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IMPLEMENTATION COMPLETION REPORT

FEDERAL REPUBLIC OF NIGERIA

BORNO STATE WATER SUPPLY PROJECT
(LOAN NO.2528-UNI)

April 22, 1996

Infrastructure and Urban Development Division
West Central Africa Department
Africa Region

CURRENCY EQUIVALENT

Currency Unit: Naira

Naira to the US$

1983 = 0.72	1990 = 8.80
1984 = 0.76	1991 = 9.80
1985 = 0.89	1992 = 18.80
1986 = 1.75	1993 = 22.00
1987 = 4.00	1994 = 22.00
1988 = 4.50	1995 = 82.00
1989 = 7.10	

(0.0122 US$ = 1 ₦)

WEIGHTS AND MEASURES

1 liter (l) = 0.264 US gallons
1 cubic meter (m^3) = 35.3 cubic feet
liters per capita per day (lcd) = 0.264 US gallons per capita per day
1 millimeter (mm) = 0.04 inches (in)
1 meter (m) = 3.28 feet
1 kilometer (km) = 0.62 miles
1 square kilometer (km^2) = 0.386 square miles

FISCAL YEAR

January 1 - December 31

ABBREVIATION AND ACRONYMS

BSG	- Borno State Government
BSMWR	- Borno State Ministry of Water Resources
BSWB	- Borno State Water Board
BSWC	- Borno State Water Corporation
CBDA	- Chad Basin Development Authority
FGN	- Federal Government of Nigeria
FMAWR	- Federal Ministry of Agriculture, Water Resources and Rural Development
GRA	- Government Reserved Area
LGA	- Local Government Authority
PPF	- Project Preparation Facility
RBDA	- River Basin and Rural Development Authority
TWI	- Thames Water International

Table of Contents

IMPLEMENTATION COMPLETION REPORT
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Preface

This is the Implementation Completion Report (ICR) for the Borno State Water Supply Project in Nigeria for which Loan 2528-UNI in an amount of US$72.0 million was approved on May 7, 1985 and became effective on May 12, 1986. The loan was closed on June 30, 1995.

This ICR was prepared by David Henley and Anton M. Rychener (Consultant) of the Infrastructure and Urban Development Division, AF4IN. It was reviewed by Mr. James Wright, Chief of the Infrastructure and Urban Development Division, and Mr. Franz Kaps, Operations Adviser of the West Central Africa Department. It is based on the President's Report, the Staff Appraisal Report, loan agreement, supervision reports, and correspondence between the Bank and the Borrower and its agencies.

Preparation of this ICR was begun during the last supervision mission of the project which took place in June 95 and was carried out by Messrs. Henley and Okongwu together with Mr. Rychener who was mostly responsible for data collection and discussions with project as well as Borno State Government officials. A number of paying customers of the Borno State Water Corporation were also interviewed by the mission and their opinion of the project and the services it renders to the community was solicited. Their observations are contained in this report. The Borrower's formal evaluation is also appended to this report.

IMPLEMENTATION COMPLETION REPORT
FEDERAL REPUBLIC OF NIGERIA
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Evaluation Summary

Introduction

As a result of years of unusually low rainfall in the seventies and a number of years of severe drought - notably in 1973/74 and 1978/79 - in the sahelian zone - within which Borno State is located, preparation of this project was begun in the early eighties. As a consequence of the drought, a sizable part of the State's population lost its livelihood, in what were marginal agricultural areas to begin with, and flocked to the state's main urban area (its capital), Maiduguri, swelling its population in a period of a few years from 400,000 to 670,000 by 1980. Up to 200,000 people were living in makeshift housing at the outskirts of Maiduguri following the 1980 drought; in later years most of this population went back to their farms and in 1995 Maiduguri's population was estimated at 660,000.

This increase in the town's population put a strain on the aquifer - on which the population relied for drinking water - which had already dropped by more than 7 meters between 1975 and 1980. Such a rate of depletion, coupled with the anticipated further increases in demands for drinking water, necessitated an alternative source to supplement groundwater. Thus, the Borno State Water Board and the Chad Basin Development Authority reached an understanding to share the waters of a nearby reservoir, Lake Alau, that was under construction. The agreement called for equal use for town water supply and irrigation of available surface water during average or better than normal rainfall years, but to give priority to urban water supply in drought years.

At the same time the Borno State Government, on behalf of the Borno State Water Board, requested Bank assistance to finance a treatment facility along with ancillary works for the purification of water from Lake Alau for the town of Maiduguri. Consequently, an identification mission visited Maiduguri in 1980, and in 1981 a consultant was appointed by the Borno State Water Board to prepare a feasibility study for the project. In 1981 and 1982, further Bank missions were undertaken to assess progress of the study and help shape the project; the final report was submitted to the Borno State Government and the Bank in 1983. The project was appraised by the Bank in May 1983.

Project Objectives

Original objectives of the project were:

(a) to provide adequate and reliable supplies of safe water to Maiduguri from the Lake Alau dam and reservoir;

(b) to strengthen the Borno State Water Board by providing technical assistance and training to enable it to undertake the orderly future development and expansion of the state's water supply program, and its efficient operation, and to help it towards financial viability; and

(c) to provide the basis for effective sanitation in Maiduguri through studies to be undertaken during project implementation.

Major legal covenants were (Loan Agreement): (a) funds to be onlent by the borrower-the Federal Republic of Nigeria (FRN)- to Borno State Government (BSG) for a period of 20 years with 5 years grace at an interest rate one half percent above the Bank's lending rate; (b) the borrower to provide sufficient funds to construct Lake Alau dam by June 30, 1986; and (c) Chad Basin Development Authority (CBDA) to provide sufficient water to supply the needs of Borno State Water Board (BSWB); and (State Agreement) (d) BSG to relend 80 percent of loan funds to the BSWB for the same period and at the same interest rate as the loan agreement (covenant (a) above) and pass on 20 percent of the loan funds to BSWB as equity; and (e) BSG to provide in its annual budgets sufficient funds to cover its contribution to project costs to be passed on to BSWB as equity and to make provision to cover BSWB's operating losses.

The objectives as stated in the SAR were straightforward, albeit ambitious given the weak institutional capacity of the BSG and BSWB. From the project's outset it was clear that the only way to achieve them was to rely heavily on external technical assistance. In contrast, given the glaring absence of BSWB capacity to manage its existing water installations, consisting mainly of some 65 deep boreholes equipped with pumps, a massive capacity building effort should have at least run concurrently with any investment project. Instead the objectives mentioned training of staff seemingly as an afterthought.

Implementation Experience and Results.

After a project implementation time that, for the treatment plant and the water mains, the project's core, lasted almost twice the time foreseen (5 1/2 years versus 3 years anticipated at appraisal), the project objectives have not been achieved. Not only were they not achieved, but installations on the ground, if they work at all, are hardly sustainable. From a technical point of view, key equipment is ill adapted to the environment, making the entire water supply system unreliable. The valves on the water pumps are prone to frequent brake-downs; at the time of the completion mission, barely two years after commissioning of the plant, only one out of four was working. The treatment plant itself is also designed for different climatic conditions; harsh winds and temperatures put a heavy strain on some of the high-tech machinery, particularly the chemical pumps and the electronically operated electrical switch panels. Although the

water distribution network has been relatively well installed and on time, connections and meters remain largely uncontrolled by BSWC and, as a result, unaccounted for water is very high. While it was envisaged at appraisal that there would be 48,000 individual connections and about 400 public standpipes at project completion in 1992; there were in fact only 33,000 connections and 232 standpipes in mid 1995, sufficient to serve about half of the current population, compared to an expectation at appraisal of perhaps 90 percent coverage.

The treatment plant was commissioned in early 1994 and in that year provided drinking water for the first time to major segments of the population of Maiduguri. However, in late 1994, owing to torrential rainfalls, a dike of the Lake Alau dam broke, in the process flooding Maiduguri and completely depleting Lake Alau. As a result, the treatment plant remained idle during the entire dry season of 1995. Thus, besides being some three years behind schedule, efforts at launching systematic collection of water charges in 1994 were undermined by the system's failure to reliably provide water over a sustained period. BSWC's ability to collect enough revenue from the sale of water to operate the system including payment of staff salaries, therefore, got off to a shaky start. Moreover, BSG is no longer able to cover operating losses of BSWC (Section 2.02 {b} BS Agreement). Last but not least, at completion there are many unanswered questions regarding the affordability on the part of the larger portion of potential customers of BSWC.

There were serious delays in procurement and installation of the treatment plant, water towers, transmission main (raw water) and the transmission and distribution systems and service connections. While there were no cost overruns in terms of total costs, the foreign component was higher for all components except drilling rigs, generators, vehicles, meters and technical assistance and training. For the latter two components this was clearly due to lower than projected physical quantities; for the others it most likely was due to the overvaluation of the Naira at appraisal. Similarly, because of the longer construction time, at completion, the Supervising Engineer's contract showed a cost overrun of the foreign portion of some 33 percent but in total terms only 2 percent (Table 8). Savings were achieved by not constructing new headquarters buildings and workshops. Of the US$72.0 million loan, US$3.4 million were canceled in June 1993 and US$1.6 million remained undisbursed at completion. This has since been cancelled. Although in the aggregate, BSG contributed all yearly (local) costs to project financing, releases of funds (to contractors) were often late, which contributed to implementation delays. BSG project cost financing in US$ terms was about 65 percent below that projected at appraisal.

Political disturbances also delayed implementation. In 1990, the BSWB was dissolved and the project agency became simply the Borno State Ministry of Water Resources (BSMWR) without corporate structure. This decision was reversed in August 1991, BSMWR abolished and Borno State Water Corporation (BSWC) founded. Worst of all, the split-up of Borno State in October 1991 - into Borno and Yobe States - robbed

the BSWC of both valuable personnel, and institutional and financial support as the Federal Statutory Allocation was halved.

Summary of Findings - Key Lessons Learned

A major reason that stood in the way of the project achieving its objectives was that BSWC personnel remain civil servants. On the engineering side, staff have been trained under the project and are capable of maintaining installations; however, the corporate side has been grossly neglected. Overall staff ability to act as corporate employees, even though some of them possess the capacity, is constrained as civil service rules continue to apply: no performance based promotions; no discretion of hiring and firing; no clear policy on connection of new consumers; ability to turn off water connections for lack of bill payment has been revoked by politicians. Civil service salaries are so low that staff can barely survive. That in turn undermines morale and renders staff unproductive and is, to a large extent, responsible for BSWC not having collected water revenues exceeding 20 percent of operating costs in any of the past 10 years. The project's estimated rate of return at appraisal was based on a long-run marginal cost of water resulting from the investment of ₦ 43.2/m^3; this compares with BSWC average current revenue of about ₦ 8.0/m^3.

Bank supervision throughout the project has been regular (Table 13). Although supervision reports consistently pointed out violations of loan covenants as well as other shortcomings, follow-up was incomplete and without decisive action. The Borrower's commitment to the project's long-range implications and, therefore, to take corrective measures when needed, must be questioned not only at completion but also at the preparation, appraisal and implementation stages. Moreover the frequent changes in BSG and the resulting placement of four different General Managers and one Acting General Manager of BSWC over the past nine years deprived the project of managerial continuity.

IMPLEMENTATION COMPLETION REPORT
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Part I. Project Implementation Assessment

1. Introduction

1.1 After Enugu and Kaduna, Maiduguri was the third state capital in Nigeria to be supported by a Bank loan for a water supply project. As a result of unusually low rainfall in the seventies and a number of years of persistent drought - notably in 1973/74 and 1978/79 - in the sahelian zone within which Maiduguri is located, preparation of this project was begun in the late seventies/early eighties. In a few years the city's population swelled from 400,000 to 670,000 by 1980, as a consequence of the drought. People previously occupied in agriculture lost their livelihood in marginal areas and had no alternative but to migrate to town, which in turn put an even greater strain on groundwater. As early as the 1960s it had been recognized that groundwater would no longer be sufficient to meet water demand in Maiduguri past the mid-eighties. The water level of the lower aquifer, the most productive in Maiduguri, dropped steadily in the seventies by as much as 7 meters.

1.2 Following endorsement by the Federal Government of Nigeria (FGN) of BSG's request for Bank assistance in the development of its state water sector plans, an exploratory Bank mission visited Maiduguri in 1979. This was followed by an identification mission in 1980 which advised the then BSWB - the parastatal agency entrusted with statewide responsibility of water supply[1] - on the need for further project preparation. In 1981, consultants were commissioned by BSWB to prepare a feasibility study on the Maiduguri component of the identified, statewide project. In 1981 and 1982, further Bank missions were undertaken to review progress of preparation and help shape the project. The final feasibility study was submitted to BSG and the Bank in March 1983, and the project was appraised by the Bank in May 1983.

1.3 Borno State had not previously benefited from any foreign financed water development project and, consequently, BSWB's capacity to manage a project of this size was untested. Its staff of about 600 at the time of loan effectiveness were mostly civil servants. Similarly, BSWB's operating procedures were very much aligned to those of state ministries with the singular difference that it kept its own accounts. But even those were kept in accordance with state accounting procedures rather than corporate ones. Key technical personnel were expatriates recruited under contracts.

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[1] Borno State Water Board was created by Edict No 7 of 1977 as a division of Borno State Ministry of Natural Resources. In February 1980 it became independent in the sense that it kept its own accounts and reported henceforth to the State's Military Governor.

2. Statement and Evaluation of Project Objectives

2.1 The original objectives of the project were:

(a) to provide adequate and reliable supplies of safe water to Maiduguri from the Lake Alau dam and reservoir;

(b) to strengthen the Borno State Water Board by providing technical assistance and training to enable it to undertake the orderly future development and expansion of the state's water supply program, and its efficient operation, and to help it towards financial viability; and

(c) to provide the basis for effective sanitation in Maiduguri through studies to be undertaken during project implementation.

The project was composed of the following components:

(a) construction of a raw water pumping station with three low lift pumps;

(b) construction of a 67,000 m^3/day treatment plant;

(c) laying of approximately 200 km of transmission lines and distribution pipes;

(d) provision of eight generators to supply 100 percent of standby power to operate facilities including existing borehole pumps;

(e) operational facilities and equipment including HQ buildings, zonal workshops, chemical storage sheds, drilling rigs, vehicles, leak detection and office equipment; and

(f) provision of technical assistance, staff training and studies.

2.2 Objectives as defined in the SAR were straightforward, albeit ambitious. It is doubtful that the designers fully understood the complexity, or perhaps the impossibility, of trying to make a parastatal subjected to civil service rules efficiently operate a project of this size. No formal modification was made to the objectives during project implementation, although sanitation studies were never commenced, and funding for these studies was cancelled by the Bank in 1993. Although the BSWC's lack of capacity to implement the project was clearly recognized at the outset, insufficient provision was made to overcome this handicap which turned out to be the project's major shortcoming. Throughout, there was too much reliance on external technical assistance to perform key functions of project implementation.

2.3 Implementation efforts were mainly devoted to achieving physical objectives: to install the water treatment plant and distribution mains and network to provide drinking water to the population of Maiduguri. The physical detachment of the project office from BSWC's Headquarters is symbolic of the lack of focus and attention that was paid to capacity building within the company that has to operate project installations. Indeed real strengthening of BSWC could only have come through considerably more autonomy or privatization of operations; payment of high salaries for the services of expatriate technical assistance was a temporary substitute which was not sustainable over time. The deletion of the sanitation study component of the project is a further consequence of the emphasis on physical components of the project.

3. Achievements of Objectives

3.1 During the seventies and early eighties, Borno State was an important center for trades of all kinds in the three-state-corner of Nigeria, Cameroon and Chad. Merchandise flowed freely not only in east-west direction but also north-south. During this time, Maiduguri was prosperous, both from private sector trade and Government projects and foreign and local contractors participated in what was a building boom. The project objectives were developed by the State Government and the Bank in a setting where financial resources were abundant. Both FGN and BSG realized that costly external assistance was needed to manage an undertaking the size of the project. They felt confident that, given continuous flow of oil revenue, they would be capable of financing such assistance without having to rely on revenue from the sale of water generated by BSWC.

3.2 Although warning signs abounded, be it the difficulty in getting vital supplies over the long distance to Maiduguri (which is some 1,500 km from Apapa, Nigeria's main port), the lack of trained, local manpower to manage the affairs of BSWB (during project implementation 1/3 of the 67 boreholes were inoperative due to lack of maintenance), or the shaky macro-economic situation of Nigeria, project activities were launched on May 12, 1986[2] with great enthusiasm.

Main Contracts for Physical Installations

3.3 Prequalification notices were published on December 30, 1985, some four months before loan effectiveness, for the major contracts under the project: (a) the water treatment plant; (b) the new water tower and refurbishment of existing one; (c) the transmission and distribution network; and (d) the raw water transmission line of 13 km (from Lake Alau to the treatment plant). Some 200 contractors responded to the prequalification invitation, and as a result of this large number, and consequently a great deal of interest in influencing the outcome of the evaluation exercise, prequalification was only completed in December of 1987. Final award of these four contracts and

[2] Date of effectiveness of Loan 2528-UNI.

mobilization did not happen until the end of 1988, some 18 months later than projected in the appraisal report (this is best demonstrated in Table 4, Loan Disbursements.) In FY 88, the actual disbursement as percentage of estimate was a mere 11 percent whereas in FY 89 and 90, respectively, this increased to 31 percent and 44 percent. Two factors contributed to these delays: (a) political interference in the procurement process; and (b) the slowness of release of counterpart funds for contract mobilization. Indeed, to partially overcome the problem of slow counterpart fund payments, the BSG, by letter of June 27, 1988, asked, and the Bank agreed, to adjust the disbursement percentage for civil works from 35 percent of total to "100 percent foreign exchange".

3.4. Completion of contract No 1 (67,000 m^3/day Water Treatment Plant) in August 1994 was close to five years behind schedule while contracts No 2 & 3 (water towers) and 4A & 4B (distribution systems) suffered a two-year implementation delay. The combined effect of these delays was postponement of provision of services to the population of Maiduguri by some 4 years. The water reservoir at Lake Alau was ready when the treatment plant finally became operational in 1994. At first the system worked well and consumers were pleased. In fact, families interviewed in Maiduguri stated that the availability of water in 1994, either through metered connections or through standpipes in neighbourhoods, had the single biggest impact on their lives; women in particular said that no longer do they have to walk long distances to fetch water. However, they maintained that the cost of water is too high in relation to their incomes and, in their view, provision of safe drinking water (at no cost to them) is the responsibility of BSG, a view that is widely shared by the population including most civil servants of BSG.

3.5 The project envisaged the number of service connections increasing from 20,000 to 48,000 during the implementation of the project (although financing was provided for only 10,000 new connections), and public standpipes increasing from 254 to about 500. In fact, at the end of the project, the number of connections stood at 33,000, and standpipes at 232, resulting in population served being only about 317,000, rather than the expected 542,000.

3.6 Lake Alau installations - the dam with spillgate, retention dikes and the raw water transmission main - were completed on time by the Chad Basin Development Authority (CBDA) and BSWC, respectively, although the project had to occasionally support CBDA with equipment during construction. The reservoir is large and retains enough water to provide for the population of Maiduguri. However, due to unusually heavy rainfalls in the wet season of 1994, a retention dike was washed away and the reservoir disgorged into the city, flooding in the process major sections of the town by as much as 5 feet. As a result, during the 1995 dry season between January and July, the reservoir was empty and the water treatment plant had little or no raw water supply. BSWC in turn could not provide all the town of Maiduguri with reliable drinking water and the only source was once again the overstretched aquifer. By July 1995, the dike was repaired and Lake Alau was ready to be filled by the coming rains.

Corporate Strengthening of BSWC

3.7 The single most important objective, the strengthening of BSWC to enable it to operate the physical installation, was not achieved by the project. If anything, in June 1995 BSWC was possibly weaker than BSWB at loan effectiveness in May 1986. As can be seen from Table 8, estimated costs set aside at appraisal for technical assistance and training activities were not fully utilized despite a project period that was three years longer than projected.

3.8 Training was carried out on an ad hoc basis rather than according to a comprehensive, well developed training agenda. Furthermore, as can be seen from Table 15- summary of training - in 1989, 1991 and 1993 there was virtually no training. These years coincide with the periods in which BSWC underwent major upheavals: transformation into the Ministry of Water Resources, split-up of the state and re-creation of BSWC. Overseas training of management, professional and technical personnel was mostly in the form of studies at large water utilities as well as courses in water development offered by British water authorities. Local training chiefly consisted of visits to other water utilities (Kaduna, Enugu) within Nigeria.

3.9 Towards the end of project implementation, during 1994/95, contracts were awarded to foreign water authorities, one to operate the water production and distribution facilities, and one to further develop the computerized billing and collection system. Both of these contracts had large on-the-job training components. While this training was effective to a certain extent, it did not achieve all that was intended due to it being disrupted by political factors, curtailed by closure of the loan, and made less effective by the absence of water to deliver during the 1995 dry season.

4. Major Factors Affecting the Project

4.1 Project implementation was affected by three major factors, all of which were clear and present at appraisal but were poorly understood: (a) macro-economic policy (exchange rate); (b) unsatisfactory institutional arrangements; and (c) deteriorating financial situation of State/Federal Governments.

Exchange Rate

4.2 Underlying the financial viability of the project were revenue projections from water sales (SAR) in current Naira of the order of 159.0 million (US$13.8 million) in 1991 and 2.10 billion (US$25.1 million) in 1995. This level of revenue would provide for operating and non-operating costs (principally depreciation and debt service) of project installations including boreholes. Instead, 1991 revenue stood at ₦ 2.5 million (US$250,000), and 1995 revenue is expected to have reached only ₦ 20.0 million (US$250,000). Projections for 1991 and 1995 were based on average cost of water per m^3 of ₦ 10.5 (US$1.05) and ₦ 112.0 (US$1.26), respectively. Instead , rates per m^3 were ₦

0.7 (US$ 0.07) in 1991 and ₦ 8.0 (US$0.09) at mid-1995. The steady erosion of the purchasing power of the Naira has had a dramatic, negative effect on BSWC's finances as well as proving demoralizing for personnel. The average monthly salary of an employee of BSWB at the time of appraisal was about US$750 equivalent, a level that dropped to about US$20 equivalent by project completion.

4.3 BSG's counterpart contributions to project costs, in current terms, fell short every year of the project. Moreover, in strict accounting terms BSG is also in default of clause 2.02 (b) of the State Agreement, which provides for BSG to fully make up losses of the utility including provision for depreciation. Up to the end of 1990 - when BSG finally issued authorization for BSWC to independently revise tariffs - proposals for increases had to be approved by BSG, a process that lasted up to 14 months. As a result, there have only been three tariff adjustments since appraisal from an average tariff per m^3 of ₦ 0.2 (US$0.20) in 1986 to ₦ 8.0 (US$0.10) in mid-1995, lower in 1995 in US$ terms than it was in 1986.

Institutional Arrangements

4.4 Throughout project implementation the executing agency's status changed three times: May 1986 - Nov. 1990 Borno State Water Board, December 1990 - August 1991 Borno State Ministry of Water Resources and September 1991 onwards Borno State Water Corporation. There are no 1989 and 1991 Balance Sheets and Profit and Loss accounts for the utility, as 1990 was the year it reverted to Ministry status. In addition, in October 1991 Borno State was split into Borno and Yobe States, a fact which decimated BSWC's personnel. The General Manager of the utility was changed four times during project implementation. All these events aggravated an already weak parastatal water utility.

BSG Financial Situation

4.5 BSWC has been BSG's single biggest user of development budget resources. The steady erosion over the past 10 years of state allocations (Federation Account) due to the creation of 11 new states and related pressure on already overstretched feder al oil revenues, made it increasingly difficult for BSG to meet its obligation under the State Agreement. Whereas the SAR projected BSG's contribution to project costs at ₦ 30.0 million, equivalent to US$43.0 million, actual, annual contributions were as indicated in the table below. Although in Naira terms BSG contributed more than projected at appraisal, ₦ 160.36 million, this was equivalent to only US$14.7 million or 34.2 percent of the projected dollar amount. Moreover, at completion by June 30, 1995 BSWC owed some ₦ 50.0 million (US$0.63 million) in counterpart funds to contractors.

Summary of Annual BSG Contributions

Calendar Year:	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	Total
Million Naira:	3.75	8.25	7.00	7.00	17.00	20.00	43.15	25.58	28.63	-	160.36
Million Dollars[1]:	1.67	2.06	1.46	0.95	2.05	2.02	2.10	1.09	1.30	-	14.70

[1]At exchange rate prevailing when paid.

5. Sustainability

5.1 Sustainability of physical installations under the project is unlikely unless a fundamental restructuring of BSWC is undertaken. Even with a restructuring accompanied by privatization, questions with respect to affordability on the part of most consumers will remain. Based on projections at appraisal, water tariffs per m^3 in 1995 should be around ₦ 112.0 instead of ₦ 8.0 as at present. With an average per capita consumption per month of about 3 m^3, water provided through connections would, therefore, have to cost about ₦ 336 per/month per family member. For a family of 5 this would work out to over ₦ 1,500, an amount that is close to 30 percent of the average civil service salary of BSG. For standpipe customers, estimated consumption would be about 1 m^3 per month which would still work out to about ₦ 560 per family per month, an amount which is almost certainly beyond the means of the majority of Maiduguri's inhabitants.

5.2 While the technical know-how to maintain facilities on the part of BSWC engineers appears to exist, if the utility continues to operate as in the past, installations will almost certainly stop functioning in the not too distant future as the sensitive equipment is frequently braking down requiring a steady flow of spare parts. The lack of resources to purchase spare parts, chemicals for water purification and fuel to keep the plant running is of major concern to BSWC. As indicated in Table 14, revenue from the sale of water by BSWC is currently so low that the utility is not even able to pay personnel costs. The table below summarizes the development of revenue as percentage of total operating costs over the project period:

Revenue versus Operating Costs

Calendar Years:	1986	1988	1990	1992	1993	1994
A. Water Revenue:	1,742	3,061	2,760	1,668	4,427	9,538
B. Operating Costs: (of which Personnel)	11,432 (3,965)	14,356 (5,227)	24,903 (7,907)	48,642 (10,170)	73,964 (14,868)	88,574 (14,727)
Percentage (A of B)	15.2	21.3	11.1	3.4	5.9	17.6

Figures in ₦ '000

5.3 As opposed to BSWC's 1995 operating costs of ₦ 90.0 million (US$1.1 million annually, adjusted), the SAR projects ₦ 295.0 million (US$3.6 million), a figure which possibly is much closer to what is actually required to keep project installations in good order. If nothing else, this difference indicates how BSWC undertakes the bare minimum of maintenance and virtually foregoes provision for depreciation. It also illustrates the need for a comprehensive review of all of BSWC's operations, including a readjustment in the book value of assets which as of December 31, 1994 were carried at ₦ 573 million (US$7.2 million) an amount that woefully understates the value of the Corporation's assets. More than anything else, however, it demonstrates how far BSWC has to go before tariffs that reflect the real cost per m^3 of water can be set, and thus for the project to eventually achieve sustainability.

6. Bank Performance

6.1 Overall the Bank's performance in assisting BSG with the identification, preparation, appraisal and carrying out supervision of the project has been unsatisfactory. During identification, preparation and appraisal, financing of investment in installations to improve provision of drinking water to Maiduguri's population was overemphasized at the expense of BSWC capacity building. It was only during the regularly carried out supervision missions (Table 13), that Bank staff began to focus on capacity building. The Bank and BSG underestimated the complexities involved in operating a water utility the size of BSWC. In fact, in the Nigerian setting where the civil service still has a high level of control, it may be impossible for a parastatal water utility to manage water treatment and distribution facilities in a manner consistent with sound commercial principles and sustainability.

6.2 Although supervision missions pointed out the need for corporate capacity building - strengthening of the billing department in particular - and financial issues early on, when there still would have been time to take corrective action, the Bank did not recommend decisive changes. Another issue which should have been focused on more

the water treatment plant's design weaknesses could have been avoided by timely interventions.

7. Borrower Performance

7.1 From the time the project was identified to its completion, the institutional weakness of BSG and BSWC prevented both from decisively influencing the outcome of events. Excessive reliance on the consulting engineers for physical implementation and on external technical assistance for management of the utility, were key factors in the failure to reach the project's objectives. In fact, BSWC is still so closely linked to BSG as to be comparable to just another Ministry. This is best reflected by the fact that even though BSWC possesses, de jure, the authority to set tariffs and to disconnect water for non-paying customers, de facto it is BSG who makes these decisions. Accordingly, repeated attempts by BSWC to increase tariffs to generate more revenue were scuttled by politicians and decisions to cut-off service to non-paying, major BSG and FGN customers (Police, Military, some 2,700 civil servants), were reversed.

7.2 On the other hand, project reporting throughout was excellent and information flow was steady. Periods where information became scarcer occurred only when BSWB was converted into the BSMWR and the State was split-up.

7.3 Perhaps the most damaging influence on BSWC, however, was the frequent changes of Government (seven) and the abrupt replacements of the utility's General Manager. It robbed the project of managerial continuity and BSG officials, at project completion, were seemingly unaware of the poor state of the utility as BSWC management always carefully ensured that high BSG officials were receiving uninterrupted service.

8. Assessment of Outcome

8.1 "Unsatisfactory" and most likely "unsustainable" under present conditions best characterize the outcome of the project. Although physical installations to provide Maiduguri's population with drinking water are in place, too many technical and operational details are left unsolved for the project to stand on its own. Continuous reliable supply of adequate and safe water from Lake Alau to Maiduguri is by no means assured at this juncture. Neither is BSWC's capacity to efficiently operate the system. Major shortcomings of the project are:

(a) Failure to develop BSWC into a utility capable of managing the State's water supply systems in an efficient manner and consistent with commercial practices; and

(b) Failure to deliver a technically and technologically adapted water treatment facility capable of providing safe and reliable drinking water to the population of Maiduguri.

9. Future Operations

9.1 Inasmuch as BSWC's revenue from water sales is currently insufficient to keep the Maiduguri water supply system operative, a dated action plan was agreed upon in June 1995 as per Appendix A - in order to improve the likelihood of sustainability of the project. If BSWC complied with the action plan, it would be eligible under the National Water Rehabilitation Project (NWRP-Loan No. 3322-UNI) for further financial support. Key elements are:

- Implementation by June 30, 1995 of a routine preventive maintenance program;
- Implementation by July 31, 1995 of a thorough program for control of unaccounted for water including identification of illegal connections;
- Preparation of a plan for additional technical assistance on an intermittent basis, under NWRP, for financial and commercial operations;
- Preparation not later than October 31, 1995 of a realistic plan for tariff increases and efficiency improvements to enable cash operating expenditures to be covered by the end of 1997; and
- A review of operation budgets and tariffs semi-annually.

To date, compliance with the action plan has been only partial, and no particular support related to this project has been requested under NWRP.

9.2 Above all, however, the Bank should encourage BSG and BSWC to enter into negotiations with interested private sector operators to participate in the operations of BSWC. More efficient personnel motivated by private sector incentives, and systematic tariff increases reflecting the real cost of water, may be the only chance for the project to reach sustainability in the sense it was intended. The Bank continues to encourage Borno, and all other states of Nigeria, to introduce the participation of the private sector into water supply operations, through continuing dialogue, and participation in seminars, under the auspices of NWRP.

10. Key Lessons Learned

10.1 Although provision of safe and reliable drinking water to Maiduguri's population is an important undertaking, the question whether this was the right way to go about it must be asked at project completion. A water utility in a city of 660,000 inhabitants with some 33,000 connections and 232 standpipes through which an estimated total annual production exceeding 20 million m^3 is distributed, can never be successfully operated by

a corporation that is essentially subject to the civil service rules and regulations that currently exist.

10.2 The key lesson doubtless remains that it does not suffice to construct physical facilities for provision of water; of equal importance - if not more so - is to develop the institutional capacity of the water utility and to provide it with the necessary independence to successfully operate and maintain physical installations. For if such capacity does not exist, as is the case with the Borno State Water Corporation, expensive installations will rapidly deteriorate and customers will become disillusioned. Allied to this, is the need for the institution to be able to develop a realistic policy for connection of consumers to the system, and a charging policy, in order to enhance revenue, serve the maximum number of people, and maintain affordability.

10.3 Care must be given to assessing affordability questions; it may well be that in the immediate future most customers will not possess enough purchasing power to pay for water at its real cost, although at appraisal it appeared that they would be able to do so. This situation may someday improve and there is little question that the majority of people are willing to pay for safe, reliable drinking water, however their ability to do so will depend on macro-economic conditions unrelated to the project. A key lesson is that macro-economic conditions can deteriorate rapidly through earlier unforseen circumstances, jeopardizing the sustainability of a project.

IMPLEMENTATION COMPLETION REPORT
FEDERAL REPUBLIC OF NIGERIA
BORNO STATE WATER SUPPLY PROJECT
(LOAN NO. 2528-UNI)

Part II. Statistical Annexes

Table 1: Summary of Assessments

A. Achievement of Objectives:	Substantial	Partial	Negligible	Not Applicable
Macroeconomic policies				x
Sector Policies			x	
Financial Objectives			x	
Capacity Building			x	
Physical Objectives	x			
Poverty Reduction		x		
Gender Concerns				x
Other Social Objectives		x		
Environmental Objectives				x
Public Sector Management			x	
Private Sector Development				x
B. Sustainability			x	

C. Bank Performance	Good	Satisfactory	Deficient
Identification		x	
Preparation		x	
Appraisal			x
Supervision		x	

D. Borrower Performance			
Preparation			x
Implementation			x
Covenant Compliance			x

	Good	Satisfactory	Unsatisfactory
E. Assessment of Outcome			x

Table 2: Related Bank Loans

Loan Title	Purpose	Year of Approval	Status
Preceding Operation:			
Kaduna State Water Supply Project (Loan 1711-UNI; US$92.0 million)	Improve the supply of drinking water to Kaduna and ensuring more equitable distribution by the provision of production and distribution facilities, and operational and institutional support.	1979	Completed 1988
Anambra State Water Supply Project (Loan 2036-UNI; US$67.0 million)	Improve water supply, solid waste management and urban infrastructure in Anambra State.	1981	Completed 1991
Following Operation:			
Lagos State Water Supply Project (Loan 2985 - UNI; US$173.2 million equivalent)	Increase production capacity by 320,000 m^3/day; laying of additional 80 km primary mains; providing and laying of 280 km of secondary mains and about 112,000 consumer connections	1988	Ongoing
National Water Rehabilitation Project (Loan 3322 - UNI: US$256.0 million equivalent)	Provision of credit to finance state-level sub-projects to address high priority rehabilitation needs of urban water supply systems	1991	Ongoing
First Multistate Water Supply Project (Credit 2372-UNI; US$101.0 million equivalent)	Improve quantity and reliability of water supply to the more important communities in Katsina and Kaduna States as well as assistance with commercialization of Water Boards.	1992	Ongoing

Table 3: Project Timetable

Steps in Project Cycle	Date Planned:	Date Actual:
Identification	Nov. 1980	Nov. 1980
Preparation[1]	Jan-Dec. 1982	Jan-Dec. 1982
Pre-Appraisal	Feb. 1983	N/A
Appraisal[2]	May 1983	May 1983
Negotiations	October 1983	April 9-11, 1984
Board Presentation	Dec. 1983	May 7, 1985
Signing	Feb. 12, 1986	February 12,1986
Effectiveness	May 12, 1986	May 12, 1986
Project Completion	Dec. 31, 1992	June 30, 1995
Loan Closing	June 30, 1993	June 30, 1995

[1] Actual Mission Dates.

[2] Actual Date of Appraisal Mission is May 11 to 26, 1983.

Table 4: Loan Disbursements

Bank Fiscal Year:	FY 86	FY 87	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94	FY 95
Appraisal Estimate	3.13	11.36	22.66	33.44	47.15	57.01	64.19	69.16	72.0	68.6[1]
Actual	0.82	2.06	2.56	10.47	21.02	32.48	42.97	48.66	57.84	62.8
Actual as Percentage of Estimate	26	18	11	31	44	57	67	70	80	91
Date of Final Disbursement	October 1995									

[1] US$3.4 million was canceled in June 1993 and US$1.6 million was canceled at loan closing.

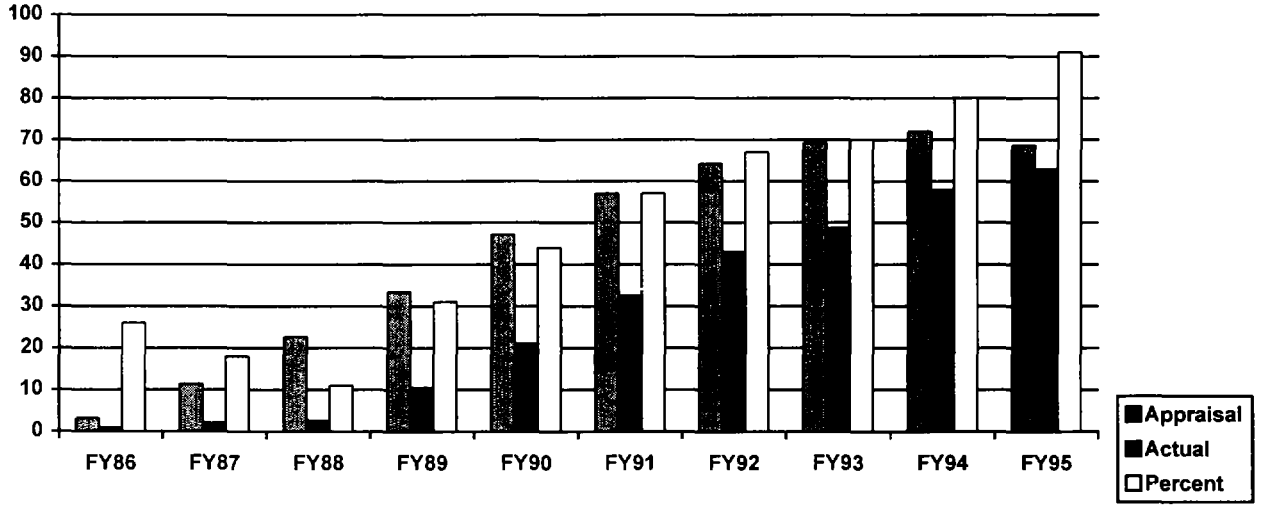

Table 5: Key Indicators for Project Implementation

Project Components	Commencement (month/year)[1]		Completion (month/year)	
	SAR Estimate	Actual	SAR Estimate	Actual[2]
Water Treatment Plant	Oct. 1986	Jun. 1989	Sep. 1989	Aug. 1994
Transmission Main (Raw Water)	Jan 1987	Nov. 1988	Dec. 1987	Aug. 1994
Water Towers: - Existing - New	Apr. 1987 Aug. 1986	Jun. 1989 Jun. 1989	Mar 1988 N/A	Mar 1990 Aug. 1991
Transmission and Distribution	Jan 1988	N/A	Jun. 1992	Aug. 1991
Riggs, Generators	N/A	N/A	N/A	Feb. 1991
Vehicles	Jan 1987	N/A	Jun. 1987	Jun. 1988
Meters	Mar 1988	N/A	N/A	July 1994
Headquarters Building and Workshop	Jun. 1989	N/A	Mar 1990	N/A
Technical Assistance	Sep. 1986	N/A	Dec. 1992	Jun. 1995
Training	Jan 1987	Dec. 1988	Dec. 1992	June 1995

[1] SAR estimates as indicated in the Project Implementation Schedule.
[2] Dates refer to actual commissioning and/or delivery of goods and services.

Table 6: Studies under the Project

Studies:	Purpose as defined at Appraisal	Status	Impact of Study
Preparation of a Phase II Project	Detailed design of follow-up project designed to provide services in Maiduguri not covered under the present project	Detailed design of zonal networks 3, 4 and 5 of Maiduguri were finished in June 1995.	N/A
Tariff Study covering all of BSWC's operations	Propose an adapted system of tariffication for BSWC	Ready as draft at completion of project	Given BSWC institutional as well as financial problems and unanswered affordability questions, the study is of little practical value
Master Plan for drainage/sewerage and solid waste disposal for Maiduguri	Definition of optimum arrangements for institutional sub-sector responsibility	Not done	

Table 7: Physical Components

Physical Components Listed in SAR (February 86)	Physical Components Completed
Water Treatment Plant	Water Treatment Plant
Transmission Main (Raw Water)	Transmission Main
Transmission and Distribution (Treated Water)	Transmission and Distribution
	Rehabilitation of existing plus construction of a new Water Tower[1]
Rigs, Generators	Rigs, Generators
Vehicles, Equipment and Water Meters	Vehicles and Workshop Equipment (meters included with distribution)
Headquarters Building and Provincial Workshops	Not done

[1] New Water Tower is included under Transmission and Distribution System in project desription.

Table 8: Estimated and Actual Costs

Project Components	SAR US$ million			Actual US$ million			Actual as percent of SAR
	Foreign	Local	Total	Foreign	Local[2]	Total	
Water Treatment Plant and Water Tower	11.19	15.9	27.8	19.6	2.3	21.9	79
Transmission Main Raw Water	5.6	5.1	10.8	10.6	1.6	12.2	113
Transmission and Distribution and Service Connections	22.3	21.1	43.4	23.9	6.5	30.4	70
Rigs, Generators, Vehicles and Meters	8.2	4.4	12.6	5.0	2.2	7.2	57
Headquarters Building, Workshop[1]	0.0	0.0	0.0	0.0	0.0	0.0	--
Technical Assistance and Training	3.2	1.3	4.5	1.9	0.3	2.2	49
Consultancy Services	5.8	2.4	8.3	7.6	0.9	8.5	102
TOTAL COSTS	57.1	50.3	107.3	68.6	13.7	82.3	77

[1] Since this component was not executed, it figures as zero for comparative purposes.
[2] Based on estimated actual exchange rates prevailing at disbursement.

Table 9: Financing Arrangements[1]
Per Source of Finance

Financier	SAR Estimates (February 1985)				Actual Costs			
	Local Costs	Foreign Costs	Total Cost	Percent	Local Costs	Foreign Costs	Total Costs	Percent
Borno State Government	43.0	0.0	43.0	37	13.7	0.0	13.7	16
I.B.R.D.	11.9	60.1	72.0	63	0.0	68.6	68.6	84
Total	54.9	60.1	115.0	100	13.7	68.6	82.3	100

[1] All values in US dollar millions.

Table 10: Loan Categories:

Loan Categories:	SAR Estimates (February 1985)		Actual	
	Amounts	Percent	Amounts	Percent
1. Equipment Plant and Material	35.3	72	10.1	100 FE
2. Civil Works	28.5	35	51.1	100 FE
3. Consulting Services, Technical Assistance and Training	8.2	80	7.4	80
Total[1]	72.0		68.6	

[1] Unallocated has been included in categories.

By letter dated June 27, 1988, BSWB requested the Bank to change disbursement percentages for categories 1 & 2 to 100 percent of Foreign expenditures to permit direct payments to contractors.

Table 11: Status of Legal Covenants

Agreement:		Status:[1]
Federal (Loan)		
Section 4.02 (a)	Borrower shall provide in its budget sufficient funds to cover completion of construction of Lake Alau dam by June 30, 1986	Because of slowness of release of federal funds, the dam was completed only in 1991. Thereafter it required repeatedly additional work some of which was paid by BSWC.
4.02 (b)	Borrower shall cause Chad Basin Development Authority toprovide sufficient water from lake Alau for Maiduguri's needs	Partially met, delays occurred (see above)
Borno State:		
Section 2.01	Without any limitations or restrictions upon any of itsother obligations, BSG shall cause BSWC to carry out project in accordance with due diligence and in conformity with appropriate public utilities practices	BSWC has not performed all of its obligations in accordance with appropriate utilities practices; it has made insufficient provisions for depreciation, has neglected maintenance and accounting and billing practices are not up-to-date
2.02 (a)	BSG shall relend 80 percent of the proceeds of the loan to BSWC and shall make 20 percent available as equity	In BSWC's December 31, 1994 accounts the split between Loan/equity is more like 55:45 than 80:20 as required by the Borno State Agreement.
2.02 (b)	BSG shall budget sufficient funds to cover on a regular basis operating losses incurred by BSWC	Although funds were transferred every year into BSWC accounts, they often came late and at completion BSWC owed some ₦ 50 million in local payments to contractors. In 1995 em has not transferred any money.

[1] Only Covenants that were not met are mentioned.

Table 12: Bank Resources: Staff Inputs
(in staff weeks)

Stage in Project Cycle	Planned	Revised	Actual[1]
Identification:	N/A	-	-
Preparation:	8.6	N/A	8.6
Pre-Appraisal/Appraisal, Negotiations:	56.9	N/A	56.9
Board-Effectiveness:	N/A	N/A	16.1
Supervision:	N/A	N/A	199.9
Completion:	8.0	8.0	8.0
Total:	-	-	289.5

[11] The project has chiefly been supervised out of the Resident Mission in Lagos.

Table 13: Mission Schedule

Mission:	Month/ Year:	No. of Staff	Days Field	Ratings		Skill Mix of Staff	Types of Problems
				Implement:	Development:		
Identification:	1980/81	-	-				
Preparation:	1981/82	2	14			FA/SE	
Pre-Appraisal:	Nov. 1982	1	7			FA	
Appraisal:	May 1983	2 [1]	21			SE/FA/TS	Legal
Supervision:	Apr. 1985	2	4	N/A		SE/FA	Legal
Supervision:	Jun. 1985	1	2	N/A		SE	Legal
Supervision	Aug. 1985	1	4	N/A		FA	Procurement
Supervision	Sep. 1985	1	4	N/A		SE	Legal
Supervision	Apr. 1986	2	1	N/A		SE/FA	Procurement
Supervision	Oct.1986	2	6	N/A		SE/FA	Procurement
Supervision	Apr. 1987	2	5	1	N/A	SE/FA	Procurement
Supervision	May 1987	1	4	2	N/A	SE	Procurement
Supervision	Jul. 1987	1	5	2	N/A	SE	Procurement & Financial
Supervision	Nov. 1987	1	6	2	N/A	SE	Financial
Supervision	Jun. 1988	1	4	2	N/A	SE	Procurement & Financial
Supervision	Oct.1988	1	6	2	N/A	SE	Procurement
Supervision	Oct. 1989	2	4	3	2	SE/OP	Financial
Supervision	Jun. 1990	2	5	2	2	OP/SE	Institutional
Supervision	Feb. 1991	2	7	2	2	OP/SE	Financial & Institutional
Supervision	Apr. 1991	2	19	2	2	OP/FA	Financial
Supervision	Jun. 1992	2	5	2	2	SE/SE	Institutional & Financial
Supervision	Aug. 1992	2	4	3	2	OP/SE	Institutional & Financial
Supervision	Nov. 1992	2	4	3	2	OP/SE	Institutional & Financial
Supervision	Jun. 1992	1	6	3	3	SE	Institutional
Supervision	Oct. 1992	2	11	3	3	OP/SE	Institutional & Financial
Supervision	Mar. 1993	2	4	3	3	OP/SE	Institutional & Financial
Supervision	Dec. 1993	2	4	3	3	SE/FA	Institutional & Financial
Supervision	May. 1994	2	4	S	S	SE/FA	Institutional & Financial
Supervision	Oct. 1994	2	5	S	S	SE/FA	Financial & Institutional
Supervision	Jun. 1995	2	4	S	S	SE/SE	Institutional, Financial and Technical
Completion	Jun. 1995	1	4				

[1] Two staff for field visit and 4 for report writing at headquarters.

Table 14A: BSWC Financial Statements

Income and Expenditures Statement
(Figures in Naira million)

Income	**1986**	**1988**	**1990**	**1992**	**1993**	**1994**
BSG Recurrent Grant	3.4	6.4	6.9	11.9	32.3	16.6
Revenue from Water Sales	1.7	3.1	2.8	1.7	4.4	9.5
AWS School Fees	0.0	0.1	0.1	0.1	0.1	0.0
Interest Earned	0.0	1.1	0.2	0.0	0.1	0.6
Sundry Revenue	1.2	0.1	0.0	0.1	0.3	0.5
Exchange Rate Difference	0.0	0.2	0.4	3.5	1.2	0.0
Total Income:	6.3	11.0	10.4	17.3	38.4	27.2
Operating Expenditures						
Personnel Costs	4.0	5.2	7.9	10.2	14.9	14.7
General Admin. Expenses	3.0	2.3	10.7	7.8	3.3	4.4
Maintenance	0.6	2.1	1.3	6.7	16.2	13.6
Consultants Services	0.0	0.0	0.0	10.9	23.6	21.1
Management	0.0	0.0	0.0	2.4	3.4	5.7
Training	0.0	0.0	0.0	3.9	2.1	8.4
Total	7.6	9.6	19.9	41.9	63.5	67.9
Operating Loss:	-1.3	1.4	-9.5	-24.6	-25.1	-40.7
Non-Operating Expenditures						
Depreciation and Interest	2.8	3.8	5.0	6.8	10.6	20.6
Other Losses	1.0	0.9	0.0	0.0	0.0	0.0
Net Loss:	-5.1	-3.3	-14.5	-31.4	-35.7	-61.3

Table 14B: BSWC Financial Statements

Balance Sheets
(In Naira million)

Assets:	**1986**	**1988**	**1990**	**1992**	**1993**	**1994**
Net Fixed Assets	32.7	33.2	55.9	126.4	127.3	573.9
Work in Progress	3.6	34.8	147.3	292.7	423.6	9.0
Pre-oper. Expenses	2.1	0.0	0.0	0.0	0.0	23.4
Stocks	5.9	5.3	10.2	17.1	14.4	21.1
Accounts Receivable	3.5	12.8	16.6	12.1	16.2	13.7
Draught Relief Balance	0.3	0.2	0.2	0.2	0.0	0.0
Cash in Bank	4.9	8.1	21.3	9.3	9.5	17.9
Total Assets	53.0	94.4	251.5	457.8	591.0	659.0
Liabilities						
BSG Contribution	73.7	113.0	176.2	265.0	301.2	375.7
IBRD Loan	1.4	16.8	109.8	223.6	302.7	402.8
Revaluation Reserves	0.0	0.0	0.0	65.2	65.3	65.3
Accts. Payables and Accruals	8.6	5.6	29.4	17.8	71.6	26.6
Loans to Employees	0.0	0.3	0.2	0.1	0.0	0.0
Overdrafts	0.0	0.1	2.9	0.3	0.0	0.0
Accumulated Losses	-30.7	-41.4	-67.0	-114.2	-149.8	-211.4
Total Liabilities	53.0	94.4	251.5	457.8	591.0	659.0

Table 14C: BSWC Financial Statements

Statement of Sources and Applications of Funds
(In Naira millions)

Sources	**1986**	**1988**	**1990**	**1992**	**1993**	**1994**
Net Losses	-5.2	-3.4	-14.6	-31.4	-35.4	-61.7
Add-Adjustment from Prev. Years	1.5	-0.1	0.0	-2.9	0.0	0.0
Depreciations	2.8	4.0	8.2	14.2	20.1	41.2
Total	-0.9	-0.5	-6.4	-20.1	-15.3	-20.5
Other Sources						
Bank Loans (Vehicles)	0.0	0.3	0.2	0.0	0.0	0.0
Capital Grants	3.3	8.6	24.8	7.3	10.5	45.7
IBRD Loan	1.4	12.8	51.1	69.1	79.1	100.0
BSG Contribution	1.8	11.1	16.9	42.4	25.6	28.8
Revaluation Adjustment	5.2	0.9	0.0	65.3	0.0	0.0
Total	10.8	34.2	86.6	164.0	99.9	154.0
Applications of Funds						
Purchase of Fixed Assets	3.6	4.9	21.0	76.9	16.3	467.1
Capital Work in Progress	3.3	27.3	61.0	84.8	130.8	-414.6
Total	6.9	32.2	82.0	161.7	147.1	52.5
Increase/Decrease in Funds	3.9	2.0	4.6	2.3	-47.2	101.5

Table 15: Summary of Trainee Numbers

Activity/Project Year:	87	88	89	90	91	92	93	94	95
Overseas : - Management	1	-	-	-	-	-	-	1	-
- Professional	4	-	-	-	-	1	-	1	2
- Technical	-	-	-	-	-	5	-	1	1
- Executives	3	-	-	-	-	4	-	7	3
In-house training/attendance to seminars: - Management	-	5	-	3	-	-	-	-	-
- Professional	9	6	-	7	-	-	-	4	-
- Technical	28	7	-	10	-	7	-	36	1
- Skilled	2	428	-	-	-	54	-	61	-
- Clerical	-	38	-	-	-	35	-	-	2
- Unskilled	-	-	-	-	-	-	-	13	-
Local: - Management	-	6	-	-	-	-	-	-	-
- Professional	1	11	2	6	-	4	-	6	-
- Technical	8	41	23	2	-	65	-	14	-
- Skilled	1	11	-	5	-	-	-	-	-
- Clerical	7	27	-	-	-	2	-	6	-
- Unskilled	-	-	-	-	-	-	-	-	-

FEDERAL REPUBLIC OF NIGERIA
BORNO WATER SUPPLY PROJECT (LN 2528-UNI)
WORLD BANK MISSION AIDE MEMOIRE: JUNE 1995

1. This aide memoire summarizes the discussions and agreements reached during a mission by David Henley and Eugene Okongwu between June 12 and June 16, 1995, this being the final supervision and implementation completion mission. The mission held discussions with the Secretary to the State Government, Director General of Parastatals, General Manager (Engr. M. K. Gubio), staff, consultants and contractors of the Borno State Water Corporation (BSWC), and the Managing Director of the Chad Basin Development Authority (Engr. B. G. Zanna). This mission followed on from a mission the previous week during which Anton Reichener had initiated the preparation of the Implementation Completion Report.

2. The mission acknowledges the several pleas it received to further extend the Loan closing date beyond June 30, 1995, but explained that current policies would not permit this. The mission would also like to acknowledge the cooperation and hospitality offered by the General Manager of BSWC and the Project Management Office.

Project Implementation

3. Physical implementation of the project has been essentially completed, and delivery of water commenced in April 1993 with considerable benefit to Maiduguri. Operation of the raw water pumping station and the water treatment plant/high lift pumps (WTP) was undertaken by the contractors up to August 1994, at which time BSWC assumed the responsibility for operation. While most of the project was handed over at that time or earlier, an extensive defects list for the WTP was prepared and many items are still not fully corrected. The mission felt that some of the stated defects were in fact design faults, or had resulted from design inadequacies or the present unusual operational conditions (para 9.), however it encouraged BSWC and the contractor to reach a pragmatic agreement to have those outstanding defects for which the contractor is responsible corrected. It is essential that this be finalized in time to allow the outstanding payment to be made to the contractor before October 31, 1995, the final date for payments under the loan.

4. Spare parts sufficient for two years operation were to have been supplied under the WTP contract, however the list of parts approved by the consultants proved to be quite inadequate. In addition, numerous items of equipment are required to correct design faults and omissions. The Bank has previously given no objection to the purchase of additional spares and other necessary items under the loan, totaling about US$1 million in value, however it will not be possible for these to be delivered before the loan closing date, and hence they will not be procured under the loan. The mission recommended that BSWC review their purchase list with view to possible reduction, and consider procurement under the National Water Rehabilitation Project (NWRP). This will require the reduction in scope of work for one contract already awarded under NWRP to make necessary savings.

5. Technical assistance in plant and system operation and maintenance, and in workshop operations, is being given by Thames Water and Ortech respectively. Both of these will continue up to June 30, 1995, and both report considerable development of BSWC staff to a point where they can satisfactorily undertake their duties and further train new recruits. However the number of personnel available for three-shift operation is inadequate. Regardless of the number and abilities of the staff, the present lack of spares will lead to complete shut down of the plant within

months if not corrected. BSWC has considered the option of having private sector maintenance of parts of its facilities however the response has not been encouraging so far because of private sector concerns about BSWC's ability to pay under their present circumstances.

6. Technical assistance for commercial operations including computerized billing is being given by Amsterdam Water/BMB, extending up to June 30, 1995. While considerable progress has been made, there are still hardware, software and operational difficulties, and it is unclear whether this operation is sustainable without further assistance. The financial expert also concludes his duties on June 30, 1995; he reports that considerable progress has been made and several qualified staff are available. The mission recommended that BSWC seriously consider utilizing funds from their component of the NWRP (from which funds have been reserved for institutional support) for extending the assistance noted under this and the previous paragraph, probably on an intermittent basis.

Commercial Operations

7. The commercial operations of BSWC have suffered dramatically during the year, because of the dyke failure at Alau dam last September (para 9.). Although collections increased steadily over the last three years, and reached an all time high of ₦1.3 million in March 1995, they subsequently dropped to almost nothing as water became unavailable. During 1994, about 60% of water produced was unaccounted for, since there are many illegal connections and many consumers have duplicate connections, only one of which is metered. Collection is only about 40% of billings. It is imperative that BSWC address these issues urgently when water becomes available again, and with the loss reduction assistance that is being given under NWRP.

8. BSWC has estimated that ₦5 to ₦6 million revenue is required per month to cover cash operating costs, including the regular supply of spare parts. Capital recovery costs could be an order of magnitude higher. Regardless of the question of capital cost recovery, if the project is to be even marginally sustainable, revenue must be increased dramatically and the question of supply of spare parts on a long term basis needs to be addressed, so that parts can be readily imported as necessary. BSWC should address the issue of import of spare parts financed by their own funds to identify processing constraints and streamline procedures.

Alau Dam

9. In September 1994, one of the dykes (saddle dams) at Alau failed, apparently by overtopping, causing severe flooding of Maiduguri, and causing the loss of most of the storage capacity of Alau reservoir. As a result, almost no water has been available from this source since about March, and Maiduguri has had to revert to its old inadequate groundwater source. Apart from the obvious distress of water shortage, this has caused it to be impossible for proper assistance and training to be given by Thames Water for Water Treatment Plant operations, and has resulted in many consumers removing their meter to extract what little water is available from the distribution pipelines. This will require a major effort to correct when water again becomes available during the coming wet season.

10. The need for further measures at Alau to retain water during the coming wet season was discussed by the mission with BSWC and the Chad Basin Development Authority (CBDA), owner of Alau Dam. CBDA has invited bids for replacement of the failed dyke, and raising and strengthening the other dykes, but this will not be concluded until next dry season. Meanwhile a

temporary low level dyke has been constructed near the failure site to impound sufficient water for next dry season. Overtopping would be prevented by proper operation of the gates at the main dam. The mission was unable to judge the soundness of this structure, but was assured by CBDA that it would withstand the forces which it would be subjected to. Although there is some risk associated with the temporary dyke, there seems little other choice for the coming wet season. BSWC agreed over the next few weeks to reduce permeability of this dyke by constructing a clay blanket on the upstream side of the dyke, to provide stone pitching to prevent erosion, and to flatten the downstream slope. This would be financed under existing contract 5A. BSWC agreed to liaise closely with CBDA on this matter.

Implementation Completion Report

11. BSWC confirmed that the project statistical information previously requested had been provided to Mr Reichener. The mission explained that the Implementation Completion Report (ICR) should contain an appendix prepared by BSWC to indicate their perceptions of the project, its achievements, its shortcomings, and the performance of itself and the Borrower, contractors, consultants, and the Bank. The mission indicated to BSWC the Bank's requirements concerning the details of BSWC's component of the ICR. BSWC agreed that this would be finalized before September 30, 1995, but provided an initial draft to the mission (Attachment 1).

12. Considerable discussion took place concerning the future actions required by BSWC to operate the water supply and render the project sustainable, as indicated above. The outcome of this is summarized in the operational action plan at Attachment 2.

Finalization of Project Accounts

13. BSWC indicated that it would be able to finalize all project accounts well before the cut-off date of October 31, 1995, using the project management office. This is necessary since the consulting engineer had ceased his services as from April 1995 due to a contractual dispute with BSWC. Since that time, Thames Water and Ortech had been assisting BSWC with wrapping up the main outstanding construction contract, that for the WTP (refer para 3.).

14. Concerning payments under the consultant's contract, the mission suggested that BSWC should make payments in accordance with the terms of the contract. Though there had been differences between the consultant and BSWC, these should not be grounds for arbitrary reductions in the amount payable unless there was full documentation of any failure by the consultant, and justification for any reduction proposed. The mission concluded that the terms of the contract regarding payment were clear, and included a percentage of final executed cost of contracts (including escalation) for (i) general supervision and (ii) as a lump sum for reimbursables. BSWC agreed to provide the Bank with final contract valuations for review by early July.

Audit

15. BSWC advised the mission that the audit of 1994 accounts was completed and only required the auditor's final signature. BSWC agreed to send the audit to the Bank before June 30, 1995.

David Henley
World Bank

ORIG. SGD.

Engr. M. K. Gubio
General Manager
Borno State Water Corporation

June 19, 1995

Attachment 1

BORNO WATER SUPPLY PROJECT - LN 2528 UNI

Maiduguri Water Supply Project

Date: **14 June 1995**

Situation Report by
Engr. M. K. Gubio, General Manager
Borno State Water Corporation

Basically the physical structures necessary for the operations and achievement of the utilisation of surface water scheme has been successfully put in place. As the main objective of the project is to process and treat raw water of the Alau dam for the daily water requirement of Maiduguri, the Capital of Borno State of Nigeria, this objective has been met by putting the plant under test-running since the middle of 1993 to date. The project was completed at a time when the alternative source of water supply to Maiduguri is almost exhausted due to over-extraction of the aquifers by the increasing number of boreholes. With the new scheme in place the standard of living and the livelihood of the inhabitants have improved tremendously, because the plant is producing four times the quantity of water been supplied by the boreholes even at 60% operation capacity. In view of this admittance by the beneficiaries one can say that the prospects for the project sustainability is very bright and hopeful.

The lack of raw water from the Alau dam which was caused by the failure of one of the dykes created acute water shortage in Maiduguri for some few months. Something which they have forgotten since the water treatment plant was put under test in 1993. This situation brought to the minds of the populance the importance of this project.

The Bank's consistent visits and assessment of the project at various stages have enhance the completion of the project successfully. The Corporation need not to mention several auidance and recommendations of the Bank officials bring the project to a successful end with various contracts and contractors. Not only was the Bank helpful in the execution of the Maiduguri Water Supply Project but it has assisted the Corporation in number of ways to keep the Corporation operational e.g. training given to staff, purchase of necessary machineries and equipments for boreholes drilling and maintenance of same, setting of a computer unit to enhance our billing system and accounting and financial discipline. All these were possible due to understanding and the cooperation accorded by the Bank Supervision Mission from time to time.

The Corporation and the State Government on the other hand were able to understand the Bank's procedures and advices, policies for the actualisation of this project. Towards this, the Government gave priority to this project to make sure that counterpart contribution requirements were met regularly to complete the construction works. Secondly the State Government also gave the Corporation the necessary authoritative independence to decide on its operational methods and determining of water rate as the prices of other essential commodities changes e.g fuel, power and labour.

The project set-up although new to the Corporation but a number of similar projects were executed in other states of the federation which are functioning successfully. Already visits were made to existing similar projects to determine the problems encountered during the operational stage. With these additional information

received and the experience encountered from the mid of 1993 to date, the Corporation being an autonomous body plans to set-up its own budgets independently. Projections will be made on the generated revenue from the sales of water to meet the operational and maintenance cost.

With improved billing and collection system, even the 60% production level so far reached, can generate enough funds for the operational cost at the rate of ₦8.00 per cubic metre of treated water. Water price adjustment can be made to consider the loan re-payment. The Corporation does not anticipate operational problems in the long term-if certain corrective measures can be taken now for a smooth take-up of the system. The initial lapses in the operation is due to design which was not rectified by the designed engineer who also supervised the project.

Almost on all the major contracts under the project, design problems were encountered right from the project inception. Some corrections to actualise the designs were made with the assistance of some of the contractors who handled the contract executions. For example, the Elevated Water Tower was completely re-designed when the initial designers could not carry out necessary corrections and explanation came at the construction stage. M/S Alfred MacApline of UK the contractor of the elevated water tower helped in actualisation of the structure. Secondly M/S PWT also made a lot of changes which the Consultants could not do when called upon to execute.

Still there are some outstanding issues not yet attended to

which will hinder the smooth take up of the project among these are:-

(a) The clarifiers almost developed problem when the raw water quality changes - which means the Consultants did not carry out any investigation on the raw water quality at various periods of the year.

(b) The pressure control valves designed were faulty and already three out of the six high lift pumps are not functioning.

(c) The sludge lagoons as designed and supervised by the Consultant have never function and no necessary rectification given by the Consultant.

(d) A lot of electro-mechanical problems were encountered during the test running which are not yet resolved. In fact, if not because of the presence of M/S Thames Water International and a Mechanical Engineer from M/S Ortech the operation of the plant could have been halted.

(e) Another problem area apart from the plant is the distribution network systems. This we have asked M/S Tahal Consultants who are designing the second phase of the Maiduguri Water Supply Project to look into ways of improvement.

(f) Procurement of necessary spareparts could not be analysed by the Consultants and now the spareparts even for the take up of the system is not available.

Throughout the project implementation period, a number of mistakes and omission by the Consultants have been observed by the Client's project supervising staff and there also have been pointed out to the Bank.

Finally, I will like to point out in the interest of the beneficiaries and the Bank who have invested millions of dollars, that the Bank needs to make the necessary corrections before handing over the responsibility of operation and maintenance of such a laudable project. If the Bank can appoint another Consultant to carryout some studies of the various aspects mentioned above, the Corporation will be highly delighted. Certain financial assistance to make rectification on the highlift pumps, chlorine room, generator etc are quite necessary.

Attached is details of other deficiencies in addition to the few mentioned ones.

MAIDUGURI WATER SUPPLY PROJECT DESIGN & SUPERVISION - DEFICIENCIES OBSERVED

1. Generators in RWPS & WTP are overdesigned. Longer operation of the generators is not feasible as this will result in frequent overhauling. Operation cost, particularly consumption of diesel at 200 litres/hour is too high (Comments Mr. Gait, TWI, WEIR Pumps).

2. Sludge lagoon is not operating due to defective design (Comments TWI/PWT/PCI).

3. The crane in the power house is of 2.5T capacity whereas the alternator weight is 5T. (Comments Mr. Gait/TWI).

4. The crane in the chlorine building is of 1.5 tonnes capacity whereas the weight of chlorine drum including gas is 1.6 tonnes. (Comments Mr. Gait/TWI).

5. No provision for lifting of backwash pump if it needs repair. (Comment Mr. Gait)

6. The treated water pump control valve is of complex type and this kind of valve is not used even in sophisticated plants. The valves cannot function and need immediate replacement (Comment PWT)

7. The motor control for chemical dosing pumps with IC card could have been avoided. TWI has now converted them into simpler system. (Comment TWI)

8. In final engineering design, the system has been designed overlooking the unaccounted water of about 40% and as a result the peak water demand cannot be taken care. (Comment TAHAL)

9. After bid opening for the water treatment plant contract, the following corrections in design were done as per BSWC's earlier observations followed by criticisms of the design received from sub-contractors PCI, SULZER, DEGROMONT:

   - Change of clarifier design by PWT/PCI.

- Introduction of a pump for backwashing of filters (in original design neither backwash pump nor any overhead tank was provided).
- Some changes in chemical dosing system.

10. Neutralization of chlorine gas in case of an accident by the scrubber system is complicated. Even modern water works in Europe use water sprinkling device which is much simpler and cheaper. (Comment SULZER)

11. Introduction of drainage ponds in the treatment plant area where the ground is fully sandy is an awful design. BSWC will require every year huge sum of money to backfill, compact and protect the slopes. The erosion of the drainage ponds in some places is threatening the existance of the internal roads.

12. It was discovered from the comments of Alfred McAlpine who was awarded the contract for the construction of Water Tower that the design of tank supported by a central shaft is an imaginery structure. Without peripherial columns the structure is not feasible. The above was accepted by the designer and changes were made with supporting columns after signing of the agreement.

13. DAR's supervision team's and their headquarters' interpretation of payment of provisional sums and fluctuated costs of basic rate items using tender date exchange rate has caused huge financial loss to BSWC. For the same contract conditions, they have interpreted the payment of fluctuated costs in favour of the client (Lagos State Drainage Division) recommending payment of foreign currency using the prevailing exchange rates.

14. Quality of general supervision was poor all through and the supervision team had always a tendency to over-certify the contractors' payment certificates.

BORNO WATER SUPPLY PROJECT (LN 2528-UNI)
OPERATION PLAN

Attachment 2

Action	By	Target Date
A. Project Finalization		
Agree with consultant on contract value	BSWC, Consultant	June 20, 1995
Resolve defects correction under WTP contract	BSWC, Contractor	June 30, 1995
Advise Bank of all final contract values	BSWC	July 15, 1995
Complete BSWC section of ICR	BSWC	Sept. 30, 1995
Make final disbursement requests	BSWC	Oct. 31, 1995
B. Engineering Operations		
Alau Dam		
Complete upgrading of temporary dyke at Alau in coordination with CBDA.	BSWC, CBDA	June 30, 1995
Ensure construction of permanent dyke upgrading continues as planned.	CBDA, BSWC, FMF	Sept. 30, 1995
Water Treatment Plant		
Complete preparation of operational instructions and implement their use	BSWC, Thames Water	June 15, 1995
Obtain consultant's statement on intended mode of operation of water supply system (including pumps and control valves)	BSWC, Consultant	June 30, 1995
Complete correction of construction defects at water treatment plant	BSWC, Contractor	June 30, 1995
Resolve the present embargo on recruitment to enable adequate staffing of operation of the WTP	BSWC, Borno State	July 31, 1995
Spare Parts		
Prepare revised estimate of spare and replacement parts requirements for purchase under NWRP	BSWC, Thames Water	June 30, 1995
Agree on deletions from existing NWRP contracts to finance spare parts requirements	BSWC, FMWR	July 15, 1995
Procure spare parts under existing arrangements with IAPSO	BSWC	Aug. 31, 1995

Resolve modes of procurement of spare parts with local finance	BSWC	Aug. 31, 1995
Install replacement parts and equipment as necessary	BSWC	Nov. 15, 1995
General Operations		
Implement routine preventive maintenance program	BSWC	June 30, 1995
Prepare plans for implementation of a program of rehabilitation of house connections when water supply is restored	BSWC	June 30, 1995
Prepare plans for additional intermittent technical assistance to engineering operations under NWRP	BSWC	July 15, 1995
Implement thorough program for control of unaccounted for water including identification of illegal connections with NWRP assistance where necessary.	BSWC	July 31, 1995
Continue to consider possibilities for private sector operations of selected parts of or the whole system as BSWC's financial situation improves	BSWC	Ongoing
C. Commercial and Financial Operations		
Identify local support available for computer operations	BSWC	June 30, 1995
Prepare plans for additional intermittent technical assistance to commercial and financial operations under NWRP	BSWC	July 15, 1995
Become actively involved in metering program including meter testing and maintenance	BSWC	July 15, 1995
Rationalize meter reading routines	BSWC	July 15, 1995
Prepare realistic plan for tariff increases and efficiency improvements to enable cash operating costs to be recovered by end 1997	BSWC	Oct. 31, 1995
Review operational budget and tariffs semi-annually	BSWC	November, May
D. Miscellaneous		
Improve management of BSWC by improving communication and participation within BSWC	BSWC	July 31, 1995
Become more actively involved in NWRP training programs	BSWC	July 31, 1995
Continue to seek financing for construction of additional distribution system in zones 3 to 5.	BSWC	Continuous

APPENDIX B

BORNO STATE WATER COPRPORATION (BSWC)
BORNO WATER SUPPLY PROJECT LN 2528 UNI

Implementation Completion Report

INTRODUCTION

1.1 With the rapid depletion of the underground water in Borno State due to severe drought in the seventies and early eighties, the then Borno State Water Board (BSWB) decided to look for alternative source of water for the population of Maiduguri. The boreholes could no longer meet the increased demand of water by the inhabitants whose population has increased by more than fifty percent as a result of migration by farmers who lost their farming jobs due to droughts.

1.2 In April 1975, consultants were commissioned by Federal Ministry of Agriculture and Natural Resources to study Ngadda stream flow at lake Alau. The study was principally for irrigation of Jere Bowl areas North-east of Maiduguri and also for Maiduguri Urban Water Supply, and was initially taken up by the State Ministry of Natural Resources. Chad Basin and Rural Development Authority later on took over the responsibility of the study. Emphasis was given for the water to be shared for both the irrigation and water supply to Maiduguri.

1.3 Borno State Government approached the World Bank for assistance in the area of provision of portable water to the populace of Maiduguri by purifying the impounded water at Lake Alau. Terms of reference for comprehensive Maiduguri Water Supply Scheme was prepared and consultants were commissioned in January 1981 to carry out the feasibility studies of Maiduguri Water Supply. The same consultants were commissioned in March 1983 to carry out the engineering design and preparation of tender and contract documents. Report on the feasibility studies was finally submitted to Borno State Water Board and the World Bank in 1983. The project was subsequen ly appraised in May 1983. The loan was finally signed in Feb ary 1986.

2. PROJECT OBJECTIVES AND ACHEVEMENTS

2.1 PROJECT OBJECTIVES

The project was conceived with the following major objectives:

(a) To provide necessary installations for provision of adequate and reliable drinking water to the populace of Maiduguri.

(b) To provide technical assistance and training with the view to strengthen the Borno State Water Board in terms of future development including efficient operation of the existing system.

For the achievement of the above objectives, the project was broken into three main components:

(i) Construction and installation of water treatment facilities consisting of raw water pumping station with three low-lift pumps and transmission line, water treatment plant with capacity 67,000m^3/day and laying of distribution pipes as well as installation of 26,500 service connections.

(ii) Operational facilities and equipment including vehicles, water tankers. rigs, leak detection equipment, trucks, computer hard and soft wares, generators, submersible pumps, motorcycles and office equipment.

(iii) Provision of technical assistance and training of staff including consultancy services.

2.2 ACHIEVEMENT OF OBJECTIVES

The greatest achievement fo the project is the successful completion of the main physical installations necessary for the supply of safe drinking water to Maiduguri. The water treatment plant with its installations and accessories was completed and put into use since August 1994. The raw water pumping station with the raw water transmission line was also completed and commissioned in 1994. About 250km distribution pipe and

26,500 numbers of metered house connections as well as about 230 numbers of stand pipes were constructed and commissioned.

2.2.1 Under the technical assistance and training, quite a number of Borno State Water Corporation's professional and technical personnel undertook various courses locally and overseas with the view of strengthening BSWC's ability to manage and maintain its facilities. Some techncial staff were also attached to other State Water Agencies with the country to improve their skills in operation and maintenance of water installations.

2.2.2 In 1994, a technical institution in Onitsha, Nigeria offered some practical lessions to BSWC's electrical, mechanical and instrumentation personnel. On-the-job training was offered by Thames Water International of U.K. but only for 6 months out of the 24 months programme. The programme was terminated due to the closure of the loan which deprived BSWC from getting its staff trained on the new installations. Reorganisation of Borno State Water Corporation's central workshop as well as training of its workshop personnel was carried out for the period of 24 months by Ortech Consulting Engineers. However, the training was not effectively carried out as desired. This is due to late arrival of necessary workshop tools and equipment ordered from Inter-Agency Procurement Services Office (IAPSO). Technical Assistance period of Ortech is required to be extended to enable BSWC's personnel get enough training on the use of the newly acquired tools and equipment. The Consultants will also coordinate the electrical and mechanical maintenance of the installation of water treatment plant and alau pumping station with a view to make BSWC's engineers adequately maintain the installation.

2.2.3 Another achievement of the project is the improvement of operational capability of BSWC in terms of provision of basic operational materials. These include the procurement of vehicles, cranes, rigs, water tankers, submersible pumps, generators, etc for improving water supply to consumers; supply and installation of computer soft and hard wares for computerisation of billing system; rehabilitation and furnishing of existing headquarters building of BSWC, etc.

3. FACTORS AFFECTING THE PROJECT

3.1 There are two main factors that affected the smooth execution of the Project. These are frequent changes and instability in the value of Naira, and the slow and inconsistent release of counterpart fund by the State Government. The decline in the purchasing power of the Naira contributed to continuous upward review of contract costs. Delays in the execution of some aspects of work as a result of contractors difficulty in timely clearing of imported goods were encountered. This is mainly due to cash flow constraints in accommodating the increase in import duties arising from changes in exchange rates. The release of counterpart funds by the State Government was sometimes steady and sometimes irregular. This can be explained from the fall in the statutory allocation to the State Government by the Federal Government. The State Government was also faced with numerous commitments in other state establishments, yet the Project enjoyed the priority attention throughout its period.

4. OPERATIONAL EXPERIENCE

4.1 Following the initial commission of the water treatment plant and raw water pumping station, a number of problems were encountered. These problem are mainly attributed to design problems as highlighted in the attachments to the June 1995 Supervision Aide-memoire. The 5 MVA transformer at Alau pumping station has very small voltage tapping range. It could not take care of all the voltage fluctuations from NEPA as a result serious overvoltage and undervoltage were experienced which will not allow pumps to be run at times.

4.2 The sizes of the generators both at water treatment and Alau pumping station are such that they could not be operated under light loads. As the main loads at both locations are the water lifting pumps, the generators are not operated when pumping is not required or when low pumping is desired. Small generators are now installed to provide power to the light loads when NEPA power is not available. The bigger generators are therefore used when maximum pumping is required.

4.3 Frequent faults were noticed with the electronically controlled chemical dosing pump panels. The electronic cards fails. An alternative solution are being adopted by eliminating the cards and replacing them with Direct-On-Line (DOL) starters. This arrangement was experimented and found to be efficient. Arrangements are being made by BSWC engineers to re-wire the remaining panels (total number of panels are eight).

4.4 Problems were encountered with the operation of the high lift pumping station in the water treatment plant. The type of control valves (Bi-water valves) installed require frequent servicing. The seals of the valve are very delicate and difficult to maintain. When the valves fail it require some manouvres to operate them. Plans are underway to replace the valves with simpler set-up. This is being done by BSWC engineers and Ortech Consulting Engineers (BSWC's technical assistance consultants). Funds are made available under the National Water Rehabilitation Project (NWRP).

4.5 The sludge lagoon could not be effectively operated. This is also part of design/supervision problem as mentioned in the attachment of June 1995 aide-memoire. Arrangement to re-route the sludge from the clarifiers to the drain is being made. This will help in recycling the wash water from filters back to the inlet.

4.6 In September 1994, both the water treatment plant and raw water pumping station worked below capacity due to the draining of the lake Alau reservoir after one of its dykes failed. A temporary dyke is now being constructed and found to be strong enough to retain the volume of water in the dam. The water level is maintained at 328 (1 meter below the highest crest level of the dam) throughout the last season. The treatment plant is back in full operation since. Contract is awarded by the Federal Ministry of Water Resources to M/S Impresit Bakalori for the construction of permanent dyke.

5. SUSTAINABILITY

5.1 The major requirement for the effective running of the water treatment plant are the water treatment chemicals, fuel and lubricants for the stand-by generators, electricity from NEPA and some spares

for the equipment. Average monthly requirement is estimated at ₦5.0m. This exludes the major spare parts. An arrangement is being made to procure essential spare parts using the National Water Rehabilitation Project funds. This spares are believed to last for a minimum of three years. Presently the State Government provides about 70 percent of the running cost while the remaining is sourced from revenue generated from water sales. The current revenue generation of BSWC stands at ₦1.8m/month. Water rates for all categories of consumers was increased in January 1996. With the new rates BSWC targets about ₦3m /month. This will greatly reduce over dependance on the State Government on operating and maintaining the installations.

6. DESIGN FOR PHASE II WATER SUPPLY PROJECT

6.1 From the feasibility study and final engineering design prepared by Dar Al-Handasah Consultants in 1983/84 Maiduguri town was divided into five zones. The central parts of the town which are densely populated were termed as zones 1 and 2, while the outskirts of the town as zones 3, 4 and 5. The water supply was designed to be implemented in two stages:

Stage I - 1992, population 534,000, water production 67,000m^3/day
State II - 2005, population 850,000, water production 134,000m^3/day

The daily water production of 67,000m^3/day in stage I was allocated for all the zones of Maiduguri, out of which some 60% were allocated for zones 1 and 2 and 40% for zones 3, 4 and 5. The water supply for zone 1 and 2 (major parts of the city) was afterwards implemented in Phase I.

6.2 Tahal Consultants (Nig) Ltd was commissioned in 1994 to plan and prepare detailed designs of the water supply system to zones 3, 4 and 5 for stage I, detailed design for the distribution network for zones 3, 4 and 5 for stage II and to prepare tender documents for Phase II of stage I for water supply system and distribution network for zones 3, 4 and 5.

6.3 In the final design report submitted by Tahal Consultants, it was discovered that the population of Maiduguri has increased considerable since the previous design report was issued in 1984. The annual

rate of gr .h is estimated to be 5% against the 3.5% as was envisaged earlier. The stage II population level will be reached by the year 2000 instead of the year 2005. Therefore, the Consultants concluded that the current water production capacity of stage I, (67,000m^3/day) constructed in 1992 is too low for the current water demands. After the implementation of the distribution system for zones 3, 4 and 5, acute water shortage will be felt in the city.

6.4 The Consultants recommended that the preparation of the detailed design of stage II of Maiduguri Water Supply system which include mainly doubling the capacity of the water supply system to be carried out immediately.

IMAGING

Report No: 15557
Type: ICR