

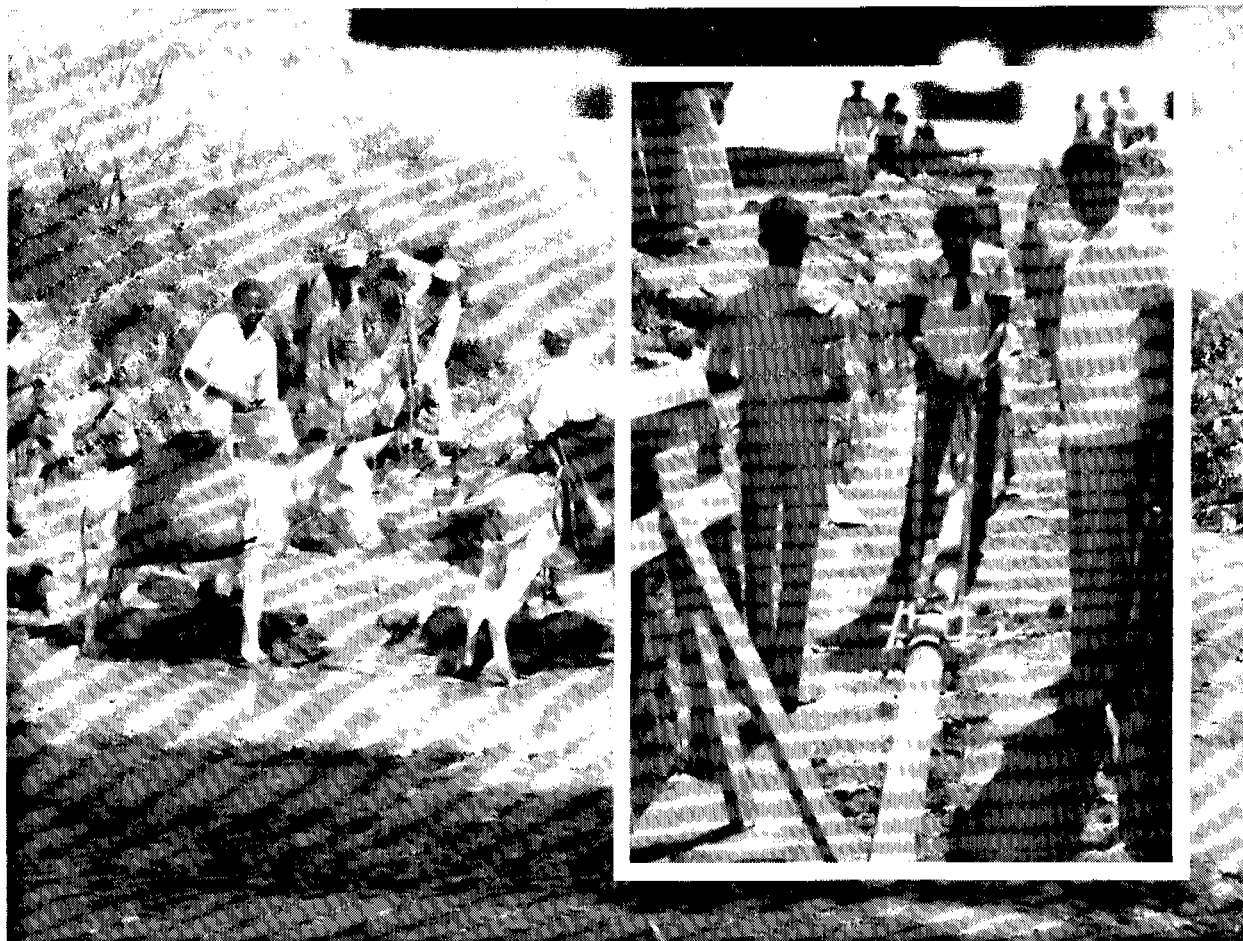
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Republic of the Sudan / Kingdom of the Netherlands

Nyala and El Geneina water supply project

Phase 2: Rehabilitation and upgrading



February 1990

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Government of the Republic
of the Sudan

Ministry of Energy
and Mining

National Urban Water
Corporation

Government of the Kingdom
of the Netherlands

Ministry of Foreign
Affairs

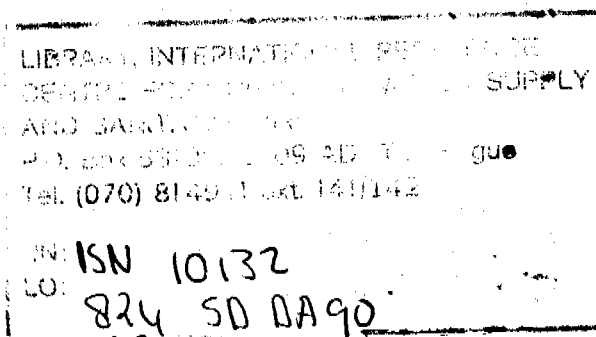
Directorate General of
Development Cooperation

NYALA AND EL GENEINA WATER SUPPLY PROJECT

PHASE 2

Rehabilitation and upgrading

FINAL REPORT



February 1990

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**Euroconsult,
Arnhem, The Netherlands**

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1 INTRODUCTION

1.1 Background

The towns of Nyala and El Geneina are located in the Darfur Region, in the Western Sudan (Figure 1).

Nyala is the main commercial, industrial and administrative centre of Southern Darfur. The town is linked with Khartoum by a single-track railway line which was completed in 1958. Rail transport to Nyala presently is at low frequency and poor efficiency, however. Road transport from Khartoum over sand tracks across the semi-desert to Nyala takes about six days for trucks, but in the wet season the tracks often become impassable.

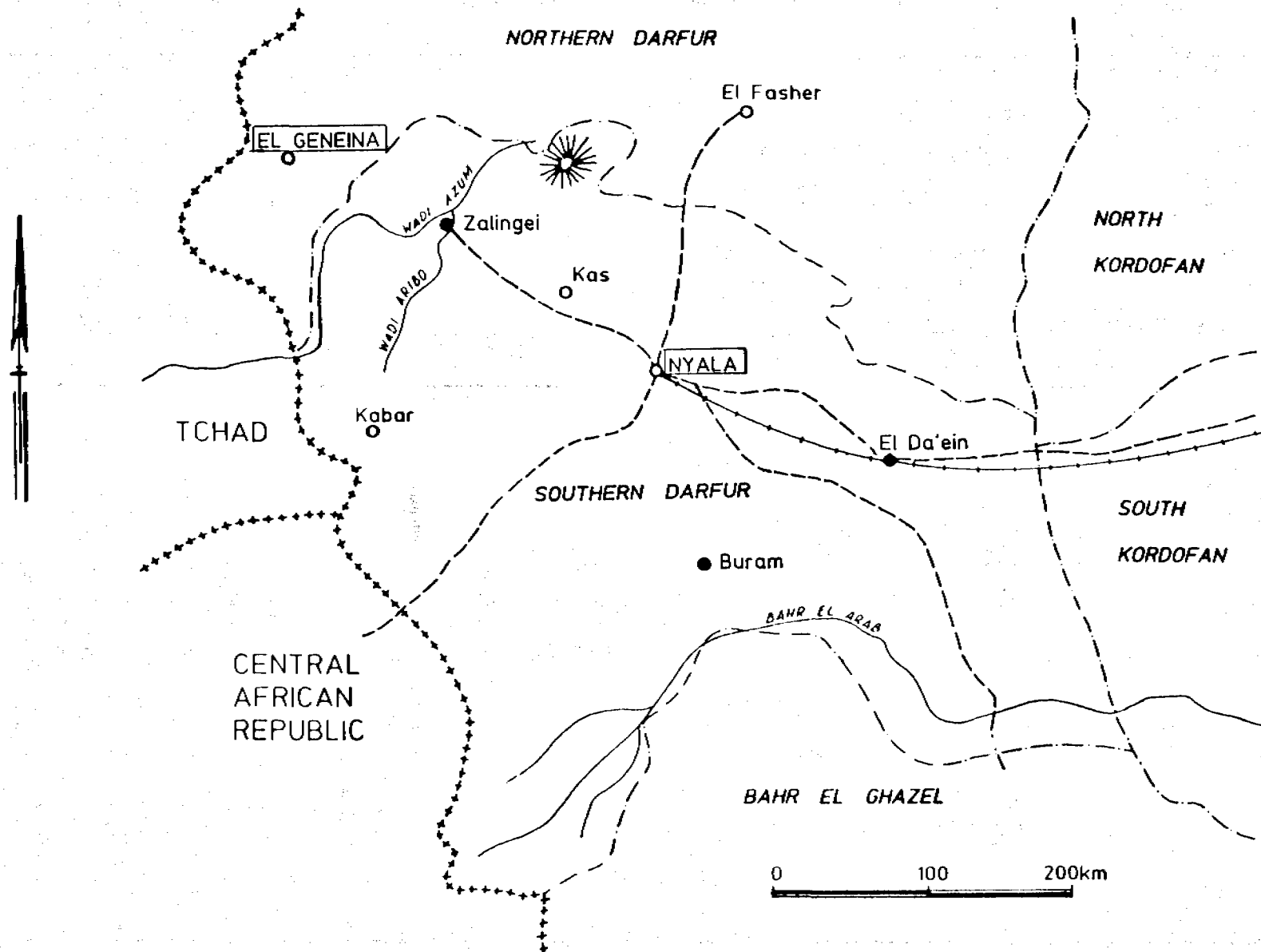
Nyala is at an altitude of 650m above mean sea level. The Jebel Nyala hill east of the town is the only significant topographical relief feature in the vicinity. Annual rainfall amounts to 465 mm on average, but varies considerably from year to year. Some 90% of the rainfall occurs in the period from June to September.

In recent years Nyala has been receiving a continuous and considerable inflow of people from the region and beyond who fled for reasons of drought conditions, political disturbances or tribal unrest. These refugees took occupation of various areas on the outskirts of Nyala town and have formed settlements there. As a result, the town's total population has greatly grown to presently an estimated 275 000 inhabitants. Initially, most of the dwellings in the outskirts settlements were temporary shelters mainly traditional mud huts with grass roofing. However, in the last few years more houses of brickwork and similar materials have been built and the fringe settlements have gradually assumed a more permanent character.

In the central town area of Nyala, north of the Wadi Nyala, governmental institutions and municipal offices are grouped together. Military compounds are situated to the west, the railway station and industrial areas to the east. The present Nyala airport is located at a flat strip north of Jebel Nyala; there are advanced plans to develop a new airport at a greater distance from the town at a location east of Jebel Nyala.

Residential areas with the better-class housing are generally concentrated to the east of the commercial area in the central town district. The outskirt settlements of newly arrived people and refugees are located to the north (e.i. Sukar Shattat, El Konghor), to the east on the lower slopes of Jebel Nyala (El Taiba, El Jebel), to the south across Wadi Nyala (e.g. El Wahda), and to the west along the wadi (El Geer). See Figure 2.

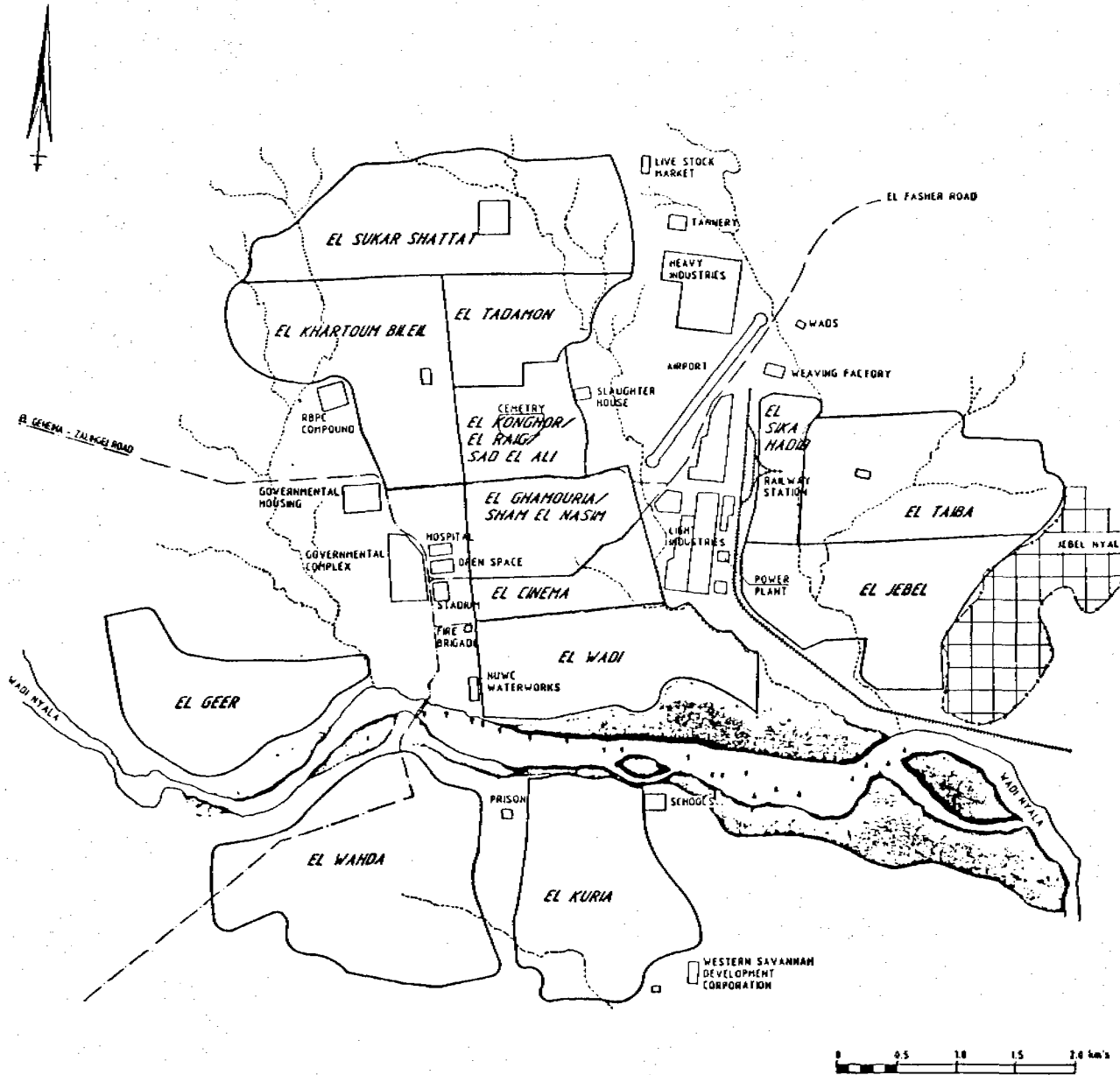
Rain-fed agriculture and animal husbandry are the main economic activities of the region. Nyala provides the market functions for agricultural produce and livestock trading. There is also considerable light industry including a weaving factory, tannery, and a number of groundnut processing and soap factories. Nyala being the main distribution



2

FIG. 1 GENERAL MAP OF DARFUR REGION

FIGURE 2 NYALA - GENERAL PLAN AND TOWN QUARTERS



LEGEND

- RAILWAY
- ROAD
- SURFACE DRAIN (KHORI)
- QUARTER BOUNDARY
- ▽ EXISTING BOREHOLE
- △ PLANNED BOREHOLE

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REPUBLIC OF THE SUDAN
 NATIONAL URBAN WATER CORPORATION
 NYALA & EL GENEINA
 WATER SUPPLY PROJECT

NYALA
 GENERAL PLAN & TOWN QUARTERS



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centre of Southern Darfur, it has a substantial service sector providing transport, communication, banking and technical services (e.g. mechanical workshops, servicing of vehicles). The town also has a number of schools and educational institutes, a hospital and some medical centres.

El Geneina is located in the extreme west of Darfur Region, near the border with Chad. The distance by road to Nyala is 360 km including gravel road sections from El Geneina to Zalingei (with a passing across the wide Wadi Azum) and the tarred road Zalingei-Nyala.

The central part of El Geneina town and most of its outskirt settlements are situated north of Wadi Kaja. See Figure 3.

There has been and continues to be a steady flow to El Geneina of people escaping the effects of droughts, political disturbances and tribal unrest. Displaced people and refugees have come to El Geneina in search for shelter and food, from the drought-stricken north-west of the Sudan, from across the Chad border, and some from southern areas. Part of this drift is caused by the severe droughts in the Sahelian region.

Considerable numbers of these people have settled in the outskirts of El Geneina town (e.g. El Riyadh, El Shati, El Nassim, and the Ardamatta A and B settlements). As a result, the population in and around El Geneina has greatly expanded and is now estimated to be over 100 000 inhabitants.

The surrounding area of El Geneina is semi-arid with an average annual rainfall of 530 mm occurring mainly in the months of July and August. The altitude is about 800m above mean sea level, but there are several low hills (jebels) rising higher at both sides of Wadi Kaja.

For centuries, El Geneina was an important commercial trading centre on the caravan route from West Africa to the north. This function has lost its importance and animal husbandry now is the main economic activity of the area. There is very little industrial or artisan activity. Groundnut growing is practiced for cash crop production and gardening along the wadi banks provides fruit and vegetables for local consumption.

The main commercial and residential areas of El Geneina are in the town centre near the Jebel Sultan. The military area, the police compounds, and the air strip are situated in the Ardamatta A settlement some 5 km north of the town. To the north of El Geneina along the road to Ardamatta fairly large settlements of newly arrived people are located. A camp for refugees from Chad is situated on the east bank of the wadi in Umm Duein.

Large groups of nomads each year stay around the town for one or two months when the local water sources in their normal grazing areas dry up at the end of the dry season.

El Geneina is considered to be the capital of the large and influential Masalite tribe. The Sultan of the Masalites resides in a palace on Jebel Sultan which overlooks the town.

1.2 Project history

Phase 1 of the Nyala/El Geneina Water Supply Project for upgrading and extension of the water supply systems of these two towns, was approved by the Sudanese Government and the Netherlands Government authorities in July 1986. Actual execution of the Phase 1 project began in September 1986. Originally, completion of Phase 1 was scheduled for early 1988 but more time was necessary because the works proved to be more elaborate and time-consuming than envisaged. There also were several delays in the supply of materials and equipment. Extension of Phase 1 to October 1988 was approved by the project authorities and accordingly executed.

The National Urban Water Corporation (NUWC) is the project executing agency with principal responsibility for the management of the project and for its planning, design and construction work. From the start, NUWC posted one of its engineers as Resident Engineer, stationed in Nyala, to supervise all project activities both in Nyala and El Geneina. NUWC also made available an engineer as Assistant Resident Engineer in El Geneina, a mechanical engineer particularly charged with the installation of pumping equipment and electrotechnical plant, several construction supervisors, and supporting staff such as a project administrator and store keepers, and a number of specialized personnel such as pipe fitters. Skilled and unskilled labour were made available from the personnel of the NUWC-organizations in Nyala and El Geneina, or recruited locally as casual labour.

To provide the required technical assistance and logistical support, Euroconsult of the Netherlands were appointed project consultant. Euroconsult fielded an expert as Project Adviser, based in Nyala, and arranged for the necessary short-term missions of experts for specific aspects of the project. The logistical support involving customs clearance and arrangements for inland transport of imported materials and equipment for the project, radio and other communications, and liaison with the project authorities in Khartoum, were provided by Euroconsult's Project Support Office in Khartoum.

1.3 Project Phase 2

In their consultations on bilateral cooperation in December 1987, the Sudanese Government and Netherlands Government authorities agreed that the Nyala/El Geneina project should continue in a Phase 2 to start in 1988 directly after Phase 1. Earlier, Euroconsult had been instructed to carry out the necessary technical surveys and studies in cooperation with NUWC in order to prepare the preliminary design, work programme and cost estimates. This work was completed in February 1988 and the results were presented to the project authorities in the Technical Report Phase 2. Following further consultations and discussions, it was decided that the project in its Phase 2 should be mainly concentrated on upgrading and rehabilitation of the water supply systems in Nyala and El Geneina. The work programme of Phase 2 was developed in close cooperation between NUWC and Euroconsult, and approved by the Sudanese Government and Netherlands Government authorities in their bilateral consultation of July 1988.

phase 1

After making the necessary arrangements, execution of the Phase 2 project began in November 1988. NUWC secured the continuation in the project, of the Resident Engineer, the Assistant Resident Engineer (El Geneina), the Mechanical Engineer, the supervisory staff and the supporting personnel. In addition, NUWC agreed to post an additional engineer as Assistant Resident Engineer in Nyala. The directors at NUWC Head Office, Khartoum, and the NUWC Regional Manager for Darfur Region, El Fasher, continued to direct and support the project for its execution.

Euroconsult carried through with the technical assistance and logistical support, and fielded an additional expert as Assistant Project Adviser, stationed in El Geneina. Short-term missions for expert contributions to the execution of the Phase 2 project were arranged in accordance with the agreed work programme. The necessary logistical support, radio and other communications, and liaison with the project authorities, were continued by Euroconsult's Project Support Office in Khartoum.

2 PROJECT PROGRESS IN PHASE 2

2.1 General

Progress made in developing the water supply systems of Nyala and El Geneina during Phase 2 of the project, included:

- distribution mains and branch lines (trenching, crimming, pipelaying and fitting)
- on-the-job training of pipe fitters
- erection of new elevated tanks
- repair of existing elevated tanks
- construction of water kiosks, complete with branch connections to mains
- testing and cleaning-out of existing boreholes
- drilling of new boreholes
- testing of existing borehole pumps
- installation of new borehole pumps
- construction of discharge lines for borehole pumps
- supply and installation of new booster pumps (Nyala booster pump station)
- preliminary rehabilitation of electrical connections and switchgear
- overhead power lines (with support poles on improved foundations)
- testing and temporary provisions for existing electro-generator sets (El Geneina)
- installation of new electro-generator sets (El Geneina)
- testing and commissioning of new components of water supply systems
- on-the-job training of staff of NUWC-organizations in Nyala and El Geneina, and preliminary improvements to the organizational structure and working procedures
- pilot system of revenue collection.

It is estimated that the water supply improvements effected at the end of Phase 2 are benefitting, either directly or indirectly, some 90 000 people in Nyala and some 50 000 in El Geneina. However, the conditions of project execution are far from easy and there is a continuing influx of people both in Nyala and El Geneina. Thus, it is true that much remains to be done. Large segments of the population in both towns still lack access to an adequate and convenient supply of water.

The low-income sections of population cannot afford to take more than very limited quantities of water daily (as little as 8-12 litres per head) and have to use it sparingly and not sufficient for personal and domestic hygiene. The cost of water from vendors is 15-20 times higher per unit than the water from the piped supply system.

Incidence of hygiene- and water-related diseases in Nyala and El Geneina is still high, especially among the under-privileged sections of population most of which live in the outskirts settlements of the two towns. The progress made with increasing the water production from boreholes, pipelaying of mains and branch lines, and construction of water kiosks, needs to be extended and consolidated so as to provide these people particularly, and the other parts of the town's population also, with an adequate and reliable supply of water for hygiene and improved health conditions at affordable cost.

2.2 Nyala

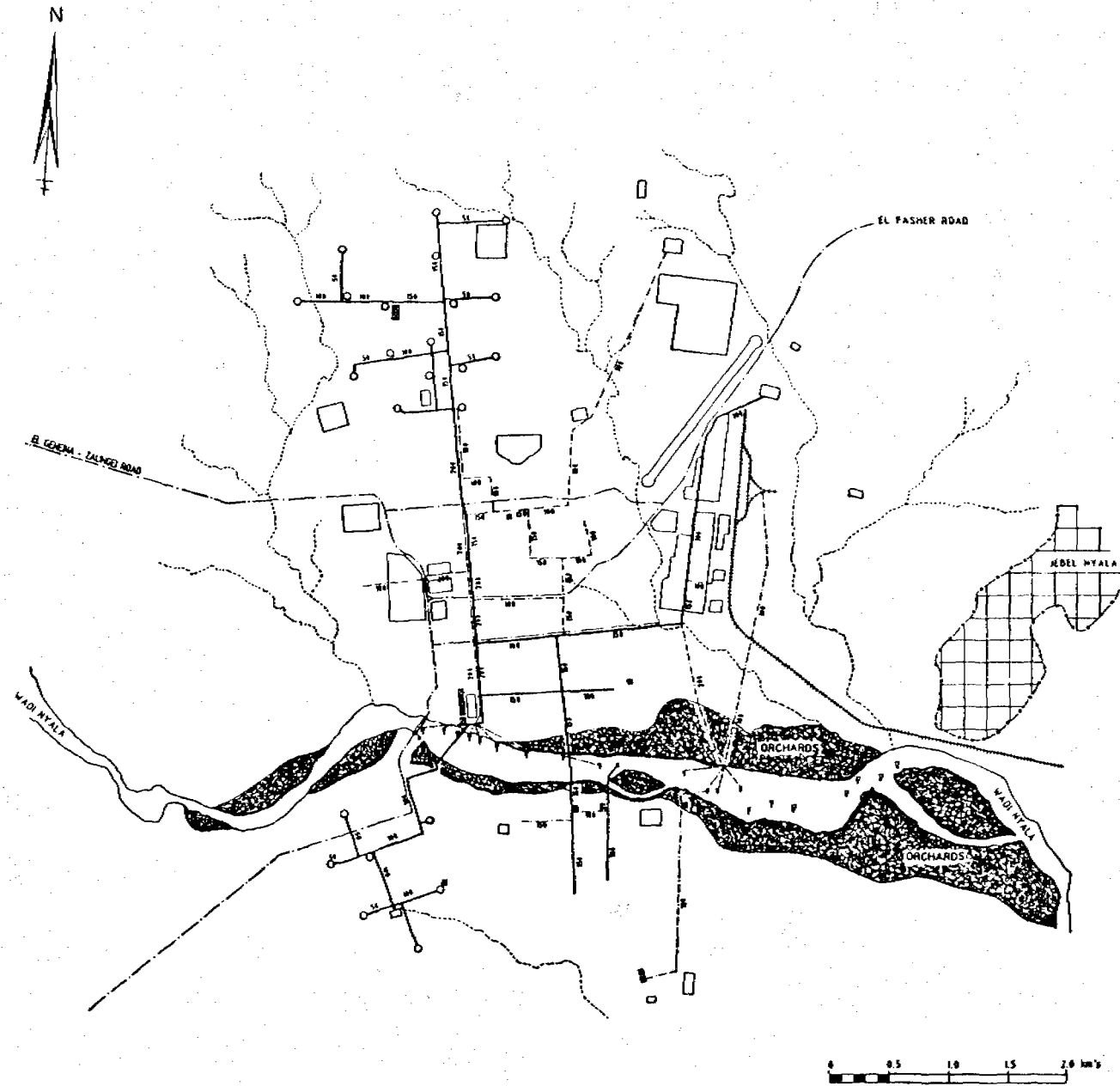
Progress made in Phase 2 project implementation in Nyala included (Figure 4):

- water supply service to outskirt settlements Sukar Shattat, El Khartoum Bileil, and El Wahda which were totally unserved when the project began
- Sukar Shattat/El Konghor distribution main with branch line to El Khartoum Bileil
- distribution main to Hai El Wahda (partly with push-off-resistant joints)
- construction of more than 20 new water kiosks and re-connection of 4 existing water kiosks
- erection of 3 new elevated tanks
- construction of valve chambers with heavy covers of reinforced concrete
- on-the-job training in installation of valves
- installation of sectional valves and air valves
- rehabilitation of selected service connections to the water supply system
- branch lines and connections to elevated tanks
- on-the-job training of pipe fitters
- selection of locations for bulk water meters
- drilling of 4 new boreholes
- laying of discharge lines for borehole pumps (partly with tension-resistant joints)
- supply and installation of 5 new borehole pumps
- placement of support poles for overhead power lines
- wiring of overhead power lines and connection to power off-take at the booster pump station
- preliminary improvement of electrical circuit and switchgear in booster pump station
- supply and installation of 2 new booster pump/motor sets (each rated 100 m³/h at 60m head)
- repair of existing elevated balancing tanks at NUWC compound, including the sealing of leaking plate and bottom joints
- provision of expert advice in mechanical and electrotechnical works (i.e. power distribution switchboard, power control panels for borehole pumps, pump installation and power connections)
- installation of new borehole heads with non-return valve and isolating (gate) valve
- on-the-job training of staff of the NUWC-organization in Nyala, in water supply engineering and design, and in supervision of construction work.

In the old water distribution network of Nyala which was constructed some fifteen years ago with asbestos-cement pipes and fittings (of imperial not metric sizes), major rehabilitation will be required to reduce water leakages by renovation of defective pipe sections and joints. Almost all of the sectional and other valves are badly leaking and many are inoperative (of some valves the gate is missing altogether). There are some 8 000 house connections, some fitted with a water meter, but most in a very poor condition and leaking. In the present state, the distribution network cannot maintain the working pressure required to serve the higher-lying parts of the service area and these are, therefore, without water supply most of the time. In the design of the Nyala water supply system as developed by the project, account has been taken of this situation and a

how
people
will
react

FIGURE 4 NYALA - PRESENT WATER SUPPLY SYSTEM



LEGEND

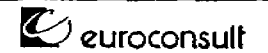
- RAILWAY
- ROAD
- - - SURFACE DRAIN DHOOR
- ▼ EXISTING BOREHOLE
- ▽ PLANNED BOREHOLE
- - - EXISTING PIPELINE
- ELEVATED TANK
- WATER KIOSK

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 WATER SUPPLY PROJECT

NYALA
 EXISTING WATER SUPPLY SYSTEM



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limited supply pressure (30 mwc) is foreseen for this part of the distribution system. Even so, extensive provisions for rehabilitation of the old distribution network will be required in the Phase 3 project period to secure the suitability of the network.

The NUWC staff and personnel deployed in the execution of project Phase 2 (some only part of the time) are listed in Table 1.

Table 1 - NUWC staff and personnel deployed in Nyala during project Phase 1 and 2

Category	Number
Resident Engineer	1
Assistant Resident Engineer	1
Mechanical Engineer	1
Construction Supervisor	-
Superintendent/Commander	1
Foreman	1
Pipe fitters (experienced)	5*
Pipe fitters (unexperienced)	3
Skilled labour	6*
Unskilled labour	50

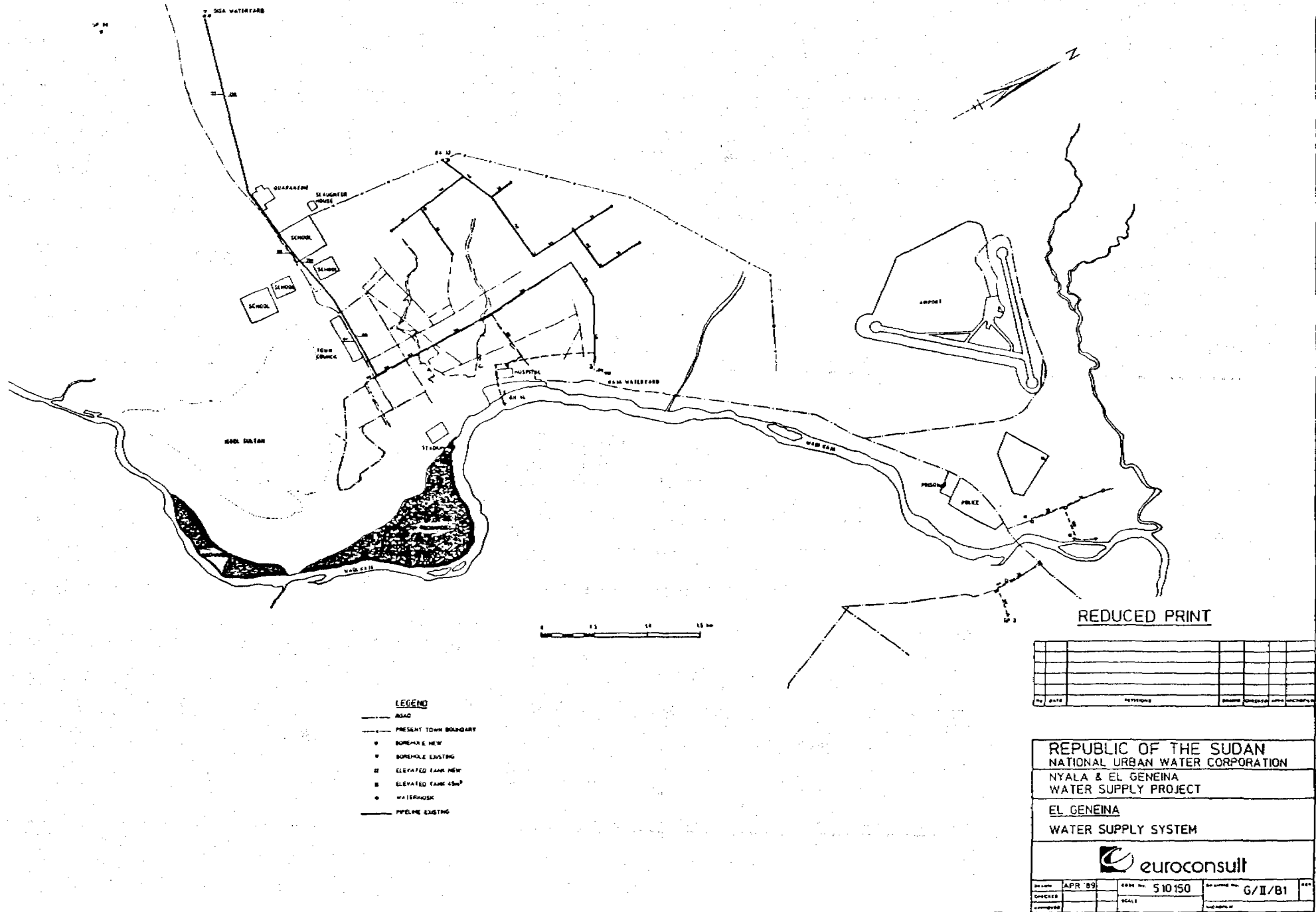
* Engaged in the project part of the time

2.3 El Geneina

Progress achieved in Phase 2 project implementation in El Geneina included (Figure 5):

- water supply service by water kiosks to parts of the outskirts settlements which were totally unserved when the project began
- BH 13 distribution main with branch line
- Disa distribution line (DI 200mm dia)
- distribution line from borehole BH 14
- distribution lines in Ardamatta area
- construction of 14 new water kiosks
- on-the-job training of pipe fitters
- construction of valve chambers complete with concrete covers
- installation of sectional (gate) valves
- on-the-job training in installation of valves
- site location for erection of 3 new elevated tanks
- repair of elevated tank at Disa water yard
- temporary repair of elevated tanks at Kaja water yard
- service lines from distribution mains to newly constructed water kiosks
- drilling of 2 new boreholes (BH 13 and BH 14)
- installation of 2 new borehole pumps
- trenching and pipelaying for discharge line of borehole GP 06 to Disa water yard
- temporary provisions at BH 13 station for direct pumping of water into BH 13 main

FIGURE 5 EL GENEINA - PRESENT WATER SUPPLY SYSTEM



- installation of new electro-generator set at BH 13 station, complete with power cabling
- overhead power line connecting GP 06 borehole pump with electro-generator set at Disa water yard
- construction of new generator house at BH 13 station
- cleaning-out of borehole GP 02 at Ardamatta water yard
- basic repair of existing small elevated tank at Ardamatta water yard
- construction of new generator house at Ardamatta water yard
- installation of new electro-generator set at Ardamatta water yard
- preparations for removal of old reciprocating pumps (SBS type) from boreholes at Kaja and Disa water yards
- provision of expert advice in mechanical and electrotechnical works (i.e. pump installation and power connections, power control panels and switchgear)
- on-the-job training of staff of the NUWC-organization in El Geneina, in water supply engineering and design, and in supervision of construction work.

The old water distribution network of El Geneina which was constructed some fifteen years ago with asbestos-cement pipes and fittings, is subject to considerable water losses by leakage. Many of its pipe joints are apparently leaking and most of the sectional valves inoperative. There are about 800 house connections most of which in a poor state of repair. Some are equipped with water meters which virtually all are out of operation.

Although the works executed by the project have provided tens of thousand people in the outskirts settlements, and also in the central town areas, with improved water supply from kiosks there remain large sections of population that are dependent on water vendors for their water requirements. The vendors sell water at excessive prices and of poor bacteriological quality because it is drawn from unprotected sources. Much work remains to be done to extend piped water supply service to the under-privileged groups of population who so far lack it. Low-income groups take very little water from the vendors (according to a survey the water usage is as low as 8-10 litres per head daily). The water is used very sparingly, not sufficient for personal and domestic hygiene. Hygiene- and water-related diseases occur widely under the population of El Geneina, especially among the low-income population and refugees in the fringe settlements.

The public power supply of El Geneina presently is very unreliable and subject to frequent breakdown. The power supply to the BH 14 borehole pump is from the town's power-generating plant. It is often interrupted so that the pump cannot be operated regularly.

The NUWC staff and personnel deployed in the execution of project Phase 2 are listed in Table 2.

Table 2 - NUWC staff and personnel deployed in El Geneina during project Phase 2

Category	Number
Assistant Resident Engineer	1
Mechanical Engineer	-*
Construction Supervisor	-
Superintendent/Commander	1
Foreman	1
Pipe fitters (experienced)	4**
Pipe fitters (unexperienced)	3**
Skilled labour	3**
Unskilled labour	60

* Based in Nyala, worked most of the time there

** Available only part of the time

2.4 Logistical support

The logistical support provided by Euroconsult's Project Support Office, Khartoum, to the Nyala/El Geneina project, involved:

- making arrangements for customs clearance at Port Sudan of imported materials and equipment ordered for the project; this requires regular visits of Euroconsult staff from Khartoum to Port Sudan to follow up on the formalities and clearing procedures
- arrangements for inland transport of the imported materials and equipment, with Sudan Railways or for truck transport as appropriate
- daily radio communications with the project staff in Nyala and, if necessary, also directly with El Geneina; mail delivery of project documents and correspondence using Sudan Airways flights if possible or otherwise private charter flights
- procurement and delivery of materials and equipment from suppliers within the Sudan
- liaison with the project authorities in Khartoum (i.e. NUWC Head Office, Ministry of Finance and Economic Planning, Royal Netherlands Embassy)
- travel arrangements, visa and inland travel permits both for resident project staff and for experts on short-term missions to the project.

Throughout the project's Phase 2, the logistical support proved to be truly essential for the project's execution.

3 KEY ISSUES

3.1 General

The objective of the project is to provide better living and health conditions for the populations of Nyala and El Geneina, especially the under-privileged sections of population in the outskirts settlements of these towns. The project pursues this objective by making systematic improvements to the water supply systems of Nyala and El Geneina. The aim is to provide all groups of population in these two towns with a supply of water that is sufficient for hygiene and domestic needs, adequate in terms of convenience, and reliable for continuous operation year-round.

3.2 Target benefits and community participation

Improved water supply service for all or most of the populations in Nyala and El Geneina is the main target benefit of the project. In particular, the under-privileged sections of population in the outskirts settlements of the two towns will be benefitting greatly by the adequate and reliable water supply from the water kiosks. At the kiosks they can obtain their daily water requirements with less effort, in quantities sufficient for hygiene and domestic use, and at much reduced cost per unit of quantity (e.g. tin).

The construction of water kiosks also makes it possible to promote the participation of the women in the operation and use of the water supply systems. In many respects, women and children are the principal users of water and thus the main beneficiaries of improved water supply. By providing reliable water delivery points in the vicinity, the project supports the women in their traditional task of catering for the family's water requirements. Less effort, time and cost will be involved. This will promote adequate use of water for food preparation and cooking, and for cleaning of utensils, so that hygiene and cleanliness can be better maintained. Each water kiosk is to have a user committee of 4-5 members (preferably at least 2 women) selected from the population living in the service area of the kiosk. These user committees will be looking after the operation, use and hygienic conditions of the kiosks.

In addition, to strengthen the involvement of the populations of Nyala and El Geneina in the management of the town water supply systems, in each of the two towns the establishment of a Water Committee is foreseen which should advise the local authorities on all matters pertaining to the water supply especially the water rates charged.

3.3 Integration of water supply with hygiene education and promotion of sanitation

There is a close relation between water supply, environmental hygiene and sanitation. Improved water supply alone cannot be expected to produce lasting effects in hygiene or in health and living conditions. Sanitary provisions for hygiene and disposal of excreta are needed to reinforce the effects of improved water supply. The project will be instrumental in giving essential support to the local authorities and

future

future

health officials in the promotion of hygiene education and sanitation. This line of activity will be further supported by the Pilot Project.

Water-borne disposal of excreta and domestic wastewater is no realistic option for major parts of Nyala and El Geneina. The cost of sewerage systems would be prohibitive and in several parts of these towns such systems would not even be technically feasible because of topography, soil conditions and rock outcrops. Fortunately, low-cost technical options of sanitation are available and suitable to provide the desired hygienic benefits and convenience of use. These options include: ventilated improved latrines, toilets connected to septic tanks or double-vault soakaway pits, and aqua privies (with the limitation that these require watertight construction). Adequate disposal of garbage and other solid wastes also is an integral part of environmental hygiene. In Nyala and El Geneina it mainly concerns the disposal of kitchen garbage, household refuse and stove ashes. Under the Pilot Project, awareness will be promoted under the local populations of the serious health hazards caused by unsanitary disposal of solid wastes.

3.4 Institutional and organizational development

The institutional framework embodied in the NUWC-organizations in Nyala and El Geneina, the NUWC Regional Office for Darfur Region, the NUWC Head Office in Khartoum, and the local and national authorities concerned, is considered to be generally adequate for the requirements of the Phase 3 project.

Technical assistance and expert consulting services are foreseen under the Pilot Project for:

- clearer designation of functions and tasks within the NUWC-organizations in Nyala and El Geneina
- improved work planning for staff and personnel
- scheduled operation and maintenance work
- upgrading of skills of supervisory staff
- improved internal communications between management, supervisory staff and work force.

Full integration with the Pilot Project will be needed in the area of revenue collection and financial management. No water supply system can be successfully operated and maintained unless its revenue collection, financial management and administration are sound. Cost recovery, at least at the level of full coverage of the recurrent costs of operation and maintenance, is mandatory for the financial sustainability of the water supply systems.

3.5 Technical training programme

Key constraints to the effective functioning of the NUWC-organizations in Nyala and El Geneina are the weaknesses in staffing and level of skills. The technical training programme incorporated in the Phase 3 project, is focused on the provision of technical skills and know-how.

Upgrading of the level of skills of the technical personnel deployed for construction and installation work, and for operation and maintenance, is absolutely needed. The programme of technical training has been designed by a short-term expert mission in March 1989 (Technical Report Nyala/El Geneina Project - Technical Training Programme). Arrangements for suitable training activities have been developed under the project Phase 2 and will be continued in Phase 3.

3.6 Maintenance support

Regular inspection of operating equipment and maintenance schedules will be used to upgrade maintenance work and to prevent breakdowns. This relates particularly to pumps, power control, switchgear and instrumentation.

Operator's manuals and checklists for operation and maintenance are required. Documentation from suppliers of equipment or from other sources may be used. Translation of key sections of these manuals and checklists into Arabic will be needed. Parts' lists should be available and used particularly when ordering replacement parts.

3.7 Workshops and stores

Adequate workshop facilities are essential for the NUWC-organizations both in Nyala and in El Geneina.

In Nyala, space for a mechanical/electrotechnical workshop is expected to become available on the NUWC compound. In El Geneina a site has already been selected, with the approval of the regional and local authorities, for construction of a workshop annex to the new NUWC office.

Stores management needs to be improved by introduction of simplified stock control and issuing procedures for materials, spare parts and equipment.

3.8 Fuel supply and storage

The timely supply of diesel fuel for the operation of the water supply systems is a matter of continuous concern, especially for El Geneina. Bulk storage of diesel and fuel to cover at least three months' requirement during the wet season is essential for continuous water supply pumping operations.

3.9 Transport

For both Nyala and El Geneina the availability of sufficient transport facilities is a continuing concern. Construction and installation work under the Phase 3 project will impose considerable transport needs. Operation and maintenance work also regularly requires the transport of materials, equipment and personnel to the working sites.

3.10 Radio communication

Radio equipment allowing daily communications between Nyala, El Geneina, El Fasher and Khartoum, has been provided under the project's Phase 2. Arrangement have been made for the installation of the radio equipment in these places. The Ministry of Communications has granted a permit and assigned a radio frequency for use by the project.

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Euroconsult
 Nyala/El Geneina Water Supply Project
Monthly Progress Reports Phase 2 (November 1988 - date)
 Arnhem, Netherlands. Various dates.

Euroconsult
 Nyala/El Geneina Water Supply Project Phase 2
Technical training programme
 Arnhem, Netherlands. April 1989.

Euroconsult
 Nyala/El Geneina Water Supply Project
Technical Drawings Phase 2 & 3
 Arnhem. Netherlands. April 1989.

Euroconsult
 Nyala/El Geneina Water Supply Project
Pumping equipment - assessment and planning
 Arnhem, Netherlands. August 1989.

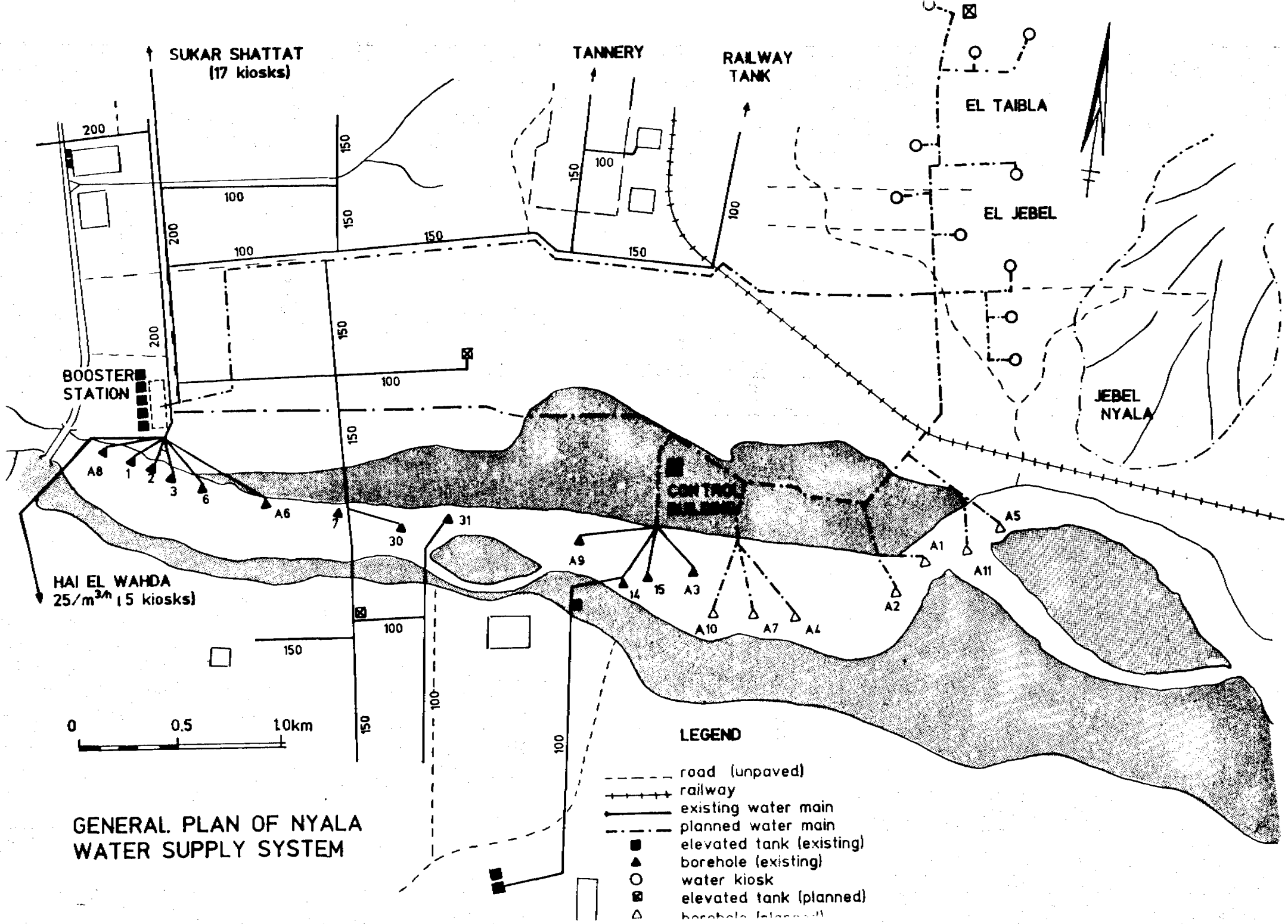
Euroconsult
 Project Formulation Report
Rural Towns Water Supply Development - Southern Darfur
 (Zalingei, El Da'ein and Buram)
 UN Capital Development Fund, New York. October 1988.

Howard Humphreys & Partners
Final Report on Nyala Water Supply
Final Report on El Geneina Water Supply
 Leatherhead, United Kingdom. 1983.

WAPS-Project (NCRWRD/TNO Groundwater Survey)
Report on Nyala Water Resources Study
Report on El Geneina Water Resources Study
 Khartoum/Delft, Netherlands. 1985.

ANNEX A

BACKGROUND MATERIAL



SUKAR SHATTAT
(17 kiosks)

TANNERY

RAILWAY
TANK

EL TAIBLA

EL JEBEL

JEBEL
NYALA

BOOSTER
STATION

CONTROL
BUILDING

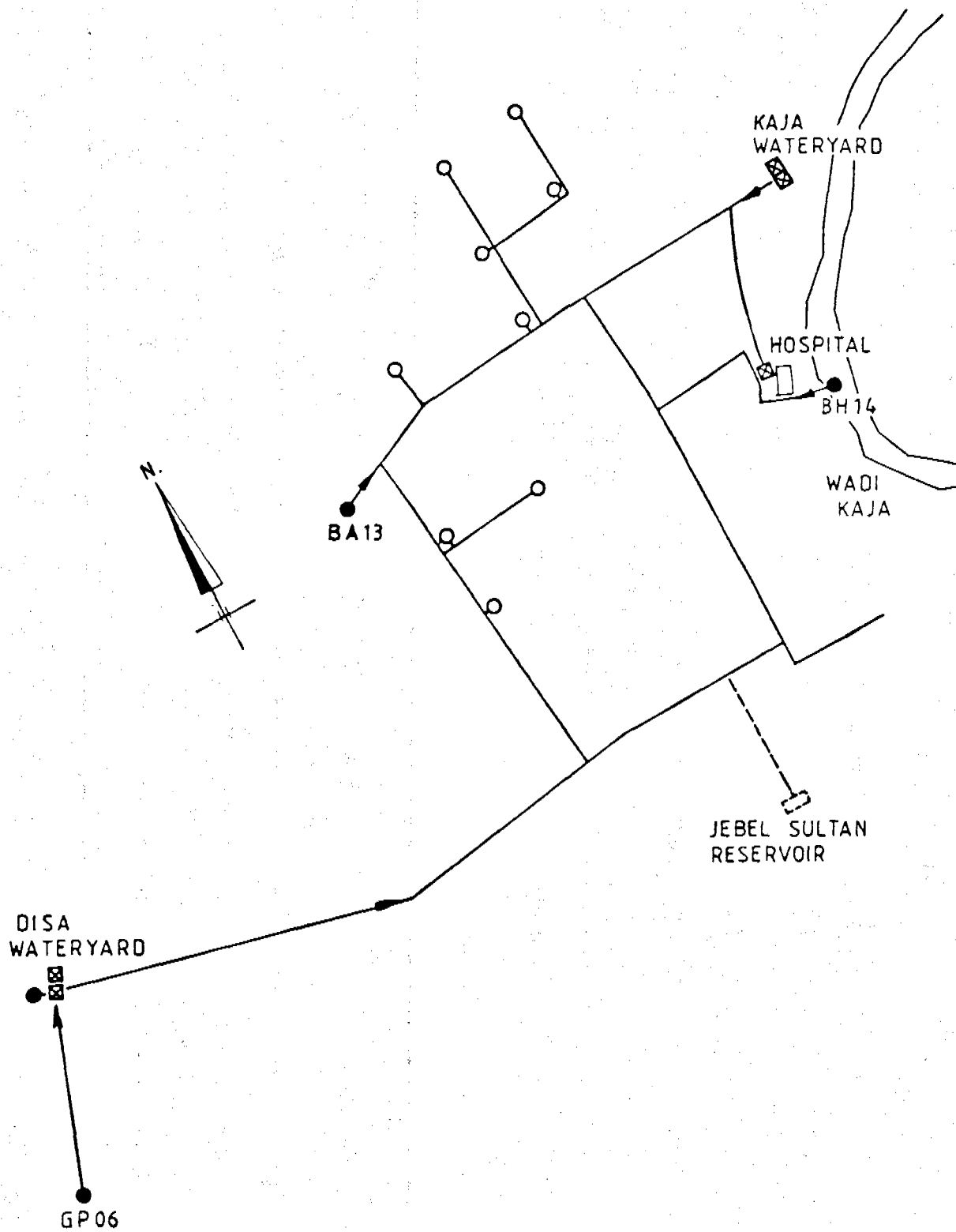
HAI EL WAHDA
25/m³h (5 kiosks)

0 0.5 1.0km

GENERAL PLAN OF NYALA
WATER SUPPLY SYSTEM

LEGEND

- road (unpaved)
- ++++ railway
- existing water main
- - - planned water main
- elevated tank (existing)
- ▲ borehole (existing)
- water kiosk
- ⊠ elevated tank (planned)
- △ borehole (planned)

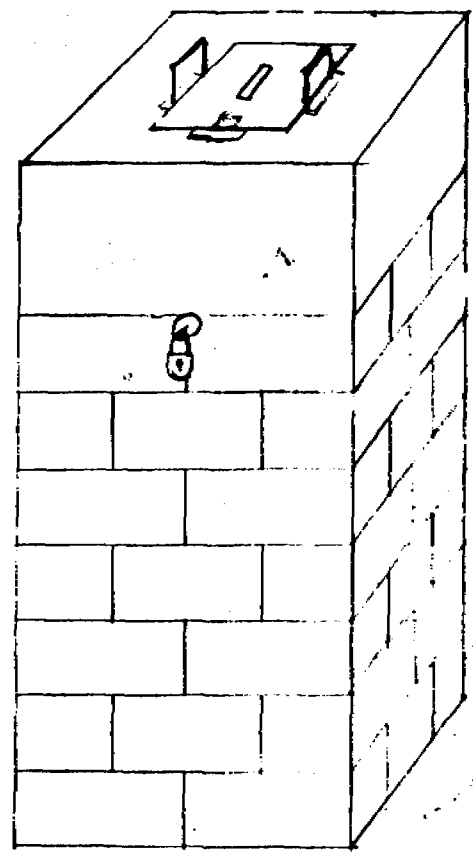


- General plan of El Geneina water supply system

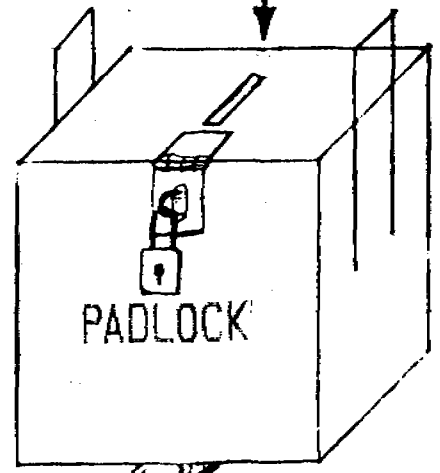
NYALA/GENEINA ...
WATER SUPPLY PROJECT

أقل بعد ٢٥ فرس لصيقين
أرفع داخل الصندوق

PROPOSED CASHBOX STAND



PADLOCK

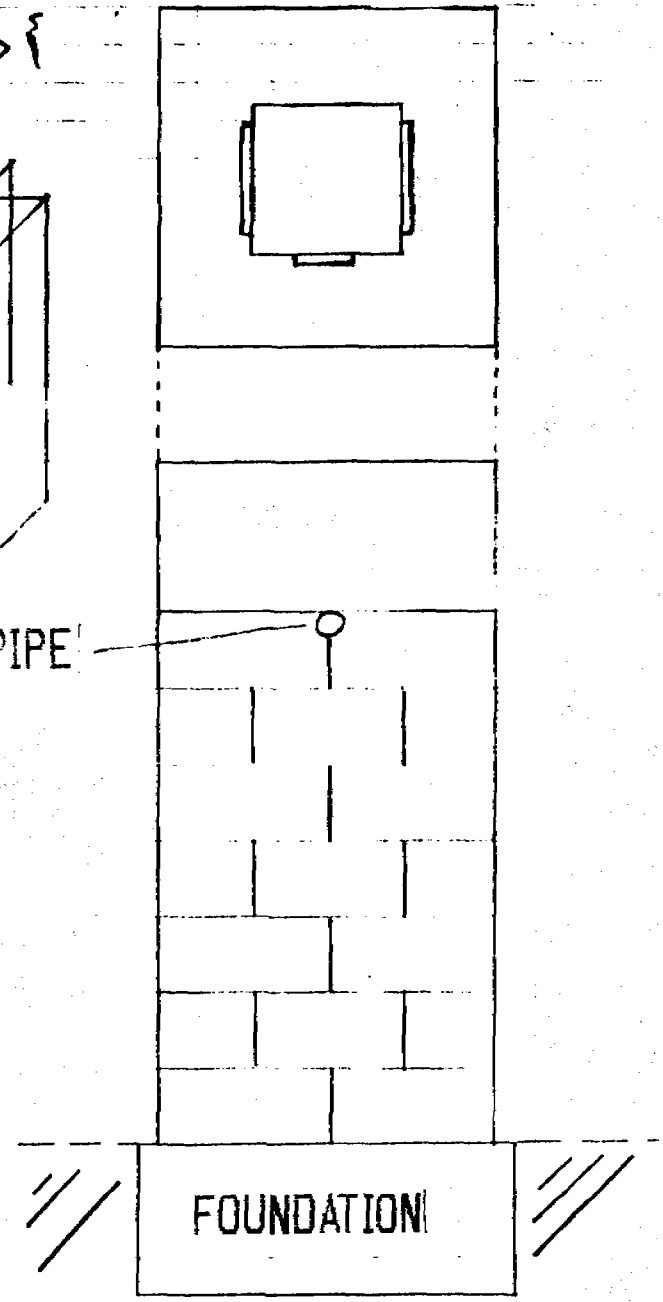


PADLOCK

1" G.S. PIPE

CASH BOX
(SCALE 1:5)

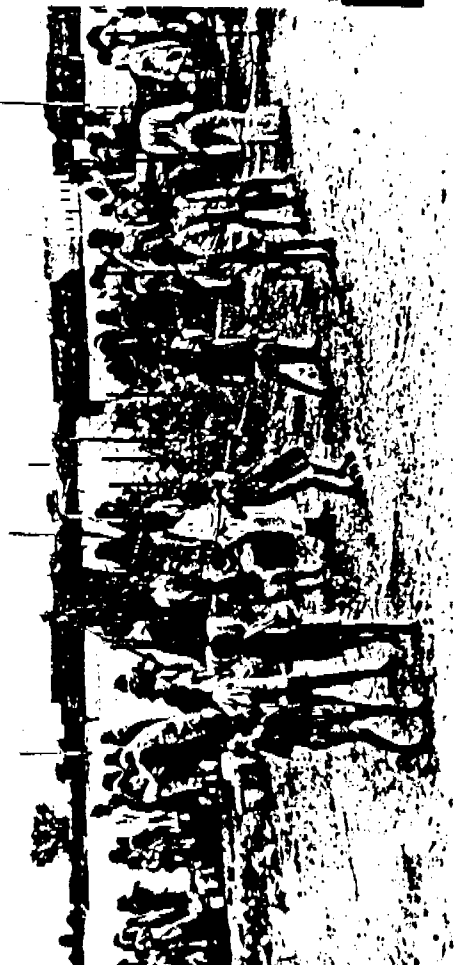
LOCKING PIN
(SCALE 1:5)



FOUNDATION

CASHBOX STAND (SCALE 1:10)

SOME IMPRESSIONS AROUND THE KIOSKS







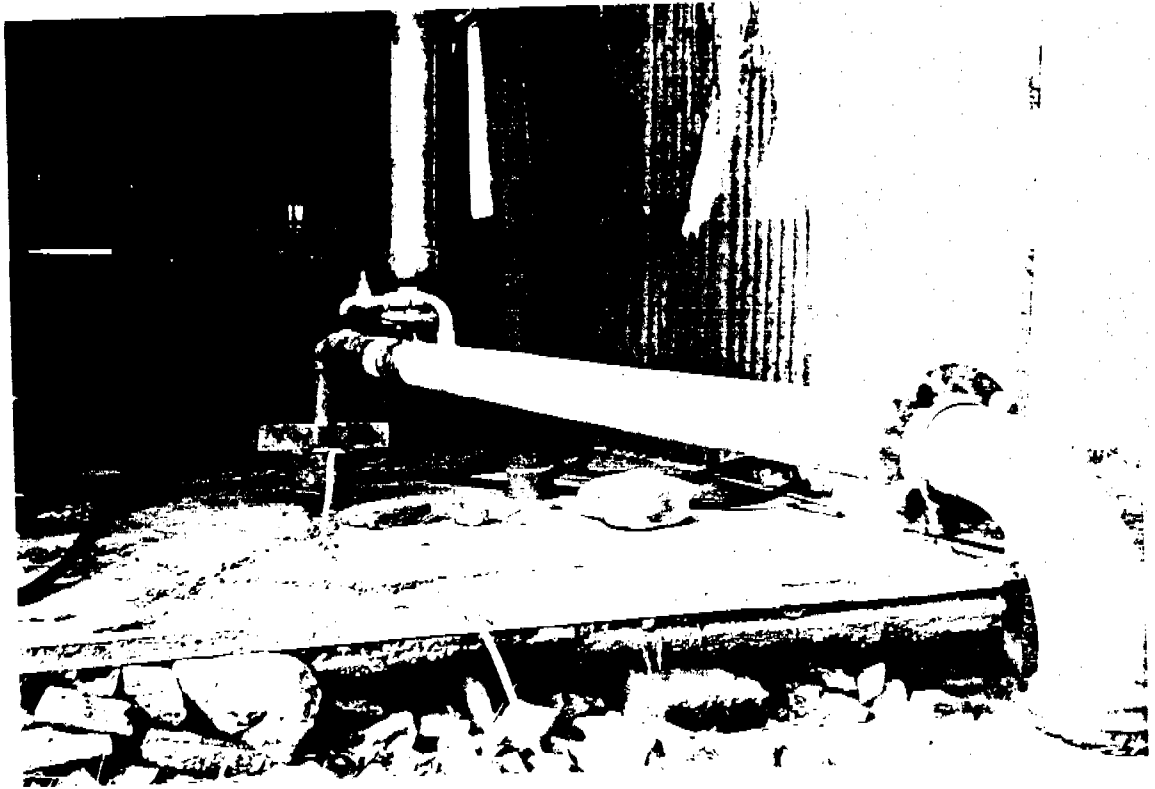
leaking airvalve



Washing mainline
Sukkar Shattat



Women fighting for water
during washing periode.





IMPROVEMENTS ON OLD TOWN MAINS



Republic of the Sudan

الرحمن الرحيم 71/5.10.150

ingek. : 3/3 ربة السودة

behand. EHH
door: EHH

behoef. jo nes

kopie: brief

bijl.

EHH K

ret 529

الهيئة القومية لمياه المدن

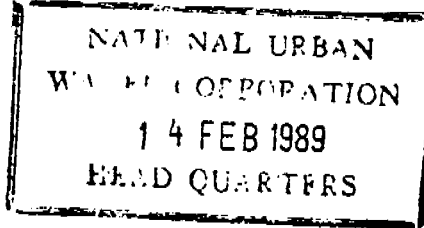


NATIONAL URBAN WATER CORPORATION

Our Ref 17/A/2/660
Your Ref. _____
Date 11/2/1989

اشارتنا
اشارتكم
التاريخ

Royal Netherlands Embassy
Khartoum



Attn. Mr. P Plantinga
First Secretary
(Development Cooperation)

Dear Sir,

Nyala/El Geneina Water Supply Project Staff Training

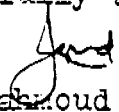
In the approved plan of implementation for the above-mentioned project, provisions have been made for training of N.U.W.C. staff assigned to the project.

In accordance with the agreements between the Netherlands Government and the Government of Sudan, we now wish to request your assistance in this respect. Please instruct the Consultant, Euroconsult, to make the necessary arrangements for overseas training in project management and administration for the following N.U.W.C. staff engaged in the project:-

Mr Mohamed Ali Abakar
Resident Engineer (Nyala)
Mr Mokhtar Bushra
Assistant Resident Engineer (El Geneina)

Your support in this matter will be gratefully appreciated.

Yours faithfully,


Ismail Mahmoud Ismail
Director General

١٤ ب شارع الجمهورية ص.ب ٣١٠ الخرطوم تليفونيا : مياه الخرطوم تليكس ٢٢٢٣٠ الخرطوم تليفونات : ٨١٣٤٠/٨٠٧٨٧

13 B. Camhuria Avenue P. O Box 310 Khartoum, Teleg. Watër Khartoum, Telex : 22230 Nuwc Tele : 80787/81348

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

السيد / السيد / Mr. Musa

Republic of the Sudan

جمهورية السودان

الهيئة القومية لمياه المدن



NATIONAL URBAN WATER CORPORATION

Our Ref. _____

Your Ref. _____

Date 16th October 1988

١٥/١٠/١٩٨٨
الهيئة القومية لمياه المدن
في نيالا

اشارتنا
اشارتكم
التاريخ

His Excellency
the Governor of the Darfur Region
EL FASHER

١٥/١٠/١٩٨٨
الهيئة القومية لمياه المدن
اقليم دار فور - الفاشر
التاريخ
الشؤون الادارية

Subject: Nyala Watersupply

Your Excellency,

We like to refer to the meeting held in your office on 5th October recently on the subject of the Nyala Watersupply Project.

Data submitted by Euroconsult, the consultant to this project, to the Ministry of Housing and Public Utilities in El Fasher on their request were the motif for this meeting.

Those data revealed the relation between the available groundwater potential in the Wadi Nyala and the maximum population in Nyala that can be served from it.

In addition to our briefing on the actual scope of the project, we expressed the need for further comprehensive investigations into supplementary and feasible sources of watersupply, for reason, as it was understood, that Nyala be a Darfur rural growth centre and because the waterdemand will reach the yieldcapacity of the aquifer in the next decade.

Although NUWC-Khartoum is the implementing authority of the project, the local and regional urban water corporations are much concerned with it, as they are the responsible bodies for operation after completion, who will face consequently future constraints.

Euroconsult, the consultant appointed by the donor as the advisor to the actual project, has the expertise, experience and appropriate advanced technology to study and recommend feasible solutions.

To our opinion, consultant's involvement should embrace such investigations to locate additional waterresources.

The latter however is subject to acceptance by the implementing authority and the donor and subsequent approval of consultant's proposal.

١٥٤٠/٨٠٧٨٧ : الخرطوم تلهونات : ٥٧٧٤٠ الخرطوم تليكس : ٣١٠ الخرطوم للترافيا : مياه الخرطوم نلكس : ٥٧٧٤٠ ب شارع الجمهورية ص.ب ٩١٠

13 B, Omburia Avenue, P. O. Box 910 Khartoum, Teleg. Water Khartoum, Telex : 22250 Nwuc Tele : 00787 8290

الهيئة القومية لمياه المدن



NATIONAL URBAN WATER CORPORATION

Our Ref. _____

Your Ref. _____

Date _____

اطروقتا

اشارتكم

تاريخ

Bilateral discussions on development co-operation between the Republic of the Sudan and the Kingdom of the Netherlands will be held in Khartoum as from 13th December 1988.

We kindly request you to take this opportunity and use your good offices in calling the attention of the implementing authority and the donor to the above subject.

Yours faithfully,

Joseph Akol Anei
Deputy Regional Director NUWC El Fasher

Ahmed Musa
Director Nyala Urban Water Corporation

cc. : mr. Mokhtar Bahr Eldeen
Director Regional Office
Ministry of Housing and Public Utilities

mr. Mohammed Ali Abakar
Resident Engineer
Nyala-Geneina Water Supply Project

mr. W. Welink
Project Advisor Euroconsult
Nyala-Geneina Water Supply Project

مستند ملفت للمتابعة
م. ب. ا
م. ب. ا
م. ب. ا
م. ب. ا
م. ب. ا

١٣ ب شارع الجمهورية ص. ب ٧١٠ الخرطوم تلفرانبا : مياه الخرطوم تنكس ٧٧٧٣٠ الخرطوم تلفونات : ٨٧٧٦٠/٨٠٧٧٧

13 B. Gamhuria Avenue. P. O. Box 910 Khartoum, Teleg. Water Khartoum, Telex : 22290 Nuwc Tele : 80787 91940