. In July 1978 a new expatriate General Manager was appointed. The new General Manager appears to be a very competent engineer and has a long experience in Kaduna. Already his presence has resulted in significant improvements in many areas of the Board's operations in particular with the redeployment of his senior staff to ensure more dynamic leadership in the key positions. The performance of the new management will be closely monitored during supervision. In view of the critical importance of an efficient management for the execution of the project, it was agreed during negotiations, firstly with KSG, that any future changes in the positions of General Manager or Secretary of KSWB and, secondly with KSWB, that any future changes in its other Chief Officers (Chief Accountant, Chief Engineer, Training Executive and Project Manager) or of its organization would be made following consultation with the Bank. The appointment of a Project Manager on terms and conditions acceptable to the Bank, directly responsible to the General Manager, is a condition of effectiveness of the Loan. Another means of strengthening the management, which is already being explored by KSG, is to obtain specialized management assistance from utilities or consultants in more developed countries.

5.08 In mid-1978 the staff employed by KSWB totalled about 1,750. Less than 15% of this staff are in the Kaduna headquarters; the rest are in the central depot and workshops in Kaduna (about 100) and in the nine districts of KSWB. Some 300 staff were engaged for the routine operation and maintenance of the Kaduna water supply. Approximately 60% of the staff are on "daily paid" or temporary terms, all in low level positions but after 5 years of satisfactory service these workers qualify for conversion to permanent staff. The staffing situation of KSWB will be reviewed under the proposed training program.

5.09 KSWB presently employs a total of 23 expatriates. The great majority of these are professional engineers and accountants who have been engaged by KSWB on a contract basis following recruiting campaigns in Pakistan, Egypt,

India and Sri Lanka. These expatriates form the core of KSWB senior staff, permitting the agency to function reasonably well but causing the normal difficulties associated with reliance on expatriates (lack of continuity, inefficiency due to frequent turnover, and salary differentials which can cause discontent among national staff). Nevertheless KSG and KSWB appreciate that expatriate staff will continue to be required in the short and medium term, until competent and experienced Nigerian staff can be recruited and trained to fill all positions. Vacancies at senior levels still exist and the Board is planning another overseas recruiting mission for 1979.

Training

Kaduna State Facilities

5.10 Although there is a reasonable understanding and awareness of KSWB's training needs among the senior management staff of the Board, the only organized training available within the authority is a special course for Assistant Works Superintendents (AWS). Since 1971, KSWB has annually provided this one-year program of formal training, which leads to the award of a Certificate in Water Supply Engineering to graduates who become, upon successful completion of the course, Assistant Works Superintendents. At present 20 of the available 40 course places are allocated to other state water boards and more places are being requested. KSWB also has been requested by KSG to provide training places on this course for the supervisory staff of the 13 local government divisions of Kaduna State who are employed on the development and supervision of minor water supplies and sanitation works in the rural sub-sector.

5.11 KSWB therefore intends to increase the 1978-79 course intake to 80 trainees. This would seriously overstrain the present resources of the KSWB training school, the full time staff of which, at the commencement of the 1978-79 program, was reduced from four to two members, one of whom was a recent recruit by KSWB. The training program depends heavily on supplementary instructors being provided from existing senior KSWB staff, an arrangement which does not work well as interruptions of the program, due to operational or emergency commitments are frequent. The normal one-year program is predominantly academic in content. It is designed to be followed by a further one year of planned practical experience but this element, even for KSWB graduates, is unstructured and amounts to no more than normal supervisory duty.

National Sector Training Facilities

5.12 An important current development in Nigeria is the establishment by the Federal Ministry of Agriculture and Water Resources (FMAWR), of a national Water Resources Center to be constructed on a 30-acre site at Mando Road, Kaduna. Initially the Center will provide a four-year course, primarily for inservice candidates, leading to the award of the Nigerian National Diploma in Water Resource Engineering. The proposed four-year curriculum will cover water resource survey, planning and construction of works and, in addition to one year of field work, will include a final year of elective

specialization in engineering hydrology, environmental health engineering, irrigation, or erosion control. The aim will be to prepare students for executive technical positions in the FMAWR, Water Boards/Corporations, and River Basin Development Authorities. The potential long-term benefits of this program to the water sector both nationally and to the English speaking countries of the West African Region, could be considerable. The phase I target is a capacity of 120 students and an initial annual output of 40 graduates.

5.13 The Water Resources Center would also provide a particularly suitable base for establishing a national manpower planning and development cadre for the sector. The scope of this service would include assisting all water agencies to develop training programs and resources within national guidelines. The proposed parallel expansion and development of the KSWB training program would permit the Water Resources Center to use this program as a model in assisting other state water boards to implement similar programs.

5.14 A further recent development of importance to the Nigeria water sector is the introduction by Ahmadu Bello University, Nigeria's largest university, of a one-year postgraduate course leading to the award of MSc in Water Resource Engineering. In the longer term the combined effects of this program, the Water Resource Diploma Course and the improved KSWB AWS program should substantially increase the Board's ability to meet its future requirements for both professional and sub-professional staff.

External Vocational Training Facilities

5.15 Kaduna is reasonably well endowed with education and training resources designed to meet local requirements for general purpose technical and administrative skills. In addition to the Kaduna Polytechnic with a capacity for 6,000 students, two trade training schools exist and the State Staff Training Center provides a wider range of short courses for government employees in administrative, financial and clerical job categories.

The Proposed KSWB Training Program

5.16 The training program to be designed and implemented under the project would consist of the following elements:

- (a) A review of the utilization of KSWB's available manpower of some 1,700 personnel, currently grouped into 60 main occupational categories and identifying, for training purposes, three manpower groups for which the work content would be of a specialized, semi-specialized or non-specialized nature;
- (b) A detailed assessment of the performance of technical, administrative and financial sub-professional staff to determine their training needs based upon a comparison between job requirements and observed levels of competence;

- (c) The appointment of a Training Executive Officer with a sufficiently high position to assume responsibility for the KSWB sub-professional training program including the management of the proposed Training Unit;
- (d) The identification of (initially) three potential instructors to be selected from past graduates of the AWS School who have reached the Higher or Senior Superintendent grades and arrangements for their intensive training in an overseas water sector training organization, for subsequent employment as additional full time training staff to the two lecturers currently in post;
- (e) The upgrading of the existing AWS School to form a Training Unit for sub-professional staff, and the construction and equipping of additional training facilities to provide much needed off-the-job training and demonstration resources for supervisory and operator level.
- (f) The reorganization of the existing AWS training program to a "sandwich" type course of three six-month elements, the middle period of which would be devoted to supervised planned practical experience, during which time the aptitude and requirement for more specialized training in various skills would be assessed, for implementation during the final phase of the course;
- (g) The production of a series of training modules designed to develop the appropriate skills and knowledge required by individual sub-professional staff engaged in the operations set out in sub-paragraph (e) above, together with all necessary training aids, models and manuals; and
- (h) The formulation and scheduling of an overall training plan for specialized, semi-specialized and non-specialized sub-professional staff, incorporating where appropriate, the local and/or national training and technical education facilities which exist in both the public and private sectors, and including the services to be provided by the Federal Water Resources Center.

5.17. The detailed design and implementation of the training program would require the assistance of training consultants. The consultant's team would be headed by a Training Adviser who, together with KSWB's management (including the technical assistance personnel, para. 5.16) would develop and coordinate, with priority accorded to the needs of Kaduna District: (a) KSWB's manpower requirements, (b) the planning and implementation of the training program including the redesign of the AWS training program; and (c) the development and extension of the existing AWS training school and premises to become the

KSWB Training Unit for sub-professional staff. The total cost of the training component is estimated to be US\$646,000 (including 10% contingencies) of which about US\$523,000 would be foreign exchange to be financed under the proposed loan. Detailed cost estimates are given in Annex 2.

5.18 The above proposals were discussed with KSWB during the appraisal and were agreed in principle. During negotiations KSWB agreed to sign a contract with consultants acceptable to the Bank to commence work on the program and appoint a Training Executive not later than October 1, 1979. Draft terms of reference for the consulting services (prepared with Bank assistance) were discussed and finalized during negotiations.

Management Systems

5.19 KSWB has very few effective management systems, since management itself has not been very effective. No annual report has ever been issued. It is the considered opinion of the mission that recommendations for specific improvements in various management systems would be inappropriate at this time. The fundamental task is for KSWB to obtain competent managers and possibly management assistance. The necessary systems to assist management should then evolve as required and in light of the particular requirements of KSWB.

Reporting and Monitoring

5.20 Specific reporting procedures which will keep KSWB management and the Bank informed of progress on the project including meeting institutional and financial objectives were discussed and agreed at negotiations. A suggested format for these reports which was given to KSWB during the post appraisal mission is included in the project file. Monitoring criteria to be included in the reporting requirements are listed in Annex 3.

VI. FINANCIAL ANALYSIS

Past and Present Financial Performance

6.01 When KSWB was established in 1971, it took over various assets and liabilities from the Ministry of Works. However, records continued to be kept on a single entry cash basis until 1973 when a rough estimate of KSWB's fixed assets was made and a first balance sheet was prepared. Subsequently, the independent audits of the accounts and financial statements for the years 1974 through 1977 recorded serious qualifications concerning the valuation of fixed assets, the accuracy of current assets and liabilities and inconsistencies in accounting treatment.

6.02 Since 1977, accounting systems and procedures have improved, controls have been strengthened and much needed senior qualified accountants have been recruited at headquarters. In the Kaduna district, the weaknesses noted by the external auditors have been remedied to some extent by the institution of stores accounting and control procedures, periodic physical check of inventories, tighter control of cashier's procedures, bank reconciliations, and improved billing and collection procedures.

6.03 The condition in the other districts varies considerably. The largest operate closely to the standard of Kaduna, but the majority are operated in a manner fairly remote from that of a commercial operation; there are virtually no operating records, and no information is available on water produced, sold, or unaccounted-for, or on sales billed and collected. It is estimated for instance that while in 1978, all other districts combined had more than twice the fixed assets of Kaduna district, they only had about one-third of its revenues.

6.04 At this time, the Kaduna district--where the physical components of the proposed project are to be implemented--appears to be the only one able to carry out institutional improvements, without prior technical assistance. Almost without exception, the performance of the other districts will need considerable upgrading before they can be meaningfully controlled. For this reason, the main thrust of the financial covenants is directed at the Kaduna district, and the financial projections are those of the Kaduna district. Nevertheless, assurances were obtained that as part of the proposed Management and Operations Improvement Plan, KSWB will bring the operations of other districts to a position where the KSWB financial covenants, originally devised for Kaduna District, will apply to them by later dates (para. 5.06).

6.05 KSWB's financial statements for fiscal year 1977 and 1978 appear in Annexes 4.1 and 4.2. Because substantial adjustments affecting 1977 were made in 1978, the figures for the two years have been combined for analysis of the results. The combined revenues for 1977 and 1978 amounted to ₦ 11.2 million, including ₦ 2.5 million, or 22%, of operating grants. These,

together with N 0.8 million of non-operating income, were sufficient to produce a net income of N 0.9 million and contribute N 3.0 million, or 20% of total investments of N 15.5 million, there having been no debt to service. A combined rate of return of 3.2% on unvalued average net fixed assets in operations was obtained for 1977 and 1978. On the same basis, the Kaduna district is estimated to have earned a return of between 7% and 12%, while the other districts combined had negative results.

6.06 Thus it appears that the Kaduna District has been operating profitably in spite of unaccounted-for water in the neighborhood of 45% of water produced. Lax billing and collection practices and a high number of unregistered connections have been largely responsible for this higher than normal unaccounted-for water. For their part, the other districts have operated at an aggregate loss in spite of substantial operating grants. Their poor results may be attributed to (i) the small size of their water supply systems with correspondingly high unit production costs, (ii) the application of uniform state-wide tariffs, and (iii) extremely high unaccounted-for water stemming from poorly operated systems, widely tolerated use of illegal connections and poor billing and collection practices. While a number of measures are already underway to improve billing and collection, KSWB gave assurances that, as a part of the Management and Operations Improvement Plan, it would set up programs in the Kaduna district to reduce unaccounted-for water to 25% by 1984 and to raise its rates of billing and collections so that by 1981 trade accounts receivable would be reduced to the equivalent of two months billings. KSG agreed during negotiations to pay KSWB, on a monthly basis, for water consumed at public standpipes at the domestic water tariffs then in effect - this will also help KSWB's performance in relation to receivables. KSWB also gave assurances that it would improve performance under the proposed Management and Operations Improvement Plan (para. 6.04) in other districts.

6.07 Efforts are also underway to set up separate fixed assets and other operating accounts by district with the aim of preparing separate financial statements. These will be essential to assess the operating and financial performance of the project area. During negotiations, KSWB agreed that its accounts will be maintained in sufficient detail to be able to prepare separate income, balance sheets and cash flow statements for each district, beginning with Kaduna district in FY 1980, and subsequently for other districts, and that these accounts and financial statements will be audited by external auditors acceptable to the Bank and submitted to the Bank not later than six months after the end of each fiscal year.

Tariffs

6.08 The aspects of economic pricing and appropriate structures have already been dealt with in paras. 4.10 and 4.12 respectively. From a financial point of view tariffs have been satisfactory in the Kaduna District, particularly in the light of the prevailing low operating efficiency (para. 6.06). It is estimated, nevertheless that in the project period tariffs will have to be raised each year so as to produce an additional 15% more revenue per year (para. 6.12). This appears reasonable in the Nigerian context.

Financing Strategy

6.09 During negotiations KSWB gave assurances that effective April 1, 1979 it would adopt a financing strategy whereby, inter alia, (i) all revenues derived from water service in the Kaduna district would be deposited in a separate account and used exclusively for the payment of the capital and operating expenditures of the Kaduna district, including a reasonable share of the operating expenditures of KSWB's headquarters, and the servicing of the debt of the Kaduna district; (ii) three months prior to the commencement of each fiscal year, an exercise would be undertaken in consultation with the Bank, to ensure that tariffs are adjusted as necessary to generate each year in the Kaduna district revenues sufficient to cover the sum of the cash operating requirements, the debt service and a percentage of the average capital expenditures of the Kaduna district for periods of three consecutive fiscal years, consisting of the prior year, the current year and the following year. (An indication of the percentage to be achieved each year in Kaduna district to reflect the latest investment and financing plan is shown in the penultimate line of Annex 4.3); and (iii) additional debt would not be incurred by KSWB unless its internal cash generation covers its maximum future debt service 1.5 times. Assurances were given by KSWB that, as part of the MOIP, the revenue covenant, originally only applicable to Kaduna district will be extended to Zaria and Funtua by FY1981 and to other districts by agreement, from time to time, between the Bank and KSWB.

6.10 The above strategy appears to be appropriate for KSWB, since it proposes attainable, realistic targets while contemplating the eventual integration of all districts under the same financial discipline. A cash generation covenant is also well indicated because (i) its implementation requires a lower level of sophistication of the borrower's accounting and management staff; (ii) it is more readily understood by KSWB and KSG officials who are used to the government approach of budgeting to meet cash flow requirements; and (iii) it addresses the crucial aspect of forward financial planning more directly, requiring KSWB to forecast operating costs and investment plans at least two years in advance and to establish its tariffs in relation to these forecasts.

Financing Plan

6.11 The Kaduna District Sources and Applications of funds statements for the period 1979 through 1985 appear in Annex 4.3. These may be summarized as follows (in million Nairas):

<u>Sources</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1979-85</u>	<u>% of Total</u>
Cash Generation	1.6	2.0	3.5	4.8	6.4	11.9	14.6	44.8	32
Debt Service	-	.6	1.0	2.1	3.4	4.3	8.4	19.8	14
Net Cash Generation	1.6	1.4	2.5	2.7	3.0	7.6	6.2	25.0	18
Proposed IBRD Loan	-	2.9	10.2	18.7	17.2	9.8	.8	59.6	42
Gov't & Army Contributions	.1	6.3	8.1	11.9	10.3	10.4	9.9	57.0	40
Total	<u>1.7</u>	<u>10.6</u>	<u>20.8</u>	<u>33.3</u>	<u>30.5</u>	<u>27.8</u>	<u>16.9</u>	<u>141.6</u>	<u>100</u>
<u>Requirements</u>									
Proposed IBRD Project	.9	3.2	16.2	31.0	30.3	19.3	1.9	102.8	73
Other Projects	6.0	6.8	3.9	2.5	1.9	5.5	18.0	44.6	31
Total Investments	6.9	10.0	20.1	33.5	32.2	24.8	19.9	147.4	104
Working Capital Inc. (Dec.)	(5.2)	.6	.7	(.2)	(1.7)	3.0	(3.0)	(5.8)	(4)
Total	<u>1.7</u>	<u>10.6</u>	<u>20.8</u>	<u>33.3</u>	<u>30.5</u>	<u>27.8</u>	<u>16.9</u>	<u>141.6</u>	<u>100</u>

6.12 The major assumptions used in preparing the financing plan are found in Annex 8. Mainly it was assumed tariffs will increase by 15% per year starting in 1979 and that unaccounted-for water will go from 45% of water produced in 1978 to about 25% by 1984. Operating and capital expenditures have been adjusted to reflect expected local and international inflation. On this basis, the Kaduna district would generate about 18% of its total requirements during 1979-85. This rate would vary between a low of 8% in 1982, peak disbursement year of the proposed project, and a high of 31% in 1984 and 1985 when the proposed project has been substantially completed. Bearing in mind the very low fixed assets base at the beginning of the period, in comparison to the investment program, the projected cash generation appears very reasonable and has been agreed with the KSWB. The proposed Bank loan would provide 42%, and Government contributions the remaining 40% of total requirements. As to the proposed project, it would be financed 58% by the proposed IBRD loan, 24% by Kaduna State Government contributions and 18% by the Kaduna district internal cash generation. The Kaduna State Government has agreed that, during the project period, it will allocate the amounts necessary to meet the financing requirement of the proposed Project after taking into account the amounts available from the proposed IBRD loan and the internal cash generation of the Kaduna district. Agreement was also reached with the Kaduna State Government that such budgetary allocations would be deposited in advance each quarter in a special bank account to be used exclusively for the capital expenditures of the proposed Project. The Federal Government has agreed to ensure that these financial obligations of the KSG and KSWB for the project, under their respective agreements, will be met.

6.13 On a three-year rolling average basis, current projections indicate that cash generation as a percentage of total investments would fall from 14% in 1980 to 8% in 1981, 9% in 1982, the two years of peak project investment, and rise to 31% in 1984 and 1985. In the 1979-85 period annual debt service would be covered at least 1.7 times by internal cash generation.

Future Financial Performance

6.14 The Kaduna district projected Income Statements appear in Annex 4.4. These may be summarized as follows (in million Nairas):

	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Revenues	3.8	4.7	7.1	9.0	11.3	18.3	22.8
Expenses	<u>2.8</u>	<u>3.7</u>	<u>4.9</u>	<u>5.9</u>	<u>8.0</u>	<u>11.0</u>	<u>13.5</u>
Operating Income	1.0	1.0	2.2	3.1	3.3	7.3	9.3
Non-Operating Income	.1	.1	.1	.1	.1	.1	
Interest	-	(.6)	(1.0)	(2.1)	(3.4)	(4.3)	(4.4)
Net Income	<u>1.1</u>	<u>.5</u>	<u>1.3</u>	<u>1.1</u>	<u>-</u>	<u>3.1</u>	<u>5.0</u>

These projections reflect the financial strategy presented in paragraph 6.09 and the assumptions contained in Annex 8. In the 1979-85 period, no deficit is expected; operating ratios would not go higher than the 79% in 1980 and would reach a low of 59% in 1985; and the rate of return on average net fixed assets in operation--revalued on a basis consistent with the local and foreign inflation factors used in costing the project--would reach a low of 3% in 1983 and a high of 5.3% in 1985. During negotiations KSWB agreed that, not later than March 31, 1982, it would value its physical assets, and annually revalue them thereafter, in accordance with sound and consistently maintained methods of valuation acceptable to the Bank.

6.15 The Kaduna district projected Balance Sheets appear in Annex 4.5. These are summarized as follows (in million Nairas):

	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
<u>ASSETS</u>							
Fixed Assets	24.6	33.7	52.6	84.5	113.7	134.0	148.7
Current Assets	<u>3.2</u>	<u>3.8</u>	<u>5.1</u>	<u>7.0</u>	<u>8.5</u>	<u>10.7</u>	<u>11.9</u>
Total	<u>27.8</u>	<u>37.5</u>	<u>57.7</u>	<u>91.5</u>	<u>122.2</u>	<u>144.7</u>	<u>160.6</u>
<u>LIABILITIES</u>							
Current Liabilities	1.5	1.4	1.9	3.8	4.2	3.0	7.1
Deposits	1.2	1.3	1.4	1.5	1.6	1.7	1.8
Long-Term Debt	-	2.9	13.1	31.8	49.0	58.8	55.6
Equity	<u>25.1</u>	<u>31.9</u>	<u>41.3</u>	<u>54.4</u>	<u>67.4</u>	<u>81.2</u>	<u>96.1</u>
Total	<u>27.8</u>	<u>37.5</u>	<u>57.7</u>	<u>91.5</u>	<u>122.2</u>	<u>144.7</u>	<u>160.6</u>

6.16 In the 1979-85 period, the value of fixed assets in the Kaduna district is expected to grow at an average rate of 35% per year. Current ratio would not go below 1.7 and debt to debt and equity ratio would not go above 42%.

VII. CONCLUSIONS AND RECOMMENDATIONS

Project Merit and Risks

7.01 The proposed project will provide Kaduna with reliable supplies of safe water, eliminate present shortages and strengthen the system substantially. During the project period, approximately 400,000 additional people, most of them low income, will, for the first time, have access to piped water as a result of the project. Provision of this basic infrastructure will permit Kaduna to continue to grow as an industrial, administrative and military center, one of the most important cities in Nigeria. KSWB, the organization responsible for water supplies throughout Kaduna State would be considerably strengthened in terms of organization, staff and financial performance as a consequence of the project. As KSWB is one of the most progressive water agencies in Nigeria, the Kaduna project, the first to be aided by the Bank in this sector, can be expected to provide a model for other water utilities throughout Nigeria.

7.02 Certain risks arise from the preliminary nature of some of the cost estimates. KSWB's project preparation has concentrated primarily on the source works to augment Kaduna's water supply and the design and cost estimates of the transmission and particularly the distribution system are, at this stage, only preliminary. However, project cost estimates are probably on the high side.

7.03 The scarcity of qualified and experienced executives in KSWB has caused management deficiencies in the past which must be corrected if KSWB is to implement this project efficiently. However, recent senior appointments, are encouraging indications that KSG and KSWB are recognizing these problems and are taking appropriate action. Such expertise is in limited supply and much sought after in Nigeria, therefore, the project carries some risk of KSWB, in future, not being able to attract and/or retain competent management despite the relevant provisions of the project (paras. 5.06, 5.07 and 6.02).

Agreements Reached

7.04 Agreements have been reached with the Nigerian authorities on the following points:

- (i) Federal Government of Nigeria (FGN) will grant exemption from incorporation requirements to non-Nigerian contractors who are awarded project contracts (para. 3.33); and

- (ii) Local cost financing (paras. 3.15 and 6.12) and the proposed lending and onlending arrangements (para. 5.01).

7.05 The Kaduna State Government has agreed on the following points:

- (i) lending arrangements (para. 5.01);
- (ii) project financing including cost overruns (para. 3.15);
- (iii) water resources management to safeguard supplies to KSWB (para. 3.28);
- (iv) prior notification of changes in posts of General Manager and Secretary to KSWB (para. 5.07);
- (v) provision of project counterpart financing (para. 6.12);
- (vi) reciprocal representation on Boards of KSWB and KCDB (para. 5.03);
- (vii) intensify its public health information campaign (para 2.31); and
- (viii) execute a sanitation improvement program for Kaduna City (para. 2.31).

7.06 The KSWB agreed on the following points:

- (i) maintenance of competent management team (para. 5.07);
- (ii) acquisition of land for project facilities (para. 3.22);
- (iii) continued engagement of external auditors (para. 6.07);
- (iv) water resources management (paras. 3.27 and 3.28);
- (v) reporting procedures (para. 5.20);
- (vi) separation and audit of accounts (para. 6.07);
- (vii) tariff action to generate desired cash flow (para. 6.09);
- (viii) debt limitation (para. 6.09);
- (ix) undertake a tariff study (para. 4.12);
- (x) prior notification of any organizational or Chief Officer changes (para. 5.07);

- (xi) appointment of a Training Executive Officer (para. 5.18);
- (xii) appointment of consultants for manpower planning and training program (para. 5.17); and
- (xiii) value all physical assets by March 31, 1982 and annually revalue thereafter (para. 6.14).

7.07 It is recommended that the following be made a condition of effectiveness of the proposed loan:

KSWB appoint a Project Manager (para. 5.07).

Recommendation

7.08 The project is suitable for a Bank loan of \$92 million at the current rates for interest and commitment fees, to be repaid over 20 years including a 5-year grace period.

NIGERIA - KADUNA WATER SUPPLY PROJECT

OUTLINE OF KSWB EMERGENCY WORKS PROGRAM

Background

Kaduna is currently experiencing increasing water shortages. Aware that the proposed project to be built with Bank financial support would be unlikely to provide additional supplies of water before 1982 or 1983, KSWB has proceeded independently to augment essential elements of the existing system in order to eliminate supply constraints in the near future. The construction of these various elements is referred to as the Emergency Works Program and the various components are described below.

Engineering assistance for the program has been provided to KSWB by their consultants Ward, Ashcroft and Parkman (Nigeria).

KSWB intended to have the program implemented entirely by contractors and were proceeding accordingly. However, in May, 1978 the State government instructed KSWB to carry out all civil works (items 5 and 6 below) by force account. Work has started on October 1, 1978 and KSWB appears to have adequate construction plant, materials and labor to complete the works successfully.

Program Components

1 - South Treatment Works: Package Plant

The very old treatment plant of Kaduna South is the primary water source for Kaduna's industrial area. Virtually all components of the existing plant are operating at capacity and many temporary and makeshift modifications have been made to increase the output of the plant.

Late in 1977 KSWB placed an order with an Italian manufacturer for a package treatment plant, a portable unit including a pressure filter with a rated capacity of 1.2 mgd (5,400 m³/day) which would increase the output of the south waterworks by 17%. The cost of this plant is reportedly ₦ 326,000 (US\$0.5 million).

Erection of the plant was substantially completed in November 1978 and it is expected to be operational by early 1979.

2 - North Treatment Works: Equipment Supply and Erection

In mid-1977 KSWB called for tenders for the supply and erection of equipment to increase the capacity of the existing north water works by 10 mgd (45,500 m³/day), effectively doubling plant output. This would essentially involve the construction of additional rapid gravity sand filters, similar to those already existing, and the increased utilization of the existing presettling tank and horizontal flow sedimentation basin.

In November 1977, KSWB signed a contract with a British supplier (PCI) for this equipment for ₦ 0.8 million (US \$1.3 million) and equipment is expected to be delivered early in 1979.

3 - Supply of Pumping and Control Equipment

Tendered in about September, 1977, this contract calls for the supply of pumps, motors, flow meters and associated control equipment for the following:

- 2 raw water pumps for the existing intake at the north treatment plant;
- 2 low lift pumps to transfer water (10 mgd) from the presettling basin to the planned new filters at the north treatment plant;
- 6 treated water pumps for the north treatment plant (4 to Lugard Hall and 2 to State House), plus a standby electrical generator;
- 2 pumps each for the State House pumping station (to supply a new elevated storage reservoir at the airport), the Lugard Hall pumping station (to supply the adjacent elevated storage reservoir), and from the south treatment plant to Kakuri plus three standby electrical generators;

Following discussions and clarifications with the supplier, KSWB awarded the contract in October 1978 at a price of ₦ 3.2 million (US \$4.9 million). Delivery is expected within 12 months of contract signature.

4 - Supply of Transmission Mains

In September 1977, KSWB tendered for the supply of some 17 km of ductile iron pipes which would be laid under a separate contract. Several bids were received late in 1977. Following extensive discussions with alternative suppliers and their consultants, KSWB was informed by the State Government in May, 1978 that the Kaduna State Distribution Agency would become responsible for the purchase of these pipes. The estimated value of the contract is ₦ 2.1 million (US\$3.4 million).

5 - Installation of Transmission Mains

In about September 1977, KSWB tendered for the installation of some 17 km of transmission mains (to be supplied separately under the contract discussed above). These mains would link:

- the Kaduna North treatment plant and the State House pumping station;
- the State House pumping station and the new elevated storage reservoir at the airport;
- the Lugard Hall pumping station and the Tudun Wada reservoir on Polytechnic Road.

On the instructions of the state government place works will also be carried out by force account and work has started in October.

NIGERIA

KADUNA WATER SUPPLY PROJECT

Training Component - Cost Estimates

Item	Foreign Costs US\$000	Local Costs US\$000	Total Costs US\$000
(a) Training Consultant's remuneration at 36 man-months (all in costs)	200	-	200
(b) Consultant's local support/services/transport costs	-	18	18
(c) 3 man-years of attachment to European and/or other external utilities and training institutions including fees, per diem, air travel and contingencies	75	-	75
(d) Training executive officer - training and familiarization program in an external/overseas water sector training organization (3 man-months)	6	-	6
(e) Instructor training and skill development program in an external/overseas water sector training organization - for 3 superintendent level staff (18 man-months)	36	-	36
(f) Cost of civil work for extension/upgrading of Training School:			
- 2 workshops of total area 5,400 sq. ft.	40	55	95
- Office, store, canteen, toilet facilities of total area 1000 sq. ft.	8	10	18
- Total area: 6400 sq. ft. - cost N18 sq. ft.			
- Hard standing area 3000 sq. ft.	1	1	2
(g) Equipment for workshops plus classroom equipment	35	-	35
(h) Training simulators and demonstration equipment for outside training area	35	20	55
(i) Printed and consumable training materials	2	4	6
(j) Cost of local training and retraining of semi-specialized and non-specialized staff (100 man-weeks)	-	5	5
	<hr/>	<hr/>	<hr/>
	478	113	591
Contingencies	<hr/>	<hr/>	<hr/>
	45	10	55
	<hr/>	<hr/>	<hr/>
	523	123	646

PROPOSED MONITORING INDICATORS

A series of indicators for monitoring project implementation, KSWB's operating and financial performance and developments pertaining to water supply were discussed during negotiations and will be included, inter alia, in the requirements for KSWB's regular reporting to the Bank (para. 5.20). The principal criteria agreed are as follows:

I. Project Area Development (Annually)

- (i) Total Population of Kaduna; and
- (ii) Population Served by:
 - a) Private Connections; and
 - b) Standpipes.

II. Project Area Operating Statistics

- (i) Volume of water produced from various sources and total - monthly;
- (ii) Volume of water billed by customer category (domestic metered, standpipe, industrial/commercial and institutional) and total - monthly;
- (iii) % unaccounted for-water;
- (iv) % estimated/measured physical losses (leakage); and
- (v) New distribution pipes laid (Kms) - quarterly;

III. Project Area Commercial Indicators (Monthly)

- (i) Collection as % of billing by consumer category and total;
- (ii) Number of service connections by consumer category and total; and
- (iii) Number of standpipes.

IV. Financial Indicators (Annually)

- (i) Audited balance sheet-KSWB;
- (ii) Audited income statement-KSWB total and Kaduna District;

- (iii) Audited funds flow statement-KSWB total and Kaduna District;
- (iv) Projected funds flow statement for subsequent three years; and
- (v) Current schedule of water charges.

V. Project Implementation (Quarterly)

- (i) Revised project construction schedule;
- (ii) Revised project cost estimates;
- (iii) Revised construction schedule Emergency Program; and
- (iv) Status of training program.

VI. General (Quarterly)

- (i) Number of employees by category (management, professional, technician, labourer and "daily paid"); and
- (ii) Average daily flows in the Kaduna River at the Kaduna North intake.

NIGERIA

KADUNA STATE WATER BOARD

ANNEX 4.1

INCOME STATEMENTS - 1977 AND 1978

(in million Nairas)

	1977	1978	Total
<u>Revenues</u>			
Sales of Water	2.9	5.5	8.4
Private Connections	.1	.2	.3
Operating Grants	<u>1.4</u>	<u>1.1</u>	<u>2.5</u>
Total Revenues	4.4	6.8	11.2
<u>Expenses</u>			
Salaries and Wages	1.0	1.1	2.1
Chemicals, Electricity, etc.	1.2	1.2	2.4
Other, including H.Q.	2.0	2.0	4.0
Depreciation	<u>1.9</u>	<u>.7</u> ^{/1}	<u>2.6</u>
Total Expenses	6.1	5.0	11.1
Net Operating Income (Deficit)	(1.7)	1.8	.1
Non-Operating Income	<u>.5</u>	<u>.3</u>	<u>.8</u>
<u>Net Income (Deficit)</u>	<u>(1.2)</u>	<u>2.1</u>	<u>.9</u>
Rate of Return on Historically Valued Assets			3.2

/1 Includes change of rates to useful life and prior year adjustment of N 0.7

NIGERIA

KADUNA STATE WATER BOARD

ANNEX 4.2

BALANCE SHEETS YEAR ENDED 1977 AND 1978

(in million Nairas)

	<u>1977</u>	<u>1978</u>
<u>ASSETS</u>		
<u>Fixed Assets</u>		
Gross	37.2	41.6
Depreciation	5.6	7.7
Net	31.6	33.9
Work-in-Progress	--	7.8
Total Fixed Assets	31.6	41.7
<u>Investments</u>		
51% in WAPDECO	.1	.3
<u>Current Assets</u>		
Cash	9.2	10.2
Trade Receivables	1.2	2.4
Other Receivables	.4	.3
Stores	.9	1.4
	11.7	14.3
TOTAL ASSETS	<u>43.4</u>	<u>56.3</u>
<u>LIABILITIES</u>		
<u>Current Liabilities</u>		
Payables	1.8	1.9
Deposits	.6	1.7
<u>Equity</u>		
Government Contributions	44.1	54.7
Accumulated Prior Years' (Deficit)	(1.8)	(3.1)
Current Year's Surplus (Deficit)	(1.3)	1.1
Total Equity	41.0	52.7
TOTAL LIABILITIES	<u>43.4</u>	<u>56.3</u>

NIGERIA

KADUNA STATE WATER BOARD

ANNEX 4.3

KADUNA DISTRICT

SOURCES AND APPLICATIONS OF FUNDS STATEMENTS

(in million Nairas)

	ESTIMATED							TOTALS 1979-85	Percent of Total
	1979	1980	1981	1982	1983	1984	1985		
<u>SOURCES</u>									
Net Income Before Interest	1.1	1.1	2.3	3.2	3.4	7.4	9.4	27.9	20
Depreciation	<u>.5</u>	<u>.9</u>	<u>1.2</u>	<u>1.6</u>	<u>3.0</u>	<u>4.5</u>	<u>5.2</u>	<u>16.9</u>	<u>12</u>
Internal Cash Generation	1.6	2.0	3.5	4.8	6.4	11.9	14.6	44.8	32
Less: Debt Service									
- Principal	-	-	-	-	-	-	4.0	4.0	3
- Interest	<u>-</u>	<u>.6</u>	<u>1.0</u>	<u>2.1</u>	<u>3.4</u>	<u>4.3</u>	<u>4.4</u>	<u>15.8</u>	<u>11</u>
Net Internal Cash Generation	1.6	1.4	2.5	2.7	3.0	7.6	6.2	25.0	18
Borrowings - Proposed IBRD Loan	-	2.9	10.2	18.7	17.2	9.8	.8	59.6	42
Government Contributions	<u>.1</u>	<u>6.3</u>	<u>8.1</u>	<u>11.9</u>	<u>10.3</u>	<u>10.4</u>	<u>9.9</u>	<u>57.0</u>	<u>40</u>
Total Sources	<u>1.7</u>	<u>10.6</u>	<u>20.8</u>	<u>33.3</u>	<u>30.5</u>	<u>27.8</u>	<u>16.9</u>	<u>141.6</u>	<u>100</u>
<u>APPLICATIONS</u>									
<u>Investments</u>									
IBRD Proposed Project	.9	3.2	16.2	31.0	30.3	19.3	1.9	102.8	73
Emergency Program	4.8	6.6	3.5	.6	-	-	-	15.5	11
Kangimi/Jaji Extension	-	-	.3	1.7	1.6	2.5	-	6.1	4
Other Project	<u>1.2</u>	<u>.2</u>	<u>.1</u>	<u>.2</u>	<u>.3</u>	<u>3.0</u>	<u>18.0</u>	<u>23.0</u>	<u>16</u>
Working Capital	6.9	10.0	20.1	33.5	32.2	24.8	19.9	147.4	104
Increase (Decrease)	(5.2)	.6	.7	(.2)	(1.7)	3.0	(3.0)	(5.8)	(4)
Total Applications	<u>1.7</u>	<u>10.6</u>	<u>20.8</u>	<u>33.3</u>	<u>30.5</u>	<u>27.8</u>	<u>16.9</u>	<u>141.6</u>	<u>100</u>
<u>RATIOS</u>									
Internal Cash Generation Times Debt Service	-	3.3	3.5	2.3	1.9	2.8	1.7	-	
Net Internal Cash Generation as % of Investments	23	14	12	8	9	31	31	18	
Net Internal Cash Generation as % of Investments - Three years moving average		15	10	10	15	22	33		

NIGERIA

KADUNA STATE WATER BOARD

ANNEX 4.4

KADUNA DISTRICT

INCOME STATEMENTS

(in million Nairas)

	ACTUAL/ ESTIMATED	ESTIMATED							TOTALS	ESTIMATED	
	1978	1979	1980	1981	1982	1983	1984	1985	1979-85	1986	1987
<u>OPERATING DATA</u>											
Production in Thousand m ³ per day	68.1	71	78	100	106	112	155	169		185	199
Sales in Thousand m ³ per day	36.8	43.7	50.7	68	75.3	81.8	116.2	128.4		142.5	156.0
Losses as % of Production ³	46	38	35	32	29	27	25	24		23	22
Average Revenues in N per m ³	0.21	0.24	0.25	0.29	0.33	0.38	0.43	0.47		0.51	0.53
<u>REVENUES</u>											
Water Sales and Connection Charges	<u>4.1</u> ^{/1}	<u>3.8</u>	<u>4.7</u>	<u>7.1</u>	<u>9.0</u>	<u>11.3</u>	<u>18.3</u>	<u>22.8</u>	<u>77.0</u>	<u>26.5</u>	<u>30.1</u>
<u>EXPENSES</u>											
Salaries and Wages	.4	.4	.5	.7	.8	.9	1.2	1.4	5.9	1.6	1.9
Chemicals, Electricity, etc.	.7	.9	1.0	1.3	1.6	1.8	2.3	3.4	12.3	4.1	4.8
Other, Including H.Q. Expense	.9	1.0	1.3	1.7	1.9	2.3	3.0	3.5	14.7	4.1	4.9
Depreciation	<u>.1</u>	<u>.5</u>	<u>.9</u>	<u>1.2</u>	<u>1.6</u>	<u>3.0</u>	<u>4.5</u>	<u>5.2</u>	<u>16.9</u>	<u>5.8</u>	<u>6.5</u>
Total Expenses	2.1	2.8	3.7	4.9	5.9	8.0	11.0	13.5	49.8	15.6	18.2
Gross Income	2.0	1.0	1.0	2.2	3.1	3.3	7.3	9.3	27.2	10.9	11.9
Non-Operating Income	.2	.1	.1	.1	.1	.1	.1	.1	.7	.1	.1
Net Income Before Interest	2.2	1.1	1.1	2.3	3.2	3.4	7.4	9.4	27.9	11.0	12.0
Interest	-	-	.6	1.0	2.1	3.4	4.3	4.4	15.8	4.2	4.0
<u>NET INCOME</u>	<u>2.2</u>	<u>1.1</u>	<u>.5</u>	<u>1.3</u>	<u>1.1</u>	<u>-</u>	<u>3.1</u>	<u>5.0</u>	<u>12.1</u>	<u>6.8</u>	<u>8.0</u>
<u>RATIOS</u>											
Rate of Return on Average Net Fixed Assets											
- Historical Values	<u>/2</u>	7.0	4.4	7.0	6.0	3.9	6.6	7.7		8.2	7.9
- Estimated Current Values	<u>/2</u>	5.0	3.4	5.1	4.5	3.0	4.9	5.3		5.2	4.7
Operating (%)	51	74	79	69	66	71	60	59		59	60

/1 1978 revenues include high proportion of retrospective sales, i.e., about one-third

/2 In view of substantial retrospective billings, calculation of rates of return for 1978 would not be meaningful.

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KADUNA STATE WATER BOARD
KADUNA DISTRICT
BALANCE SHEETS

ANNEX 4.5

(in million Nairas)

	<u>ACTUAL/ ESTIMATED</u>	<u>E S T I M A T E D</u>								
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
<u>ASSETS</u>										
<u>Fixed Assets</u>										
Gross	11.6	22.9	30.9	41.2	74.9	113.4	130.8	144.1	165.8	190.8
Depreciation	1.2	1.7	2.6	3.8	5.4	8.4	12.9	16.1	23.9	30.5
Net	10.4	21.2	28.3	37.4	69.5	105.0	117.9	126.0	141.9	160.3
Work-in-Progress	7.8	3.4	5.4	15.2	15.0	8.7	16.1	22.7	25.0	30.0
Total Fixed Assets	18.2	24.6	33.7	52.6	84.5	113.7	134.0	148.7	166.9	190.3
<u>Current Assets</u>										
Cash	6.6	.6	.7	.9	1.1	1.3	1.6	2.1	2.5	2.9
Trade-Receivables	1.8	1.3	1.2	1.2	1.5	1.9	3.1	3.8	4.4	5.0
Other Receivables	.2	.3	.4	.4	.5	.5	.6	.6	.7	.7
Stores	.6	.8	1.1	1.5	2.8	4.2	4.7	5.0	5.1	5.2
Prepayments	-	.2	.4	1.1	1.1	.6	.7	.4	.3	.3
Total Current Assets	9.2	3.2	3.8	5.1	7.0	8.5	10.7	11.9	13.0	14.1
TOTAL ASSETS	27.4	27.8	37.5	57.7	91.5	122.2	144.7	160.6	179.9	204.4
<u>LIABILITIES</u>										
<u>Current Liabilities</u>										
Payables, including Short-term Maturities	2.4	.7	.8	1.2	1.4	1.5	1.8	6.2	6.6	7.0
Retentions	-	.8	.6	.7	2.4	2.7	1.2	.9	.6	.5
Total Current Liabilities	2.4	1.5	1.4	1.9	3.8	4.2	3.0	7.1	7.2	7.5
Deposits	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
<u>Long-Term Debt</u>										
Proposed IBRD Loan	-	-	2.9	13.1	31.8	49.0	58.8	55.6	51.6	47.6
<u>Equity</u>										
Government Contributions	21.7	21.8	28.1	36.2	48.1	58.4	68.8	78.7	95.0	115.1
Consumer Contributions (Army)	-	-	-	-	.1	2.8	3.1	3.1	3.1	3.1
Accumulated Surplus	.1	2.2	3.3	3.8	5.1	6.2	6.2	9.3	14.3	21.1
Year's Surplus	2.1	1.1	.5	1.3	1.1	-	3.1	5.0	6.8	8.0
Total Equity	23.9	25.1	31.9	41.3	54.4	67.4	81.2	96.1	119.2	147.3
TOTAL LIABILITIES	27.4	27.8	37.5	57.7	91.5	122.2	144.7	160.6	179.9	204.4
<u>RATIOS</u>										
Current	3.8	2.1	2.7	2.7	1.8	2.0	3.6	1.7	1.8	1.9
Long-Term Debt as % of Long-Term Debt plus Equity	-	-	8	30	37	42	42	37	30	24

KADUNA WATER SUPPLY PROJECT

Selected Documents and Data Available in the Project File

A. Sector Reports and Studies by Others

- A.1 "An Inventory of Urban Water Resources Development in Nigeria", by Professor Lekan Oyebande, published in August, 1977 by the Federal Ministry of Water Resources.
- A.2 "Third National Development Plan, 1975 - 80: Kaduna State Revised Programme", published by Ministry of Economic Development in Kaduna.
- A.3 "the North Central State Water Board Edict, 1971" (or subsequent revision).
- A.4 "Water Supply Master Plan for Kaduna State Water Board" by MRT Consulting Engineers Limited; Summary report plus six volumes and album of maps; June, 1978.
- A.5 "Kaduna State - Economic Background"; 7 - page note prepared by Petkovic and Abukur of Kaduna State Ministry of Economic Development; April, 1977.
- A.6 "Population Census of Kaduna State 1963 and Projections 1976 - 1980 by Local Government Councils and Districts" by Statistics Division, of Kaduna State Ministry of Economic Development; December, 1977.
- A.7 (Possibly sector analysis as a product of "rapid assessment" currently underway in Nigeria by WHO).

B. Project-Related Reports and Studies by Others

- B.1 "Preliminary Feasibility Report" covering extensions to Kaduna water supply to the year 2010 by Ward, Ashcroft & Parkman (Nigeria); January, 1974.
- B.2 "Appraisal Report" covering extensions to Kaduna Water Supply to the year 2000 by Ward, Ashcroft & Parkman (Nigeria); July, 1975.
- B.3 "Re-Appraisal Report" and "Report on Emergency Extensions" re Kaduna Water Supply Extensions by Ward, Ashcroft & Parkman (Nigeria); September, 1976.
- B.4 "Report on Kaduna Water Supply Extensions" by Ward, Ashcroft & Parkman (Nigeria); November, 1977.
- B.5 "Revisions and Additions to Kaduna Water Supply Extensions Report" by Ward, Ashcroft & Parkman (Nigeria); March, 1978.

- B.6 "Kaduna City Water Supply Extensions: Location of New Treatment Works", 12-page note by Ward, Ashcroft & Parkman (Nigeria); June, 1978.
- B.7 "Some Results of a Plot Housing Survey in Selected Residential Areas of Kaduna"; 13-page note by Dr. Tony Seymour of Centre for Social and Economic Research at Ahmadu Bello University, Zaria; April 12, 1978.
- B.8 "Housing, Income and Occupational Activity in Selected Residential Areas of Kaduna"; 7-page report outline by Dr. Tony Seymour of Ahmadu Bello University, Zaria; April 17, 1978.
- B.9 "Kaduna Sewerage and Drainage Project: Urban Context; Preliminary Report" by Consulting Engineers on UNDP Project (Dr. G. Holfelder Ltd. in cooperation with G. K. W.); May, 1978.

C. Documentation Prepared by Bank Staff or Consultants

- C.1 Chronology of Bank Involvement in Project.
- C.2 "Nigeria-Kaduna Water Supply: Urban Poverty Analysis"; 59-page report by Concept Ecodesign International; May 31, 1978.
- C.3 Aide Memoire prepared in Kaduna on June 14, 1978 by IBRD appraisal mission, comprising:
 - I. Preliminary Project Cost Estimate;
 - II. Outline of Project Components;
 - III. Preliminary Conclusion of IBRD Appraisal Mission;
 - IV. Critical Actions to Expedite Construction and Early Operation of Project; and
 - V. Preliminary Comments on Draft Tender Documents for Equipment for Water Treatment Plant.
- C.4 Assumptions for Population Projections
- C.5 Background Note on Projected Capacity, Production and Sales for Kaduna District System
- C.6 Background Note on Wastewater Disposal in Kaduna
- C.7 Outline of Project Components and Basis for Cost Estimate
- C.8 Annual Project Capital Expenditures, 1978-1985
- C.9 Annual Non-Project Capital Expenditures in Kaduna, 1979-1987
- C.10 Long Run Marginal Costs for Water in Kaduna
- C.11 Internal Financial Rate of Return Calculations
- C.12 Terms of Reference for Tariff Study in Kaduna District

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KADUNA WATER SUPPLY PROJECT

Management and Operations Improvement Plan

The agreements and assurances given by KSWB, and referred to in para. 3.06, whereby it will develop its management and operations in order to cope effectively and efficiently with the considerable increases in its fixed assets, facilities and numbers of customers to be served, are set out below:

1. Management

- (i) Employ competent Chief Officers and senior staff (para. 5.07);
- (ii) Appoint a Training Executive Officer (para. 5.18); and
- (iii) Appoint a Project Manager (para. 5.07).

2. Engage Consultants, under terms and conditions acceptable to the Bank:

- (i) To design Kaduna's distribution system (para. 3.17);
- (ii) To design the new source works (including treatment and pumping facilities), transmission mains and storage reservoirs (para. 3.17);
- (iii) To design the Headquarters building, workshop and communications system (para. 3.19);
- (iv) For manpower planning and training program (para. 5.18);
- (v) To undertake a tariff study (para. 4.12); and
- (vi) If necessary, to help evaluate the future role of the Kaduna South Water Works (para. 3.24).

3. Operations - Physical

- (i) Ensure, through Project Management, the cooperation between consultants of the KSWB and KCDB (paras. 3.17 and 3.18);
- (ii) Prepare a program to cope with increasing numbers of connections and public standpipes and to reduce the number of illegal connections (paras. 3.05 and 6.06);
- (iii) Follow a policy of providing water to meet the basic needs of all residents of the Kaduna area at affordable prices (para. 3.08);

- (iv) Reduce the unaccounted for water to 25% of water produced by 1984 (paras. 3.05 and 6.06);
- (v) Monitor Water resources (paras. 3.27 and 3.28);
- (vi) Improve the standard of maintenance of all its facilities and carry out a comprehensive rehabilitation of the Kaduna North Water Works by December 1980 (paras. 3.04 and 3.05); and
- (vii) Arrange for all its major pipelines to be clearly marked on the ground and recorded on maps and maintenance of access to pipelines at all times (para. 3.23).

4. Operations - Financial

(i) In Kaduna District

- (a) Provide 18% of total capital expenditures during project implementation period by internal cash generation (para. 6.12);
- (b) Use revenues generated within the district solely for Kaduna District (para. 6.09);
- (c) Reduce accounts receivable to equivalent of two months sales by FY1981 (para. 6.06);
- (d) Take all necessary tariff action to generate desired cash flow (para. 6.09);
- (e) Limit additional debt (para. 6.09);
- (f) Prepare and have audited separate income, balance sheets and cash flow statements for FY1980 onwards (para. 6.07); and
- (g) Revalue fixed assets by FY1982 and annually thereafter (para. 6.14).

(ii) In KSWB generally:

- (a) Prepare separate fixed assets and other operating accounts by districts and have them separately and collectively audited (para. 6.07); and
- (b) Improve operating and financial performance of other districts (paras. 6.06 and 6.07) and extend the KSWB financial covenants to Kaduna district in FY1980 and to Zaria and Funtua for FY1981 (para. 6.09).

5. Others

- (i) Maintain a viable organization and prenotify any proposed changes to the Bank (para. 5.07); and
- (ii) Maintain and/or develop systems and procedures adequate to meet internal and Bank reporting requirements (para. 5.20) and preparation of appropriate performance monitoring indicators (Annex 3).

COMPARATIVE COSTS OF WATER SUPPLY IN SOME WEST AFRICAN COUNTRIES

Country	Type	(US Dollars/m ³)								Year	
		Residents 15 m ³ /month	Residents 30 m ³ /month	Residents 60 m ³ /month	Industrials 750 $\frac{m^3}{month}$	Industrials 3,000 $\frac{m^3}{month}$	Industrials 6,000 $\frac{m^3}{month}$	Industrials 12,000 $\frac{m^3}{month}$	Standpipes 150 $\frac{m^3}{month}$		Standpipes 300 $\frac{m^3}{month}$
Cameroon	Water II	0.39	0.39	0.39	0.38	0.35	0.27	0.23	0.31	0.31	1978
Gabon	Water I	0.74	0.74	0.74	0.74	0.74	0.72	0.70	0.74	0.74	1978
Ghana	Water II ^{1/}	0.09	0.09	0.09	0.19	0.19	0.19	0.19			1977
Guinea		0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	1978
Ivory Coast	Water I ^{2/} (In 1984)	0.53	0.57	0.58	0.60	0.56	0.40	0.32	0.29	0.29	1978
Liberia	Water I ^{1/}	0.42	0.45	0.45	0.58	0.59	0.60	0.60	0.52	0.56	1978
Senegal	Water I (Dakar)	0.41	0.49	0.53	0.57	0.57	0.57	0.57	0.32	0.32	1977
	Water I (Secondary Centers)	0.36	0.41	0.43	0.46	0.46	0.46	0.46	0.21	0.21	
Nigeria	(Kaduna)	0.27	0.27	0.27	0.43	0.43	0.43	0.43	-	-	1977
Togo	Water I ^{4/}	0.32	0.32	0.32	0.36	0.36	0.36	0.36	-	-	1978

^{1/} Assumed exchange rates US\$ = c3

(1000 Imperial gallons = 4.5 m³)

^{2/} Ivory Coast sewerage tariff = 16.9 CFAF/m³/month for full tariff and first industrial block (1500 - 41,666 m³/month)

^{3/} Sewerage tariff = 60% of water tariff
(1000 US\$ Gallons = 3.75 m³)

^{4/} US\$ 1 = 220 CFAF

NIGERIA

KADUNA STATE WATER BOARD

KADUNA DISTRICT

Major Assumptions Used in Financial Projections

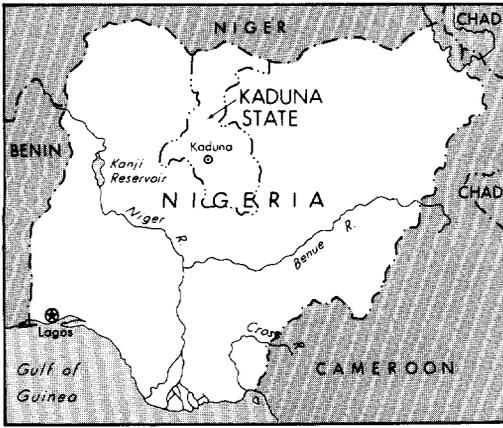
A. Income Statements

1. Revenues are based on present tariffs to be increased by 15% each year starting in 1979; unaccounted-for water to be reduced from about 45% of water produced in 1978 to about 25% by 1984; and revenue for private connections to be an average of ₦ 150;
2. Expenses include direct salaries and wages increased to foreseen staffing level plus 13% p.a. salary price increases; chemicals and other materials in volume proportionate to production plus 8% p.a. price increase; electricity, fuel and lubricants in volume geared to production plus 20% p.a. price increase; cost of private connections (materials) assumed at ₦ 75 per connection; bad debts assumed at 5% for non-industrial consumers; depreciation at an average of 4% of gross plant in service; and headquarter charges apportioned on basis of sales.

B. Balance Sheets

3. Fixed Assets - 1978 Kaduna district fixed assets and depreciations separated by KSWB's accounting department on basis of available information; those for projected period 1979-85 assume work-in-progress transferred to fixed assets in service when placed in operation.
4. Current Assets - cash is at least equivalent to three months of cash operating expenses; trade receivables 1978 actual equivalent to five months of sales, forecast 1979 four months, 1980 three months, 1981 and thereafter two months; stores set at 4% of net fixed assets in operations; and prepayments set at 7% of work-in-progress, i.e. 10% of 70%.
5. Current Liabilities - payables equivalent to three months of cash operating expenses plus 2% of work-in-progress; current maturities of long-term debt are those of the proposed Bank loan; and retentions calculated at 10% of the amount of work-in-progress which is transferred each year to fixed assets in service.

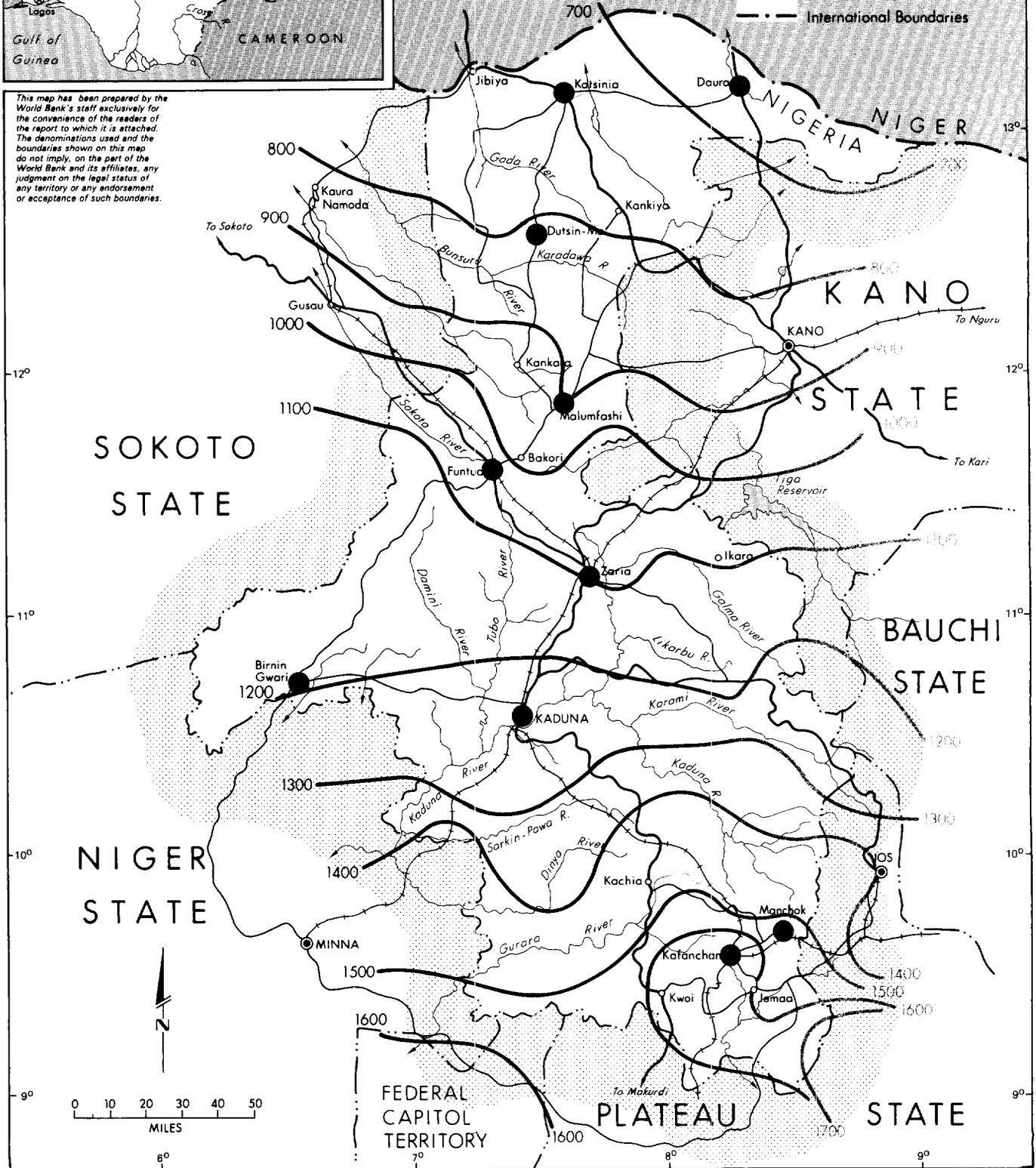
6. Deposits - 1978 actual increased by ₦ 100,000 each year.
 7. Long-term Debt - IBRD proposed loan; with repayment commencing in 1985.
 8. Equity - Government contributions end 1978 separated on basis of net fixed assets in service; thereafter Government contributions are equal to amounts required by the Kaduna district to complete financing of its investment program, after taking account of its net internal cash generation and the proposed IBRD loan; consumer contributions represent half the cost of the Kangimi/Jaji Extension and is to be contributed by the Army.
 9. Accumulated Surplus - as Kaduna District has been profitable in the recent past but insufficient data was available, a break-even position was assumed at the end of 1977, and the actual annual surplus of 1978 was used; the year's surpluses for 1979 through 1987 are derived from the projected income statements.
- C. Sources and Applications of Funds Statements
10. Debt Service - IBRD Loan of ₦ 59.6 million (US\$92 million) effective October 1, 1979; terms 20 years of which 5 years of grace at 8% and commitment fee at 3/4%. Principal repaid over 15 years starting in 1985.

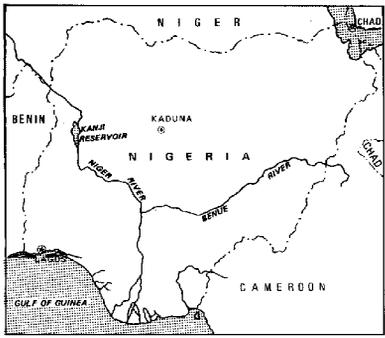


NIGERIA KADUNA WATER SUPPLY PROJECT KADUNA STATE

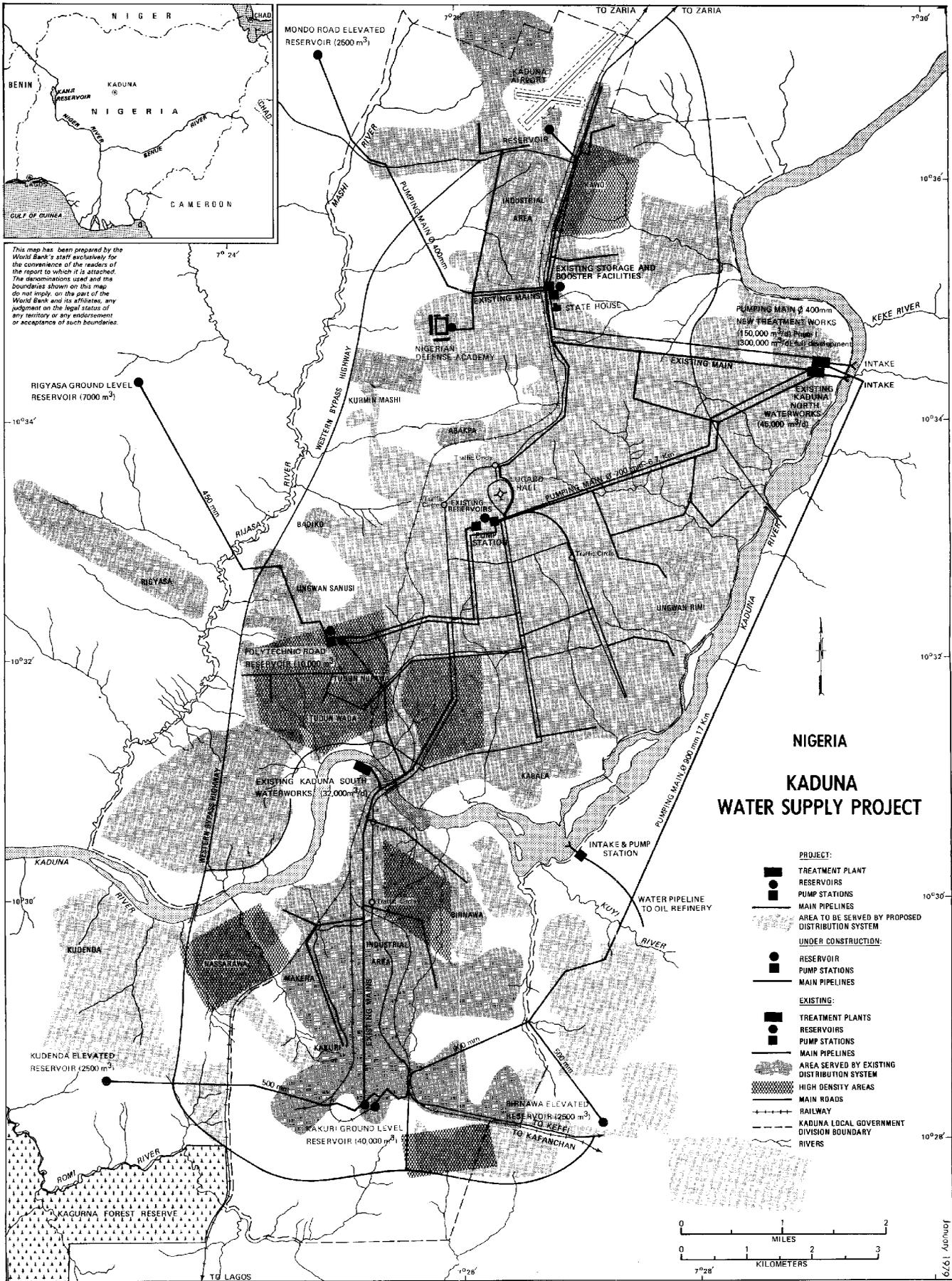
- Trunk Roads
- Other Roads
- Railways
- State Capitals
- Principal Towns
- Existing KSWB Water Supply
- Isohyets in Millimeters
- Rivers
- State Boundaries
- International Boundaries

This map has been prepared by the World Bank's staff exclusively for the convenience of the readers of the report to which it is attached. The denominations used and the boundaries shown on this map do not imply, on the part of the World Bank and its affiliates, any judgment on the legal status of any territory or any endorsement or acceptance of such boundaries.





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NIGERIA
KADUNA
WATER SUPPLY PROJECT

- PROJECT:**
- TREATMENT PLANT
 - RESERVOIRS
 - PUMP STATIONS
 - MAIN PIPELINES
 - ▨ AREA TO BE SERVED BY PROPOSED DISTRIBUTION SYSTEM
- UNDER CONSTRUCTION:**
- RESERVOIR
 - PUMP STATIONS
 - MAIN PIPELINES
- EXISTING:**
- TREATMENT PLANTS
 - RESERVOIRS
 - PUMP STATIONS
 - MAIN PIPELINES
 - ▨ AREA SERVED BY EXISTING DISTRIBUTION SYSTEM
 - ▨ HIGH DENSITY AREAS
 - MAIN ROADS
 - RAILWAY
 - KADUNA LOCAL GOVERNMENT DIVISION BOUNDARY
 - RIVERS

