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SETTLEMENT PROJECT
FOR
ETHIOPIAN REFUGEES FROM ERITREA
IN
EAST CENTRAL SUDAN

Confidential Preliminary Report

8 February, 1976.

Hunting Technical Services Ltd.
Land & Water Resource Consultants,
Borehamwood,
England.

SUDAN 274D

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1. The first part of the paper discusses the general theory of the subject. It is divided into two main sections: the first section deals with the general theory, and the second section deals with the special theory. The general theory is based on the principle of least action, and the special theory is based on the principle of least time.

2. The second part of the paper discusses the application of the general theory to the special theory. It is divided into two main sections: the first section deals with the general theory, and the second section deals with the special theory. The general theory is based on the principle of least action, and the special theory is based on the principle of least time.

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Introduction

At the beginning of January 1976, UNHCR requested the Consultants to carry out a preliminary study of the feasibility of an agricultural settlement scheme for refugees near Esh Showak in the area set aside by the Government of Sudan and defined in a Presidential Decree.

On 5th January, two members of the pre-feasibility team left for the survey area. They held discussions with the Assistant Commissioner at Gedaref and his staff, as well as with the representatives of the Rural Water Corporation, the Mechanised Farming Corporation, Ministry of Education, Ministry of Health and the Police. After obtaining general information about the refugee problem in Gedaref District, the team visited the area set aside for the settlement scheme near Esh Showak, and representatives of the local farming community were interviewed at Umm Sheggara, Esh Showak and Mugataa. In the course of this work, the team toured the proposed settlement area. Further discussions were held with the Local Government Officer at Esh Showak.

The team then proceeded to Wad el Hileiwu in order to meet prospective settlers. In addition to meeting the refugees themselves and staff of the Commissioner for Refugees, discussions were held with representatives of the Ministry of Local Government, the headmaster of the school and the Police. The team also met the Omda of the Wad el Hileiwu area. A survey was made of the village environment, its water supply and agricultural hinterland. In order to gain information about previous refugee settlements in the rainlands, a visit was made to Qala el Nahal.

The Esh Showak area was visited by a hydrologist* and a hydrogeologist. An aerial reconnaissance of the area was carried out in company with UNHCR staff.

We wish to thank all the people who gave their time and their help to the members of the team. In particular we wish to thank the Commissioner for Refugees, members of the UNHCR staff in Khartoum and officials of the Ministry of Local Government in Gedaref.

It proved necessary to look into the broader aspects of the refugee problem in order to gain a closer understanding of the type of settlement required. As a result, this report contains recommendations which

* from Sir M. MacDonald & Partners

extend beyond the original terms of reference. It includes proposals for improvement of services for refugees at Gedaref, Wad el Hileiwu and Qala el Nahal as well as an outline proposal for a new settlement scheme at Jebel Maharigat near Esh Showak. In Appendix V, a detailed work programme is set out for a feasibility study. The Consultants would be pleased to participate in this programme if UNHCR and the Commissioner for Refugees so desired.

Finally, it is necessary to say that because of the short time which we had to study the problem (about one month), some of our observations may be superficial. Nevertheless, we hope that this report will throw new light on the refugee problem and form the basis for a successful project.

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THE ESH SHOWAK SETTLEMENT AREA1.1 Introduction

When a wave of refugees swept over the border from Eritrea into Sudan in 1967, the Sudan Government saw the solution in the context of a land settlement scheme in which the refugees would become self-farmers. With the aid of UNHCR such a scheme was established at Qala el Nahal. In 1972 a further area of 240,000 feddans was demarcated north-west of Esh Showak and the boundary was surveyed by the Sudan Survey Department. Three sites were selected for boreholes and UNHCR contracted RWC to drill and erect three water-yards (a borehole with facilities for domestic and livestock use). So far, no refugees have been moved to the area, but it was the intention of Government that refugees should begin to settle before the coming rainy season.

1.2 Present Land Use in the Esh Showak Area

It is well known that the area is already used by local cultivators as well as large-scale producers, but it has been assumed that these farmers would be prepared to move out when the time came. However, the Government appears to have underestimated the problems involved.

Although we recognize that the area has been set aside by a Presidential Decree, thus cancelling the traditional rights of the people in the area, we do not believe that, given this new information, either the Government of Sudan or UNHCR will wish the rights of the people expropriated. The demarcated area is at present intensively cultivated with the exception of an area to the east. It is farmed, not by absentee landlords from urban areas, but by long-settled village communities. For example, the farmers at Umm Sheggara are descendants of the nomadic Shukriya tribe who have occupied the area since the Mahdiya. The farmers of Esh Showak and the camel herders at Muqataa moved into the area during the early days of the Condominium.*

* 1972 satellite imagery of the area indicates that, contrary to what has been believed, the area was cultivated at the time of demarcation.

The capital assets of the existing farmers consist not only of moveable equipment, such as tractors and vehicles, but also of hafirs, housing for labourers and cleared land. Their enterprises have grown rapidly since 1958 and some of the more successful ones have become modern farms in every sense of the word; thousands of feddans are cultivated annually, employing about 16,000 labourers. These are recruited locally or come from western Sudan; some are refugees from Eritrea. Each farmer has developed his own individual technique, practising improved methods such as weed control, seed selection, land rotation, etc.

The legal status of the farmers in the area is precarious because all farms in excess of 1,500 feddans in the name of one user are technically illegal. However, no plans have been made by Government to sub-divide the area into 'schemes' of approved size because the area is officially considered to be marginal in terms of rainfall and now exhausted. The local farmers prefer this area to those further south because weed growth is not so prolific and plant diseases (presumably fungal) are less frequent in the drier environment.* Proximity to markets is another reason why farmers prefer this area to those further south.

There is a further fact which must be taken into account. It has been estimated by a committee set up by the Assistant Commissioner, Gedaref, to examine the grievances of the existing farmers in the area of the Presidential Decree, that the gross production of sorghum in that area averages 600,000 sacks per year**, equal to about L.S. 3 million per year. If no alternative area is allocated to the existing farmers, the loss to the Sudan economy will exceed the costs of maintaining the refugees in a camp without work.

There are few livestock because of the shortage of water points. The sorghum stubble is grazed by camels which enter the area after

* Contrary to earlier reports, we could find no evidence that there had been a history of crop failure in the area due to low rainfall.

** The present relief to the refugees is calculated to be 40,000 sacks per annum.

the harvest. Introduction of cattle is dependent on the construction of hafirs and wateryards.

The northern part of the proposed settlement area is used by the Lahaween tribe of camel herders. It forms a central position on the route between the River Atbara and the grazing area near Jebel Kasamor. During the late dry season, thousands of camels congregate in the northern part of the settlement area before moving into the area of the sorghum stubble. The high ground around Jebel Karkora is used by the Lahaween for camp sites. Any extension of sorghum cultivation northwards would transgress on the traditional rights of these people and would run counter to one of the principal objectives of the settlement programme: namely to integrate the refugees into the local physical and human environment.

There are no villages in the proposed settlement area. The only settlements are 10 to 15 small camps for agricultural workers. Permanent settlement has been precluded both by the general absence of domestic water and poor drainage. Settlements are confined to small hills, none of which are found in the area of the Presidential Decree. During the rainy season the clay soils become sticky, then plastic, and the roads become impassable for normal traffic. Water stagnating on the impermeable surface creates an unhealthy environment, especially unattractive to refugees used to well-drained hilly country.

Whilst overestimating the readiness of existing farmers to vacate the area, Government has also overestimated the willingness of Eritrean refugees to take up sorghum production as individual farmers. The farming interests of the refugees will be discussed in another section of this report.

Our conclusions on the existing proposal for a refugee settlement scheme in the area of the Presidential Decree are as follows:

1. The area is intensively used and any attempts to compulsorily vacate it for the refugees would create more human problems than it would solve.

2. The value of the present production from the area represents a very high opportunity cost to a refugee settlement scheme which displaces existing producers.

3. The agricultural economy in the area of the proposed settlement scheme can offer substantial employment opportunities to refugees if left undisturbed.

4. The expropriation of existing rights in favour of refugees would create strong local opposition to refugees rather than local acceptance which we observed at Wad el Hileiwu.

5. The drainage of the area is poor and the construction of settlements would involve costly engineering works.

In our discussions with Government officials, at all levels, it was revealed without exception that they agreed with the above conclusions and were anxious to find alternative solutions.

THE ETHIOPIAN REFUGEES FROM ERITREA

In the course of the pre-feasibility study, an attempt was made to meet as many refugees as possible. In addition to interviewing itinerant refugees wherever we encountered them, we visited Wad el Hileiwu and Qala el Nahal.

2.1 Migrant Labourers

Some refugees were encountered working as casual labourers in the area of the proposed Esh Showak scheme. They consisted of men and boys, wandering in groups through the area looking for work. They work for only short periods and then return to join their families. They were poorly clothed and generally in poor health. They said that the work which they particularly disliked was weeding; they are unaccustomed to the heavy clay soils of the rainlands and are used to working with animal-drawn rather than hand tools. They dislike the clay plains and say that they are plagued with mosquitoes and malaria and that it is too humid during the rainy season. They expressed a strong desire to settle in Wad el Hileiwu because it is elevated and well drained, has good water from the river and is healthy.

It is interesting to note the opinions of the sorghum farmers who employ the refugees. Compared with the Westerners, the refugees are considered lazy and reluctant to stay until the task in hand is completed. Unlike the Westerners, who come to earn money to buy cattle or a bride and return to the west after a couple of years, the refugees are content to live from month to month and do not save. They return to their homes after collecting only a few pounds and set off again in search of work when their money is exhausted. The sorghum farmers are prepared to employ refugees because employment is based on piece rates and because of the general shortage of labour. One disadvantage of employing refugees is that they, like other casual labour, receive a daily allocation of food (sorghum flour, weika and dried fish); the longer they take to do the task, the longer the employer has to provide the food.

2.2 Qala el Nahal Refugees

The majority of the 1967 refugees were settled in an ambitious settlement project in the neighbourhood of Qala el Nahal. Many of the refugees were formerly nomadic pastoralists. Great care was taken to provide the basic services for their welfare, namely schools, water supply, health services and security. In addition, tractors were provided for sorghum cultivation. In 1975 UN food aid was withdrawn following two reasonably good harvests. The resident manager also left at that time. The scheme was taken over by Local Government which was then expected to carry the costs of operating the tractor services as well as other services.

We visited only Um Saqata*, the principal settlement of the above scheme on 14th January. We observed that the village was almost deserted. Houses were closed up and dilapidated. Grain stores were overturned and empty. The shops in the market were closed and the few which were open were very poorly stocked.

In the course of an informal meeting, the team was told by a group of indignant refugees, that due to the late arrival (28th August) of fuel for tractors, no cultivation had taken place on time and the harvest was negligible. Certainly, a tour of the area confirmed this. People had left the village in search of work and taken many of the children with them. They had sought work in the agricultural production schemes (cotton picking, M.C.P.S. at Simsim for sorghum harvesting) and in Khartoum and Khashm el Girba. We discovered from another source that some refugees had returned to Wad el Hileiwu to take advantage of the food relief. It was pointed out that even if the fuel had arrived on time, the refugees would not have had enough savings in grain to carry them over until the harvest and they were forced to work as labourers on the land of local farmers.

The services allocated to the refugees have been of very little benefit in the absence of an adequate means of subsistence. The evidence of the Sudanese school teachers on the subject of the childrens' diet was typical. The children arrive at school at 6.30 a.m. and leave at 3.00 p.m. The majority of them spend that

* Our conclusions are therefore based on this village and may not be representative of the settlement as a whole.

period without food. The health condition of the orphans is particularly bad. When the children do eat, they receive only aseeda without the sauce. The children suffer from anaemia and TB. The comparative poverty of the area is clear to anybody with a knowledge of rural Sudan: very little meat is eaten; on the rare occasions when an animal is slaughtered, there is insufficient purchasing power for the carcass to be sold in the one or two days before it has to be condemned; the village shoemaker sits in front of a pile of unclaimed shoes because the people do not have the few piastres needed to collect them.

In a meeting with the remaining sheikhs at Um Saqata (5 of 22), the team listened to a list of grievances. The problem of the tractor services was uppermost. They complained of the proposal to charge for water. When asked how they could best be helped to help themselves, they requested an agricultural manager like Omer*. He had been able to get what the refugees wanted. He had been hard working. He had even chased the tractor drivers in the middle of the night when they neglected their duties.

2.3 Wad el Hileiwu Refugees

About 70 per cent of the refugees at Wad el Hileiwu come from Umm Hager (Gaymans, 1976**), about 55 miles upstream, which has an identical environment. Before the recent disturbances, the international frontier had little cultural significance. People visited their kin across the frontier at Umm Hager, just as they might visit people in a neighbouring Sudanese town. Many of the Sudanese at Wad el Hileiwu have relatives among the refugees. Several of the school children have been re-patriated and rejoined their old school at Wad el Hileiwu. In many respects, it is difficult to distinguish refugees from the local people. If it had not been for the war, many of them would be considered seasonal agricultural and pastoral migrants. Other refugees are from dry, hilly country in the Eritrean interior. For them Wad el Hileiwu is a new environment,

* the present Commissioner for Refugees

** H. Gaymans: Socio-Economic Survey among Refugees at Wad el Hileiwu UNHCR Khartoum 1976

but not so fundamentally different as the clay plains. As a result of the war, they have lost all their possessions and been separated from their kin. Nobody would wish to compound their distress by resettling them in an alien environment.

Table 2.1 Composition of Wad el Hileiwu (Gaymans, 1976)

Sudanese	3,300
Hausa and Burno	1,600
1967 refugees	3,000
1975 refugees	11,900
Uncertain	<u>900</u>
Total	<u>20,700</u>

Table 2.2 Place of residence before flight to Sudan (after Gaymans, 1976)

Place of Origin	Refugees ¹	Refugees ²	All
	1967	1975	Refugees
per cent			
Umm Hager	14	74	60
Village near Umm Hager	2	10	8
Other Town	43	11	19
Village near Other Town	40	4	13

¹ 43 informants

² 140 informants

In all our meetings with refugees they expressed a strong desire to stay at Wad el Hileiwu. This is understandable if one compares the environment there with the clay plains. The village is sited on the valley side of the Setit. It is elevated in relation to the surrounding country and from most parts of the village it is possible to obtain a wide view. As we have already mentioned, the site is considered healthy and well drained. The Setit is a perennial river in most years and flows in a gravel bed. It is clean and presently a more healthy source of water than is found on the Blue Nile, Dinder or Rahad which are the principal sources of water in the plain.

Before the arrival of the refugees in 1967 the village of Wad el Hileiwu had about 2,500 people. It was a small market centre with a stagnant economy. Since the influx of the 1975 refugees it has developed into a town. New buildings have sprung up (government offices, food relief stores, shops and coffee houses) and the square is busy with vehicles, many of them imported by the refugees. The settlement now gives the impression of being a thriving market town.

This impression of prosperity is, of course, superficial. Much of it results from Government and UN aid which cannot continue indefinitely. Nevertheless, the investment by the refugees in shops and services (coffee places, tailor shops, shoemakers, radio repairers, butchers, etc.) is substantial and would be costly to relocate elsewhere. If it were possible to involve refugees in agricultural production in the Wad el Hileiwu area (thus removing the need for aid) and if it could be established that the settlement of refugees in the area did not constitute a risk to security, then such a move would not be necessary.

2.3.1 Meeting with the Omda of Humrau

The omda confirmed that many of the refugees from Umm Hager were closely related to the people of Wad el Hileiwu. He was keen to point out that the refugees were welcomed because they had brought prosperity to the area. He was anxious that they should not be moved. In 1967, he had been summoned to Kassala to discuss the refugee question with the Commissioner. They had agreed at that time that the refugees did not constitute a security problem and many of the 1967 refugees had been rehabilitated in the village and in other villages along the Setit. In 1975, in response to a request from the refugees, an area of land was made available by the omda to the refugees for sorghum production. They had obtained some fuel from Gedaref. However, for one reason or another (absence of disc ploughs, the need for land clearing, etc) no cultivation was carried out directly by the refugees. Some had gone into partnership with local farmers and others had hired out their tractors.

2.3.2 Communal Organisation among the Refugees

It is noteworthy that the refugees are demonstrating an ability to organise themselves along communal lines to solve their problems. For example, the distribution of part of the water requirements of the settlement has been organised in such a way as to provide water and revenue for the relief of deserving cases. A school has been set up in a temporary building and staffed by teachers among the refugees. The distribution of relief food supplies is organised on the basis of tribal groups, each represented by a sheikh who redistributes the allocation to members. This facilitates the relief programme and few complaints are received from the people.

Table 2.3 Tribal Groups at Wad el Hileiwu Refugee Settlement

Name of Tribe	Responsible Sheikh	No. of People
Christian Eritreans	Krinkeil Saintbeit	3875
Beni Amer	Mohammed Abu Baker	2100
Sawarta	Abdalla Mohammed Abdalla	3700
Marya	Mohammed Saleh Osman	2000
Belein	Mohari Awati	1300
Labad	-	1500
Baria	Isa Mohammed	300
Baza	Musa Lile	331
Habab	Ali Dirar	1100
Dankil	-	170
Nabtab	-	521
Hausa	-	300
Borno	-	314
Bargo	-	200
Others	-	5000
	Total	<u>23311</u>

Notes

In the above table, obtained from the manager of the food store, the total number of refugees is probably an overestimate of the people in the area. Many refugees have left, but the original

allocation has not been reduced. A quantity of relief issued to refugees is sold in the market to raise money for tea, sugar and other necessities.

2.3.3 Existing Services for Refugees at Wad el Hileiwu

The main services which impinge on the welfare of refugees are an elementary school for boys, a dispensary, public health service and a police post. These services existed prior to the influx of refugees and have been severely strained by the emergency. The school at Wad el Hileiwu consists of six classes. The teaching staff who are working under extreme pressure have been able to accept only about 10 per cent of applicants; many have been turned away and are expected to re-apply for admission in the new year. There is no school for girls.

Table 2.4 Wad el Hileiwu School

Class	Refugees 1967	Boarding	Refugees 1975	Boarding	Sudanese	Total
1	15	1	10	-	32	57
2	24	1	14	-	26	64
3	16	2	10	-	21	47
4	19	3	3	-	10	32
5	7	-	2	-	18	27
6	5	-	-	-	16	31

Some of the 1967 refugees came from Qala el Nahal.

The dispensary at Wad el Hileiwu and the auxiliary services of a visiting expatriate doctor are considered to be inadequate. During our visit, many requests were received for medical assistance, especially from mothers with babies. The hospital at Gedaref has been overstrained, however, especially the paediatric unit which deals with cases of under-nutrition and malnutrition and which has inadequate facilities for dealing with the problems. A survey of the

wards showed that 25 to 30 per cent of beds were taken up by refugees, especially TB cases. The public health officer attached to the Local Government at Wad el Hileiwu appears to be coping with the influx of refugees. There is no evidence that epidemics are a greater risk at Wad el Hileiwu than in any other settlement in the area.

Although the police force is small, approximately one policeman to 2,000 people, there is no immediate security problem. The officer in charge said that law enforcement was no problem and no different to that in any other rural area in which he had served. No weapons had been found among the refugee population. There was a high level of co-operation between the Police and the refugee representatives. The officer in charge said that his only problem was transport and fuel which he considered to be inadequate. He had one vehicle and only one drum of fuel a month. He expressed the opinion that Wad el Hileiwu had now absorbed as many refugees as was desirable and he thought that the 1976 refugees should be transferred to another site.

2.3.4 Meeting with Refugee Representatives at Wad el Hileiwu

On 12th January the team met with the leaders of the refugee community to explain the purpose of their visit, namely to explore the possibilities for a refugee re-settlement project near Esh Showak. The main reasons for the proposed scheme were outlined.

- a) The existing refugee settlement at Wad el Hileiwu is only 45 miles from the frontier and there is a possibility that a large Eritrean refugee settlement at Wad el Hileiwu might lead to conflict between the two governments.
- b) The existing food relief is a temporary measure and the time has come to explore means by which the refugees may support themselves.
- c) The capacity of Wad el Hileiwu to absorb refugees is limited and there is a need to find an alternative site.

It was emphasised that the team was seeking information and could not give any promises; that such a settlement project might not materialise. Further, the team did not represent either UNHCR or the Government, but a firm of consultants which had been asked to look into the problem.

The leaders requested permission to discuss the matter among themselves and to report their decision the following day. On the 13th January a deputation of 37 refugee representatives presented the following petition:

"THE ERITREAN REFUGEES EXTEND THEIR GREETINGS AND WISH TO EXPRESS THEIR GRATITUDE TO THE REPRESENTATIVES FOR THEIR COMING TO INVESTIGATE THEIR PLIGHT. THE REFUGEES ALSO WISH TO EXPRESS THEIR GRATITUDE TO SUDAN GOVERNMENT AND THE SUDANESE PEOPLE FOR THEIR GENEROSITY, PATIENCE AND HOSPITALITY. WITH REGARD TO THE QUESTIONS PUT YESTERDAY OUR ANSWER IS AS FOLLOWS:

"WE BEG THAT WE BE ALLOWED TO STAY IN WAD EL HILEIWU. IN THIS WE APPEAL TO YOUR MERCY AND KINDNESS. OUR REASONS FOR WISHING TO STAY ARE THAT THE VILLAGE IS VERY SUITABLE FOR US IN ALL RESPECTS. IT HAS A VERY EQUABLE CLIMATE. IT HAS A SWEET WATER SUPPLY. IT IS NOT FAR AWAY FROM OUR COUNTRY. WE ARE NOW MENTALLY ADJUSTED TO OUR NEW SITUATION. PLEASE HAVE MERCY ON US AND PERMIT US TO STAY IN WAD EL HILEIWU. WE REPEAT OUR THANKS TO SUDAN GOVERNMENT WHICH EXERTS GREAT EFFORT FOR OUR WELFARE.

"IN THE NAME OF THE ERITREAN PEOPLE, LIVING AS REFUGEES AT WAD EL HILEIWU"

13/1/76

Following the presentation of the petition, we thanked the representatives for their answer and promised to place their wishes before the authorities, but informed them that we were not empowered to decide the issue in their favour. The representatives of the refugees said that they placed themselves in the hands of the Sudanese authorities who had the right to move them wherever they thought necessary. One spokesman stated that they did not all subscribe to the petition and that some would be prepared to move to an alternative site.

2.3.5 The Need for a Field Advisory Service

In addition to the deficiencies in the community services already stated it was apparent that there was a need for an on-the-spot advisory service for refugees. It is our impression that the existing local representative of the Commissioner for Refugees spends most of

his time away from the area and appears to be out of touch with what is going on and unaware of the real needs of the refugees.

2.3.6 The Gaymans Survey

In the second half of June 1975, H. Gaymans of the UNHCR Branch Office made a survey of the refugee population in Wad el Hileiwu. Some of the results have been reproduced in Section 2.3. Some important conclusions are listed below.

Household Composition

- a) The ratio of males to females among the 1975 refugee population is 1:0.8. The reason for this is that some refugee families left their women behind to guard their land and other properties.
- b) The fact that only a few households do not have male members does not mean that only these households have no men in their most productive years.
- c) Only 50 per cent of the total population of refugees in and around Wad el Hileiwu is in the economically productive age group of 13-50 years. Nearly half the population is either too young or too old to do more than minor tasks in the economic process.

Occupational Structure

- d) Half of the 1975 refugees have at least one member who was engaged in economic activities other than agriculture. Only about 1 in 4 households of the 1975 refugees had not been so engaged. A large group had been involved in both farming and other economic activities.
- e) Asked whether they would be willing to cultivate if the Government made tools and land available, the vast majority of refugees said yes.
- f) Rural settlement is called for but, in addition, facilities for other economic activities should be made available.

Education

- g) The rate of illiteracy is very high. In half of the households no one has attended school. Some refugees have

qualifications which fit them for employment as clerks, drivers, extension officers and teachers, etc.

Gaymans survey provides invaluable information on the demographic and socio-economic features of Wad el Hileiwu refugees. We are, however, cautious in interpreting responses of refugees to the question about their willingness to cultivate. Responses to hypothetical questions are notoriously unreliable. They depend very much on how the respondent interprets a hypothetical situation e.g. how much land, what sort of land, distance from the village, what tools, what crops, what returns for his labour, and so on. Inevitably the respondent's past experience in Eritrea would be a yardstick. Farming in the clay plains of Sudan is different from farming in an Eritrean valley.

2.4 Conclusions

On the basis of our meetings with refugees throughout the area, we draw the following conclusions:

Qala el Nahal

- a) The Qala el Nahal Project has not yet developed sufficiently to allow a handover of the scheme to Local Government, especially on the agricultural production side. There is a danger that it will be permanently deserted because the refugees do not have enough savings to carry them over the coming rainy season when they should be cultivating their own farms.
- b) Contrary to previous statements, the scheme is not running at anything like full capacity, and no future schemes of this nature should be started until the potential of Qala el Nahal to absorb more settlers has been explored.

Social Work

- c) Due to the many social and psychological disadvantages of the refugees, there is urgent need for active social workers with adequate resources to help the special cases of orphans, widows, old people and mentally disturbed victims of the disturbances in Eritrea.

d) There is a need for an organisation to care for the welfare of refugees employed as migrant labourers in agricultural production schemes outside the settlements.

Wad el Hileiwu

e) Except for the security aspect on which we are not able to pass judgement, there is a strong case for allowing the refugees to stay at Wad el Hileiwu.

f) Land should be set aside by the Onda at Wad el Hileiwu for an agricultural production co-operative.

g) Community services (education, health and police) should be improved.

h) Further settlement at Wad el Hileiwu should be discouraged.

i) An on-the-spot advisory service for the refugees is needed.

Gedaref

j) The hospital and secondary school at Gedaref need to be strengthened.

CHAPTER 3

GUIDELINES FOR POLICY

In this chapter, we attempt to set out our conclusions on the principal factors involved in designing a project for refugees.

3.1 Refugee Settlements are Likely to be Temporary

The dominant theme in all our discussions with the refugees was their wish to return to their homeland. It is worth noting that thirty young men have recently left Um Saqata for military service in the Eritrean Liberation Front, eight years after arriving in Sudan. There is a reluctance on the part of refugees to invest their labour and capital on any permanent basis in Sudan. At the same time, the Sudan Government awaits the end of the war in Eritrea and the return of the refugees. This fact must influence planning. Every attempt should be made to cater for refugees by strengthening existing services in the areas where refugees are concentrated. Any spare capacity resulting from the return of the refugees would then be used by the expanding Sudanese population. Such a policy is likely to be more cost effective and of more immediate benefit to the refugees.

3.2 The Need for a Comprehensive Programme

It is not possible to plan for the welfare of refugees within separated and unrelated projects at Qala el Nahal, Wad el Hileiwu and Esh Showak. Conditions at one project are likely to influence conditions at another. The refugees will tend to gravitate to the settlement where conditions are most favourable. We believe that the three areas of settlement should come under the administration and monitoring of a single body. In this way, the special needs of the various groups of refugees from different parts of Eritrea can best be handled. Such groups include pastoralists, cultivators in both the modern and traditional sectors, and people from urban areas.

3.3 Economic Viability of the Refugees

It is tempting to assume that the refugees do not differ greatly from Sudanese farmers and that, given the land and the means to

cultivate, they will readily set about supporting themselves and their families and produce a surplus for sale. In fact, the refugees are very different from local farmers. They have suffered psychological trauma following the loss of relatives, their land and possessions and their means of livelihood. They have arrived in a relatively unfamiliar environment, most of them empty-handed. Some of the refugees are quite resilient, but there are those who have gone out of their minds with the events of the last few months. It would be a mistake to believe that more than a small proportion have the ability or the will to support themselves on individual farms. Their main concern is to return home and regain what they have lost, by force of arms if necessary. Many able-bodied men are periodically absent from the household, involved in military duties. The main hope for the success of an agricultural project must lie in some co-operative programme in which the stronger members of the community support their weaker kin.

It is inevitable in a country as poor as Sudan, where the great majority of people are under-privileged, that there is a strong need for refugees to support themselves. Further, there is an awareness that, for their own good, refugees should make every effort to help themselves and not become the subject of charity. Day-to-day self help, such as house building, land clearing and weeding of crops should be encouraged and can result in cost savings. However, it is unlikely that the refugees will be able to repay Government the costs of infrastructure and services through direct or indirect taxation.

In the planning of refugee settlement projects, we must accept that only a small proportion of refugees are capable of supporting themselves by agriculture and that the majority will seek employment as wage labourers.

3.4 The Need for Community Development and Social Work

We observed that the refugees at Wad el Hileiwa have shown a marked ability to organise themselves. We also noted that they were well disposed to the Sudanese authorities. Therefore, every effort should be made to capitalise on this situation by applying the

community development philosophy* in any future projects. This will avoid the situation which seems to have developed at Um Saqata, where the refugees found it difficult to help themselves and were militant in their attitude towards both the Government and UN. There is no tradition for community development work in Sudan generally and an extra effort is needed on the part of Government in this field.

As a result of the war in Eritrea, many individual cases of social distress have occurred among the refugees. The refugee community is unable to cope with these problems. One example is the orphans at Um Saqata whom the teachers are trying to help with very limited resources. Another is the widows at Wad el Hileiwu and the mentally disturbed, wandering in the market place. All these need special care. In addition, an effort should be made to help people with special qualifications to find appropriate employment and to protect the casual labourers in the agricultural production schemes who are in danger of being exploited.

3.5 Site Selection

In selecting a site for settlement of refugees, a number of factors must be considered. The refugees must have access to employment opportunities, both as farmers and wage labourers in agricultural production schemes. The larger the settlement, the more scope there will be for refugees to find employment in secondary and tertiary production.

Every effort must be made to avoid disrupting local Sudanese communities.

By placing settlements in areas where use can be made of existing services, suitably strengthened for the purpose, the costs to Government and UN should be minimised.

Finally, the preferences of the refugees for a site which combines many of the environmental features of their home country should not be neglected. The location should be as close as possible to the frontier so that they can maintain contact with their kin. We recognise that there are security considerations, but these should be analysed carefully and weighed against others.

* Community development philosophy: the involvement of the people in planning and implementation in order to elicit local enthusiasm and active self help.

A PROJECT FOR ETHIOPIAN REFUGEES FROM ERITREA IN EASTERN SUDAN

It will be apparent from the foregoing chapters that there is a need for a comprehensive programme to cater for refugees in Eastern Sudan. Our proposals involve the setting up of two local bodies: one to advise the Commissioner for Refugees and another to implement, administer and monitor the programme.

4.1 Provincial Committee for Refugees

The majority of refugees pass through, or settle in, Kassala Province. They pose a variety of problems to the provincial authorities which deal with health, education, security, employment and supplies. There is need for the province to co-ordinate its activities to cater for refugees and to communicate its needs to the Commissioner for Refugees.

It is proposed that a committee be set up by the Provincial Commissioner consisting of the assistant commissioners of those departments concerned with refugees. The committee should meet at least three times a year to advise on a joint policy and recommend the necessary action to the Commissioner for Refugees in Khartoum. In so far as most of the problems are found in Gedaref District, the Provincial Commissioner might decide to delegate his powers to the Assistant Commissioner, Gedaref.

4.2 Field Team for Refugees

The Local Government Administration is occupied with the day to day tasks of running the province and has little time to devote to the special problems of refugees. The assignment of a Local Government Officer for refugees has done little to resolve the problem. It is, therefore, proposed that a field team be formed under the joint direction of the Commissioner for Refugees and the UNHCR Representative to organise a programme locally. Its work would range from management of agricultural production schemes for refugees to providing assistance to individual cases.

The field team should include the following:

- Project Manager qualified in rural development planning, community development and administration
- Team Leader with similar qualifications to the Project Manager, to assist him and act as deputy when required
- Agriculturalist experienced in mechanised farming, to advise the Project Manager on crop production
- Sociologist experienced in community development work and social work, to supervise the social workers and advise the Project Manager on sociological problems
- Principal Settlement Officer An experienced administrator to look after the implementation and day to day running of the settlement scheme at Jebel Maharigat
- Farm Managers (two posts) to manage the proposed agricultural production scheme at Qala el Nahal and the scheme in the Esh Showak area
- Community Development and Social Workers (six posts) These would be filled by suitably qualified and motivated graduates in the social sciences who would, if necessary, receive a brief orientation course before joining the programme.

In addition, the field team would need help on an ad hoc basis from the staff of the provincial administration. The Project Manager should set up an office in Gedaref as soon as possible, with administrative assistants seconded from the province. The Project Manager should be in daily contact with both the provincial authorities and the refugees in order to facilitate the smooth running of the programme.

The team should aim to graft the refugee programme onto the normal work of the administration in the province within the course of two or three years.

This must be achieved by:

- (a) working alongside the local administrative system and establishing a close working relationship with its staff.
- (b) activating and encouraging the refugee councils by inviting their participation and support and possibly pressing for an extension of their powers.

4.3 Qala el Nahal

The present arrangements at Qala el Nahal seem to suffer from two deficiencies, design and management.

The allocation of farms of equal size takes no account of the labour capacity or needs of different households. At Qala el Nahal, and other refugee settlements, it is to be expected that there will be a high proportion of old, young and handicapped people, unable to cope with 10 feddans. A system of production needs to be worked out within which groups of people can be allocated areas for weeding and harvesting on a communal/co-operative basis in order to contribute towards the costs of inputs as well as create a grain store for non-viable households.

There is need for a competent manager to make timely preparations before the onset of the rains and to be on site throughout the season. He should be assisted by members of the field team as well as by two community development and social workers assigned to the scheme. Other staff, particularly a book-keeper, might be recruited from the provincial administration and from the refugee community.

Immediate attention must be given to the food needs of the scheme in the re-establishment period and UN aid should be sought for this purpose.

4.4 Wad el Hileiwu

We have been advised that UNHCR will not contribute directly to the setting up of a permanent refugee settlement in the Wad el Hileiwu area as it is considered that the settlement is too close to the border and providing direct aid to such a settlement might damage relations with the Ethiopian Government.

It is recommended that no action be taken to move refugees from the area of Wad el Hileiwu against their will. The site has many physical advantages and the 1975 refugees from the border area at Umm Hager are likely to rehabilitate themselves more rapidly at Wad el Hileiwu than elsewhere. The local people and their leadership are well-disposed to the refugees and land has been offered to them for farming. It is likely, however, that if and when a UNHCR sponsored settlement is created in the Esh Showak area, and when emergency relief is discontinued at Wad el Hileiwu, a proportion of the refugees at Wad el Hileiwu will be attracted to the new settlement.

Government may wish to provide improved services at Wad el Hileiwu as part of their provincial programme of rural development. The existing services at Wad el Hileiwu could be improved by:

- the addition of six extra classrooms to the boys' school
- constructing a school for girls
- providing accommodation for the extra teachers
- upgrading the dispensary to a health centre
- providing a ferry across the Atbara reservoir at Showak.

4.5 Jebel Maharigat - a New Refugee Settlement

We have examined the existing proposals for an agricultural settlement in the Esh Showak area and conclude that such a scheme would solve only part of the problem. Large numbers of refugees are drifting into the towns seeking employment. Others prefer to obtain seasonal employment in agriculture. There is need for a major settlement which would serve as a home for refugees in Kassala Province. Such a settlement would accommodate about 15 000 people and act as a focus for government assistance to refugees. Associated with the settlement would be an agricultural production scheme, either within the area of the Presidential Decree, or on the east bank of the Atbara in the area of Jebel Aklaiyit.

4.5.1 Choice of Site

The site meets the criteria set out in 3.5. Jebel Maharigat is an unhabited hilly area about 10 km west of Esh Showak. The site is well drained and above the clay plain. Water supply is presently a

problem as the jebel is about 12 km from the nearest borehole. Water could be obtained from this borehole by tanker while arrangements were made to connect the settlement with a pipeline to the Esh Showak supply (see Appendix II).

This site has been selected in preference to one overlooking the kerrib land on the west bank of the Atbara reservoir, because it is better drained and provides more space and better access during the wet season. Jebel Maharigat has the further advantage that it provides a readily available supply of building material, both in the form of stone from the jebel and timber from the Wad Kabu Forest Reserve. When the Gedaref-Port Sudan highway is constructed, the road will pass within a few kilometres of the settlement.

4.5.2 Employment Opportunities

Jebel Maharigat is strategically placed within the province to give refugees ready access to agricultural schemes and construction projects where they can obtain employment. An employment agency should be set up in the settlement to provide information about employment opportunities, rates of pay, etc. Transport arrangements could also be made in order to allow the refugees to return at regular intervals to visit relatives and schoolchildren left behind in the settlement. Since agricultural labour is in short supply in Kassala Province, the refugees would be making a positive contribution to the development of the area. The proximity of both rainfed and irrigated agriculture provides a good opportunity for year-round employment. More detail about employment opportunities is given in Appendix IV.

4.5.3 Services at Jebel Maharigat

In keeping with the policy of strengthening existing services in the area, we recommend the following:

- (a) Medical: The capacity of Gedaref hospital should be expanded to meet the increased demand created by the refugees. Special attention should be paid to the needs of the paediatric unit and the TB unit. We consider that the construction of a new hospital at Esh Showak cannot be justified when the opportunity exists for improving facilities at Gedaref. The dispensary at Esh Showak should be upgraded to a health centre and a dispensary constructed at Jebel Maharigat.

- (b) Education: The existing secondary schools at Gedaref should be strengthened and a primary school constructed at Jebel Maharigat. Attention should be paid to the possibility of providing adult literacy classes to refugees.
- (c) Community Centre: This would provide a focus for community development and social work, including the employment information centre described in Section 4.5.2.
- (d) Public Utilities: The project should be linked to the water and electricity network presently supplying Esh Showak and Gedaref. Sewage disposal arrangements must also be made.

4.5.4 Grain Production

In order to produce the grain needed by non-viable households, provide an opportunity for refugees to support themselves and to cover the overhead costs of such a scheme, an agricultural production scheme has to be set up as soon as possible.

Appendix I

SURFACE WATER RESOURCES

IN THE ESH SHOWAK AREA

I.1 Climate

The climate of the Showak area is classified by Meigs (1953) as 'hot' and 'arid' (UNESCO code Ab 34). The seasons are controlled primarily by the annual migration of the latitude of maximum insolation and the associated inter-tropical convergence zone (ITCZ). In July, when the ITCZ is at its northernmost position, the prevailing southerly winds sweep across the western flank of the Eritrean highlands and force the ITCZ north of its usual latitude. Consequently, the Showak area experiences an average annual rainfall (400-500 mm, Table I.1) about 50 per cent greater than similar latitudes west of the Blue Nile. Table I.2 shows the climatic norms for Gedaref which, with the exception of rainfall which decreases with latitude, probably are typical of the Showak area.

About 90 per cent of the annual rainfall is confined usually to a period of just over 100 days, extending from mid-June to late September. Rainfall generally results from isolated thunderstorms, often preceded by high winds which can raise dry soil into a dust-storm. At any one point, rain is experienced usually on only about 40 days per year. Only about 40 per cent of raindays bring falls in excess of 10 mm. Consequently, a considerable proportion of the annual rainfall is returned to the atmosphere by evaporation before it can infiltrate the heavy clayey soils and recharge the root zone. The area is of marginal suitability for rainfed crops and at present there is little cultivation north of the 450 mm isohyet of average rainfall (Figure I.1).

Although the summer rains can raise daytime humidities to over 40 per cent, the greater cloud cover lowers daytime temperatures by over 5°C. Consequently, the hottest conditions occur in April to June before the arrival of the rains. Although daytime temperatures generally exceed 30°C during the pre-rains hot season (seif), daytime humidities are generally only 20-30 per cent. A second hot season occurs after the rains during October and November. Although

Table I.1 Hydrometeorological Data

<u>Climatological Stations</u>				
Name	Lat.	Long.	Record	Category
Halfa el Gedida	15°19'	35°36'	1964-75	Agro-met
Showak	14°24'	35°51'	1972-75	" "
Gedaref	14°02'	35°24'	pre-1941-75	" " (1966)*

* full-time Met. 1960-65, part-time Met. 1941-59

<u>Raingauges</u>					
Name	Ref.No.	Lat.	Long.	Record	1941-70 Average* Annual Rainfall
Kashm el Girba	14359901	14°59'	35°55'	1903-75	358 mm
Showak	14334801	14°24'	35°51'	1942-75	476 mm
Umm Khanga	14351202	14°11'	35°17'	-	-
Umm Leiyun	11351101	14°06'	35°11'	1957-75	513 mm
Gedaref	14350401	14°02'	35°24'	pre-1941-75	579 mm
Hillet Dkuma	13368101	13°52'	36°07'	-	-

* no allowance is made for short-record bias

Table I.2 Gedaref - Climatic Norms (1941-70)

	J	F	M	A	M	J	J	A	S	O	N	D	Year
Mean Air Temp. °C*	26.1	27.2	30.0	31.9	32.3	30.1	27.2	26.4	27.2	29.1	29.0	26.7	28.5
Relative Humidity%**	23	23	19	19	23	33	47	57	49	33	25	25	31
Penman Evaporation mm***	180	186	233	243	251	231	198	186	192	192	183	177	2452
Rainfall mm	tr	tr	1	4	27	86	154	188	92	24	3	0	579

* (mean max. + mean min.) x 0.5

** 12.00 hours

*** Adam (c 1974)

temperatures are generally lower than in the pre-rains period, the post-rains hot season is often associated with daytime humidities in excess of 30 per cent.

II.2 Drainage

According to the Langbein Method (WMO, 1965) of computing average annual runoff typical of arid intermountain valleys, runoff can be expected to average at least 11-13 mm per year. This is equivalent to over 2.5 per cent of the average annual rainfall. The surface drainage of the area of the Presidential Decree can be expected to average over 10 million cubic metres per year of which the major proportion will accumulate and stagnate in local depressions until evaporated.

Despite its proximity to the River Atbara, the Presidential Decree area (PDA) is poorly drained. The PDA is bordered on its south-east and east sides by high ground formed by basalt flows which outcrop at Wad Kabu, at several points around Jebel Muhariqat, at Jebel Urm Dubban and at Jebel Karkora. In general, this high ground is elevated only a few metres above the clayey plain which forms the PDA and drainage onto the plain is generally diffuse. Hillslopes are generally less than 10 m per km except near the jebels where the pediment may fall over 20 m per km. Most of the water draining onto the plain stagnates in depressions (talh) along its south-eastern border. These seasonally-waterlogged depressions are densely vegetated with Acacia seyal/Acacia nelliifera and cultivation has tended to favour the open plains in the centre of the PDA.

The central plains slope northwards falling only about 1 m per km. There are no distinct drainage channels, except for an alluvial stream which passes around the north-west corner of the PDA near Jebel Kasamor. Drainage is generally slow and diffuse. Although the movement of surface water is generally northward, some runoff from the area immediately south of Jebel Karkora may move north-east into the Atbara Reservoir near Moqatta.

During the rainy season, the clayey soils become sticky and plastic and the roads become impassable for normal traffic. Water stagnating on the impermeable surface creates an unhealthy environment,

especially unattractive to refugees used to well-drained, hilly country. Although 10-15 small farm settlements have been established already on the clay plains of the PDA, the area is not suitable for the establishment of a large settlement.

Although better drainage prevails on the jebel pediments, no such area lies within the PDA. Moreover, jebels remote from the railway would be difficult to reach during the rainy season as access routes would have to cross the waterlogged plains.

Better drainage also prevails along the incised edge of the Atbara Reservoir where the land falls 30-40 m in an eroded landscape of gullies and narrow ridges known as the kerrib. Moreover, near Showak and north of the Khor Katut where the kerrib is used for browsing camels in the dry season, the area is already settled. Furthermore, none of the kerrib lies within the PDA.

3. Water Supplies

If water is to be supplied mainly from street watering points (kiosks) and waterpoints, a community of 15,000 people can be expected to consume an average of at least 20 l/h/d. As the number of connections from the distribution system increases, consumption is expected to rise to at least 50 l/h/d (Ross Institute, 1974). Wastage by leaking pipes and fittings is inevitable in any water distribution system and supply should be reckoned to exceed consumption by about 20 per cent. Consequently, about 450 m³/day will be required initially to supply a refugee community of 15,000. The gradual rehabilitation of the refugees is expected to boost the requirement to 900 m³/day within a few years. However, in the immediate future, 100 m³/day might suffice to supply up to 5,000 people engaged in the construction of a new settlement.

The continued arrival of new refugees from disrupted areas of Eritrea would make the community especially vulnerable to epidemics of waterborne diseases (e.g. typhoid, cholera, dysentery and gastroenteritis), virus diseases (e.g. infectious hepatitis) and parasites. Thus, particular care must be taken to prevent contamination of either the source or the distribution system. Providing the wellhead is properly drained, the deep Nubian aquifer provides the safest

source of water. Water obtained from a surface source (e.g. the Atbara Reservoir or a hafir) would have to be clarified, filtered and disinfected. Contamination of the distribution system through leaks or back syphonage is best prevented by providing high-level storage to maintain adequate pressures throughout the system. In any case, storage (not necessarily all at high level) is necessary to equalise diurnal variations in demand and safeguard supplies in emergencies (e.g. a major fire or a pump failure). A system without adequate storage is likely to provide unsatisfactory intermittent supplies. As an additional safeguard against contamination of the distribution system, it is recommended that all piped supplies should be disinfected with chlorine.

A water charging system will have to be considered if conditions within the refugee community are to conform with the rest of Sudan. In Kassala Province, street watering points charge 0.5 pt per tin (equivalent to 27.5 pt per m³) and consumers with metered connections are charged 10 pt per m³. However, in view of the acute shortage of new meters and spare parts prevailing in Sudan, a fixed charge system may be advisable. Fixed charging is best suited to systems where ample supplies are available to compensate for the higher demands likely if high consumption (and wastage) is not penalised by cost.

At present, surface cisterns (hafayra) are the only source of water in the PDA. Except for the shallow cisterns at Jebel Kasamor (both just outside the PDA) which are used by camel herders, the cisterns serve small farm settlements. Each cistern is 10-20 m square and about 1.5 m deep, surrounded by an irregular spoil heap up to 1.5 m high. Water enters the cistern by one or more shallow channels which intercept diffuse runoff across the plain. If not used for watering stock, each cistern provides sufficient water for a farm community until the end of the harvest (February). Some cisterns are used for watering stock and these may dry up earlier, in which case water must be imported from the Atbara Reservoir or the wateryards at Wad Kabu and Tatabkouri. The farm settlements are usually evacuated after the harvest. Farm workers returning to prepare the land at the beginning of the rainy season rely on imported water supplemented by intermittent supplies from early showers.

Although 5-10 m deep cisterns are capable of providing a perennial source of water, they cannot be recommended for supplying a large community. Even if the catchment is remote from any large settlements, it is difficult to ensure that a cistern is not contaminated with domestic or agricultural effluents. Any purification measures must be capable of treating very turbid water with a minimum of wastage. Where available, groundwater is to be preferred.

Three new wateryards are being constructed inside the PDA by the Rural Water Corporation for the UNHCR. The two tubewells for the northern wateryard have just been drilled, but they are not yet equipped (January 1976). The wateryard is on the northern boundary of the PDA, about 10 km west of Jebel Karkora. The wells will be equipped with Mono positive-displacement rotary pumps, vee-belt driven by Petter air-cooled 18 hp diesel engines. After running-in, these pumps are each expected to yield 10-12 m³/hour. The yard will be set out to the usual RWC design: an 80 x 60 m fenced yard subdivided so that the main pumphouse (the second well is located several hundred metres to the west) and the 50 m³ high-level tank are separated from a watering area equipped with one 6-tap stand and two pairs of 1150 l (250-gal.) troughs. This design is intended primarily for watering large numbers of cattle and is unsuitable for domestic supplies. Three of the troughs should be replaced by water crane for filling watercarts and donkey panniers.

A similar installation is being constructed at the central wateryard, 20 km south-west of Jebel Karkora. The Mono pumps to be installed in the northern and central wateryards are of a type which has been used in Sudan since 1969. They have proved reliable and spares are reputed to be available in Gedaref.

The wells at the southern wateryard (6-7 km north of Wad Kabu) are being equipped with EDECO reciprocating pumps, vee-belt driven by Lister 6 hp diesel engines. The equipment being installed is not new (new pumps are reputed to be in Port Sudan) and the EDECO unit in the main pump-house has a damaged Pitman bearing which requires attention. The output of each pump is likely to be only about 5 m³/hour. The EDECO/Lister pumping units are generally very reliable and some units may have a working life of over 10 years.

However, worn parts must be replaced promptly if severe damage (particularly to the Pitman arm) is to be avoided. Although the RWC has maintenance facilities in Gedaref, spare parts are in short supply. Because of the lack of spare parts, damaged taps and valves are rarely replaced. Thus, if these wateryards are to be used by the refugees, funds should be allocated for the purchase of an adequate stock of parts.

Outside the PDA, water supplies are available from the three public wateryards at Wad Kabu, (2 tubewells), Tetabkouri and Muhariqat (14-15 km west of Jebel Muhariqat). All the tubewells supplying these yards are equipped with EDECO pumps driven by Lister engines. Although the maximum output of the Tetabkouri yard is reputed to be only about $3.5 \text{ m}^3/\text{hour}$, the Muhariqat yard is capable of supplying up to $6 \text{ m}^3/\text{hour}$ (a typical value for this type of installation). The wateryard at Wad Kabu supplies water to farms in the southern part of the PDA as well as the village itself. Water is transported by horse-drawn bowsers. The Tetabkouri yard is used for watering cattle in the Wad Kabu Forest Reserve. At present (January 1976), the Muhariqat yard is not fully operational.

Water is also available from the Atbara Reservoir. Villages in the kerrib north of Showak draw water from the reservoir which recedes into a series of pools (birkat) at the end of the dry season (April-June). Water is normally transported to the villages by donkeys, each carrying a 20-25 litre goatskin pannier. At Showak, there are two pumped water supply systems drawing water from the Atbara Reservoir:

(a) Sudan Railways pumps approximately $200 \text{ m}^3/\text{day}$ from the Atbara Reservoir to Showak station where the water is stored in three high-level tanks for watering locomotives and for export to outstations, as well as local consumption. Water is pumped into a 35-40 km long, 4 in (100 mm) diameter galvanised-iron main by a 6 stage centrifugal pump powered by a Lister diesel engine rated at 26.5 hp. However, since the engine is very old, it produces less than half its rated horsepower and the pump must be run for 8-10 hours/day. During the dry season, the pump must be moved down the bank to follow the receding reservoir

level. Towards the end of the dry season, the pump is lowered into a sump dug in the reservoir bed and connected to a nearby pool by an open ditch.

(b) The Public Electricity and Water Corporation (PEWC, formerly CEWC) pumps $5000 \text{ m}^3/\text{day}$ from the Atbara Reservoir to Gedaref. An additional $300 \text{ m}^3/\text{day}$ is supplied to about 100 metered connections and 5 street watering points in Showak. Water for both communities comes from Showak Waterworks which was completed in 1970. With full standby capacity, the works is capable of supplying up to $420 \text{ m}^3/\text{hour}$. Power is supplied by two 11 kv transmission lines connected to the main 66 kv transmission line from Khashm el Girba to Gedaref.

During the flood season (July-September), water is extracted from a large well connected to the Atbara Reservoir by screened intakes. However, towards the end of the dry season, the reservoir recedes into a pool located several hundred metres from the intake. Therefore, after the end of the rains, the extraction pumps are removed from the intake well and re-erected with temporary staging and pipework on the reservoir bank. This installation is periodically extended throughout the dry season to follow the receding water's edge across the bed of the reservoir.

Since the construction of the Khashm el Girba dam, fine sediment has accumulated throughout the reservoir and partially sealed the bed. Consequently, there is insufficient sub-surface flow to equalise the effect of a large extraction of water from the intake pool. In some years, it is necessary to install temporary pumps to transfer water into the intake pool from a larger pool upstream. This problem might be resolved by extracting water from the gravelly alluvium which formed the original bed of the River Atbara. However, further investigations would be required to establish the nature and content of this source as well as a suitable means of extraction.

After extraction, the water is dosed with alum coagulant and passed through a $1,200 \text{ m}^3$ circular sedimentation basin (space is available for a second basin). During the dry season, the pH of the water rises and lime is added to obtain the alkalinity necessary for floc formation. The basin is cleaned twice per month and

disinfected with chlorine to impede algae growth. During the flood season, the sedimentation basin is unable to remove all the turbidity and two-stage sedimentation may be advisable to avoid clogging of the filter beds.

Bacteria are removed from the water by three sand filters (space is available for nine more filters) which are cleaned at the end of each dry season.

Water is pumped into the 20-in (500-mm) steel main supplying Gedaref from a 1,100 m³ sump by a pair of 633 hp centrifugal pumps. Severe maintenance problems are encountered due to the high starting current required by the 415 v motors. Separate pumps are used to supply Showak. However, because of the small volume of storage in the Showak distribution system (30 m³, only 10 per cent of the daily supply), an intermittent supply is maintained at low pressures by pumping at half-hourly intervals.

During the dry season, there is a risk that chemical effluents from the waterworks may contaminate the intake pool. Moreover, during the flood season, the reservoir level can rise 0.5 m above the pumphouse threshold and some permanent flood protection works are necessary.

Nevertheless, despite its problems, the Showak waterworks would be a convenient source of supply for any large settlement in the Showak area. At present there is probably sufficient capacity to supply the needs of a refugee settlement as well as Gedaref and Showak. In any case, the waterworks has been built to facilitate any necessary expansion.

At present, the sedimentation of the Atbara Reservoir and the conjunctive operation of a reservoir formed by a proposed dam on the Atbara/Setit at Abu Zeida (10-15 km upstream of Showak) are being studied by consultants for the Ministry of Irrigation. The effect of this development on the intake problem at Showak waterworks is not known. Further study is required before the water supply for any refugee settlement is connected to the Showak source.

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Appendix II

GROUNDWATER SUPPLIES

II.1. Introduction

The information given below is largely based on a report prepared (by the Rural Water Corporation entitled "Geophysical and Hydro-geological Investigation of the Eritrean Refugees Resettlement Area West of El Showak, Kassala Province, Khartoum, December 1973 - May 1974". This was supplemented by a brief field reconnaissance in January 1976.

The RWC report gives the results of an extensive geophysical (gravity) survey and the drilling of seven exploratory boreholes. The field reconnaissance disclosed the presence of three wateryards (each with two boreholes) in the area itself and more wateryard boreholes just to the south and east of the area.

II.2. Geology

The solid geology of the area is difficult to map out because it is obscured by the presence of a superficial deposit, the black cracking 'Butana' clay, blanketing the whole region.

The geological succession is as follows:

<u>Formation</u>	<u>Rock Type</u>
Superficial Deposits	'Butana' clay
Tertiary Basalt	Basalt lava flows; largely unweathered; sometimes vesicular and fissured
Nubian Formation	Mudstone and sandstone intercalations
Basement Complex	Complex of crystalline metamorphic rocks

The Basement Complex forms an irregular floor on which the Nubian rests more or less horizontally. This floor comes to within 100 metres of the surface in the west of the area.

The Nubian Formation is present under the whole of the area but varies a great deal in thickness from about 50 metres to more than 300 metres. In very general terms it is expected to thicken from

the north-west towards the south-east, though a buried ridge in the basement between boreholes 6453 and 6436 (see Figure II.1) distorts this picture somewhat.

The Nubian passes under the Tertiary basalts, which are probably of considerable thickness (more than 200 metres at borehole 6452) and cover the eastern part of the area as shown in Figure II.1.

All these solid formations are buried under the 'Butana' clays, reportedly varying in thickness from 5 to 35 metres.

II.3 Hydrogeology

The only water-bearing formation in the area of any importance is the Nubian. The 'Butana' clays are largely impervious and the basement rocks and the basalts, though sometimes yielding small quantities of water, are too unreliable a source for planning of domestic supplies.

According to the RWC, even the Nubian in this area consists mainly of mudstones and compact sandstones, which are largely impervious. This view, however, appears to be based on rather dubious interpretation of electric and gamma-ray logs of the RWC exploratory boreholes and is not supported by later borehole data. A number of wateryard wells produce water from the Nubian, though admittedly in limited quantities. Thus it can be taken that domestic supplies could be obtained from the Nubian where sufficient saturated thickness of this formation is found.

The logs of the seven exploratory boreholes drilled by RWC in 1973-74 are given in their report. The reference numbering and location of these is highly confused and difficult to understand. Thus the locations given in Fig. II.1 are uncertain. The relevant hydrogeological data have been abstracted from these logs and are given in Table II.1.

Only borehole 6452 was tested by bailing, but this was bailed dry after a few hours and therefore abandoned. The rest were declared non-productive on lithological and geophysical evidence.

Since the RWC study, several wateryards equipped with boreholes have been constructed in the area. These are marked on the sketch-map (Fig. II.1) and the details are given in Table II.2.

Table II.1 RWC Borehole Data

Bore No.	Total Depth (m)	Butana Clay Thickness (m)	Tertiary Basalt Depth to (m)	Tertiary Basalt Thickness (m)	Nubian Formation Depth to (m)	Nubian Formation Thickness (m)	Basement Complex Depth to (m)
6355	114	11	-	0	11	103	114
6356	131	30	-	0	30	95	125
6396	78	3	3	75+	?	?	?
6436	216	37	-	0	37	179+	?
6452	203	8	8	195+	?	?	?
6453	244	21	-	0	21	214	235
6557	110	5	-	0	5	99	104

Table II.2 Existing Wateryard Boreholes

Bore No.	Depth (m)	Depth to Static Water Level (m)	Test Yield (m ³ /h)	Drawdown (m)
6711	144	98	4.1	?
6712	136	85	4.1	?
6713	324	61	4.1	?
6714	318	?	Not yet tested	
6913	214	71	6.5	13
6914	?	?	Not yet tested	

Since the testing borehole 6713 has been equipped with a new Mono pump and 18 hp engine and has yielded 6.8 m³/h at 10w throttle setting. It is hoped that at full throttle it will yield some 11.5 m³/h.

In addition to the above, wateryards at Muhariqat, Tetabkouri and near Wad Kabu (Southern UNHCR Wateryard) located along the southern boundary of the project area have been inspected. All are equipped with productive boreholes though their yields are small.

Little is known about groundwater quality in the area. Some samples have been collected but have not yet been analysed. However,

the quality is expected to be reasonable in terms of the major chemical constituents.

II.4 Development Potential

It is estimated that the water requirements of the proposed refugee settlement would be $450 \text{ m}^3/\text{day}$ initially, rising to $900 \text{ m}^3/\text{day}$ eventually. It is now necessary to consider whether such quantities of water could be conveniently obtained from groundwater sources in the project area.

The RWC report concludes that groundwater should be excluded as a water source for establishment of resettlement centres in this area. This conclusion cannot really be supported but there is no doubt that there are some difficulties in obtaining the requisite amount of water.

Though most of the area is underlain by water-bearing strata, the yields of existing wells are low. The main constraints to groundwater abstraction by wells are:

- (i) Presence of basement rocks at shallow depths in the west of the area, so that only a small saturated thickness of aquifer is available for exploitation. This can support low-yielding wells only.
- (ii) Presence of the basaltic rocks in the east of the area. Though the Nubian aquifer is believed to underlie the basalt, the necessity of penetrating these hard volcanic rocks with production wells would make these prohibitively expensive.
- (iii) The nature of the Nubian Formation in the area. This contains a large proportion of clay and mudstone, making high-yielding wells difficult.

One possibility of meeting the water demand of the proposed settlement is to obtain the required supply from boreholes 6713 and 674. These are both over 300 metres deep with static water level at about 60 metres. It is probable that, equipped with suitable pumps, the wells could produce higher discharges than at present. A production rate of $20 \text{ m}^3/\text{h}$ from each well with pumping for 12 hours each day would meet the initial demand of the proposed settlement.

If new wells are to be installed in the area the best results are likely in the area just to the west of the basalt outcrop. Boreholes there are likely to find the greatest thickness of saturated Nubian Formation without the difficulty and expense of penetration of considerable thicknesses of hard basaltic lavas. The areas most suitable for installation of new wells are delineated in Figure II.1.

If new wells are to be installed in the area the post-war area
 likely in the area just to the west of the basalt outcrop. However,
 there are likely to find the greatest thickness of post-war
 formation without the difficulty and expense of penetration of
 considerable thicknesses of hard basaltic lava. The cost of
 suitable for installation of new wells are defined by the
 conditions of the area.

The area is characterized by a high degree of
 erosion and the basaltic lava is highly
 fractured and the water is held in
 the cracks and is not available
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Appendix III

CHOICE OF SETTLEMENT SITE

IN THE ESH SHOWAK AREA

III.1 Presidential Decree Area

As stated in Appendix I, this area is not suited for any major settlement because of poor drainage. Except for the northern part of the plain, where the average annual rainfall (1941-70) is probably less than 450 mm, the best drained areas are already extensively cultivated. The presence of adequate groundwater in the Nubian Formation is not sufficient to compensate for the poor drainage.

III.2 Kerrib on Atbara West Bank

Although this area is already settled, a refugee settlement could be sited at the top of the kerrib at Kotourda, about 12 km north of Esh Showak. Although there is already a small village on the lower kerrib and on a ridge to the south, the ridge immediately south of Khor Katut is unoccupied. However, the transition from the kerrib to the clay plain is very abrupt and the high ground terminates in steep slopes. Access to the north and west is obstructed by the incised valley of Khor Katut. Access to Esh Showak follows a heavily rutted track along the top of the kerrib. Any settlement and road on the heavy clay along the top of the kerrib would have to be provided with drains to channel runoff into the kerrib gullies. Special care would be needed to prevent gully erosion encroaching on the settlement area. Moreover, the area with direct access to the kerrib is very limited and a considerable proportion of the settlement might have to be sited on the relatively flat region south-west of Kotourda. A detailed topographic survey would be required to make the best use of the terrain.

Water would be supplied from the Atbara Reservoir or from Esh Showak. The settlement site is 30 to 40 m above the reservoir and about 3 km from a possible intake site. The initial requirements of 450 m³/day could be supplied by a 100 mm pumped main (total head at 6.25 l/sec, about 85 m) costing about L.S.10,000 (based on 1974 PEWC costs). However, if a 150 mm pumped main costing about L.S.15,000 was installed, this would suffice for supplying the full

requirement of 900 m³/day. Furthermore, use of a 150 mm main would reduce pumping costs by at least 20 per cent (total head at 6.25 l/sec, only about 50 m, rising to 65 m at 12.5 l/sec).

Alternatively, treated water could be piped from Showak waterworks by a similar diameter main (total head at 6.25 l/sec, increased to about 65 m, rising to about 120 m at 12.5 l/sec). The 12 km long main would cost about L.S.60,000. To double the capacity of the pipeline from 450 to 900 m³/day, an intermediate booster station would be installed near Showak railway station.

Both alternatives would necessitate the provision of 450 m³ of storage at the settlement site to equalise the pumping regime. In each case, the storage would have to be doubled to supply the estimated future requirement of 900 m³/day. However, the cost of pumping 900 m³/day from Showak (say 550 kwh/day) would probably be nearly double the costs of a direct supply from the reservoir. Moreover, the cost of a new treatment works at Kotourda (say L.S.20,000) is likely to be much less than the difference in the cost of the mains. Thus, a direct supply from the reservoir is likely to prove the cheapest if not the most expedient solution. A further reconnaissance at the end of the dry season will be necessary to verify the existence of a suitable site for a waterworks intake in the vicinity of Kotourda.

Power supplies could be provided by an 11 kv transmission line from the switching yard at Showak.

III.3 Jebel

The isolated hills formed by outcrops of Tertiary basalts (Jebel Muhariqat, Umm Dubban and Karkora) or Basement Complex granites (Jebel Kasamor and Aklaitit) have well-drained pediments. Due to the lack of perennial water supplies, these hills are devoid of permanent settlement. However, water supplies could be provided either by pipeline from a remote wateryard or from the Atbara Reservoir, or by storage of pediment runoff in an artificial cistern (hafir). Furthermore, the jebel sites are a good source of stone both for ashlar, concrete and road paving.

However, Jebel Kasamor is clearly too remote both from a suitable source of water (e.g. the Nubian aquifer) and from the existing lines of communication. Although Jebel Karkora is much nearer a source of water (the northern UNHCR wateryard is only about 10 km west) and the lines of communication (12 km west of Moqatta station and on the direct Moqatta - Gedaref road), this exposed and desolate jebel is situated in a featureless plain. Jebel Umm Debban (east of the railway, 15 km north-north-west of Showak) is quite small and a large settlement could not be confined to the well-drained pediment.

In terms of amenity and access (both to Showak and the PDA), Jebel Muhariqat is clearly the best jebel site. The jebel is formed by a group of small hills rising about 5 m above an undulating pediment of clayey-gravel. An open well (2 m diameter) with a depth of about 25 m already exists. However, the well has a very low yield and is in need of cleaning.

The valley floors between the hills are composed of heavy clays. Cisterns (hafayra) excavated at specific points could be used for temporary water supplies during the construction phase. However, for the reasons given in Appendix I, these cisterns are not recommended as a permanent source of potable water for a large settlement. Furthermore, in order to provide a reliable supply of 450 m³/day, some cisterns would have to be sited several kilometres from the jebel to intercept sufficient runoff to ensure that most are refilled each year. Nevertheless, cisterns used during the construction phase would remain a useful source of non-potable water (e.g. for fire-fighting). A pair of cisterns approximately 45 m square with a depth of not less than 7 m (bulk excavation 37,500 m³) would suffice to supply 100 m³/day (HTS, 1974). The cost of these cisterns would be approximately L.S.15,000 each.

The cost of a 150-mm pipeline from Showak waterworks to Jebel Muhariqat would be similar to the cost of a pipeline to Kotourda (L.S.60,000). However, the cost of pumping 900 m³/day would be nearly 20 per cent higher (say 650 kwh/day for a total head of nearly 160m). Although the same storage (initially 450 m³ rising to 900 m³) would be required as at Kotourda, pressures in the distribution system could be maintained by ground level tanks.

Jebel Aklaitit is 10 km east of Showak on the east bank of the Atbara Reservoir. Although a vehicle ferry (with access ramps) would have to be provided at Showak to maintain access to this site, the same ferry might serve a new road to Wad el Hileiwu, 20 km southwest of the jebel. The site commands an area which appears to be sparsely inhabited with sufficient land available for cultivation. Because of its greater proximity to Showak water supply, a pipeline might be constructed for about L.S.50,000.

APPENDIX IV

OPPORTUNITIES FOR SEASONAL EMPLOYMENT

IV.1 Kassala Province provides good opportunities for seasonal employment in agriculture. It was stated by ILO* that Kassala Province is the only province in which there are acute shortfalls in the supply of labour, chiefly in the period from August to November. Only in June and July does supply exceed demand.

Table IV.1 Seasonal Demand for Labour in East-Central Sudan

	J	F	M	A	M	J	J	A	S	O	N	D
Rainfed Agriculture	—											—
Irrigated												—
Construction												—

IV.2 Mechanised Rainfed Agriculture

Within Kassala Province, mechanised farming provides the greatest demand for seasonal labour. It is estimated that about 280 000 seasonal jobs are available at L.S. 34 - L.S. 42 for a three month input. Kassala receives 100 000 seasonal migrants annually from outside the province.

Table IV.2 Employment Opportunities in Mechanised Farming in Kassala*

	Feddans cropped (millions)	Man days (per feddan)	Man days/year (millions)	Season
Cotton	0.02	39	0.8	Jan/Feb
Sorghum	1.4	11	15.4	Aug/Jan
Sesame	0.4	11	4.4	Jul/Nov

* Growth, Employment and Equity, A Comprehensive Strategy for Sudan ILO/UNDP 1975.

IV.3 Irrigated Agriculture

Khashm el Girba irrigation scheme (total area 450 000 feddans) provides seasonal employment, especially in the period from December to May. In May there is a peak demand for sugar cane harvesting.

In January and February, the people living around Gedaref tend to migrate to the Gezira where 1.35 million feddans are cropped annually, to pick cotton. The Gezira, which is about 300 km to the south west of Esh Showak, employs about half a million casual labourers a year. Two thirds come from the locality of the Gezira; the remainder are recruited from other provinces as follows: Blue Nile 118 000, Kordofan and Darfur 96 000, and Kassala 8000. The average daily wage of cotton pickers in the Gezira is 35-50 pt., of which two-thirds is paid in cash, and the rest in food. At a weekly rate of L.S. 2.10 to L.S. 3.00, a single man can earn between L.S. 14.00 and L.S. 20.00 over a ten week period. However, since labour is organised on a family and piecework basis, the earnings of individuals are of less interest than those of the family unit. It is estimated that a nuclear family of two adults and two economically active children should be able to return to Kassala with L.S. 35.00 to L.S. 50.00 after the cotton picking season.

When the Rahad Irrigation Project in southern Kassala Province gets under way in 1977/78, between 200 000 and 400 000 additional seasonal workers will be required.

IV.4 Construction Projects

In 1977 there will be three major construction projects within a day's travel of the Esh Showak area. The Rahad Project, employing 8000 to 10 000 labourers, has already started. The proposed Gedaref-Port Sudan highway which is routed within a few kilometres of Jebel Maharigat will be started next year. The Atbara/Setit dam is scheduled for construction in the coming year.

APPENDIX V

PROPOSED TERMS OF REFERENCE FOR A FEASIBILITY STUDY

The following should be carried out between 1 March and 31 May, 1976:

1. Provincial Committee for Refugees

In discussions with the Commissioner for Refugees and the Commissioner of Kassala Province, make arrangements for the setting up of the Provincial Committee for Refugees.

2. Field Team for Refugees

In co-operation with the Commissioner for Refugees and the UNHCR Country Representative, recruit and initiate operation of the Field Team for Refugees in Kassala Province.

3. Qala el Nahal

Following a detailed study of the social and economic features of the existing refugee settlement at Qala el Nahal and of the agricultural production and marketing in the area, draw up a detailed plan and budget for an agricultural production scheme at Qala el Nahal.

Determine the food relief needs of the settlement during the coming rainy season and advise UNHCR accordingly.

4. Wad el Hileiwu

Conduct a detailed study of the refugees at Wad el Hileiwu in order to determine the demographic and social characteristics of those refugees who are likely to be attracted to the proposed settlement at Jebel Maharigat. Advise Government of the needs of those refugees likely to remain in the settlement so that the existing services can be strengthened. Prepare a plan and budget for such a programme.

5. Jebel Maharigat

Plan a settlement for about 15 000 refugees (about 2400 households) at Jebel Maharigat paying due attention to health and public safety provisions as required by the Government. The following work shall be carried out:

(a) Site Survey

Carry out a topographical survey of about 25 square kilometres and level the access route and pipeline from Esh Showak. Levelling should be tied to a bench mark (e.g. pumphouse threshold) at the Esh Showak Waterworks. Prepare 1:5000 scale map for the planning of the settlement and a level profile of the pipeline route and a 1:50 000 scale outline map of the access route. Prepare detailed plans of the proposed settlement layout.

(b) Public Utilities

Following discussions with the Public Electricity and Water Supply Corporation, design and cost a water and electricity supply for the settlement. Draw up recommendations for public sanitary service.

(c) Social Services

Prepare outline plans and costs for the following:

- Primary school for boys and girls, teachers' accommodation
- Community Centre
- Dispensary
- Office and Rest House for Project Staff
- Police Post

(d) Agricultural Production Scheme

Following a detailed study of the social and economic features of the likely immigrant community and agricultural production and marketing in the area, draw up a detailed plan and budget for an agricultural production scheme near Jebel Maharigat. Select a site in the Presidential Decree Area or in the neighbourhood of Jebel Aklaiyit, which causes the minimum of disruption to the existing economy. The plan of operation must take account of the need for a viable, self-supporting scheme.

(e) Employment

Conduct a survey of the agricultural labour market in Kassala, Blue Nile and Gezira Provinces and draw up recommendations which will encourage the refugees to take up seasonal employment in these schemes.

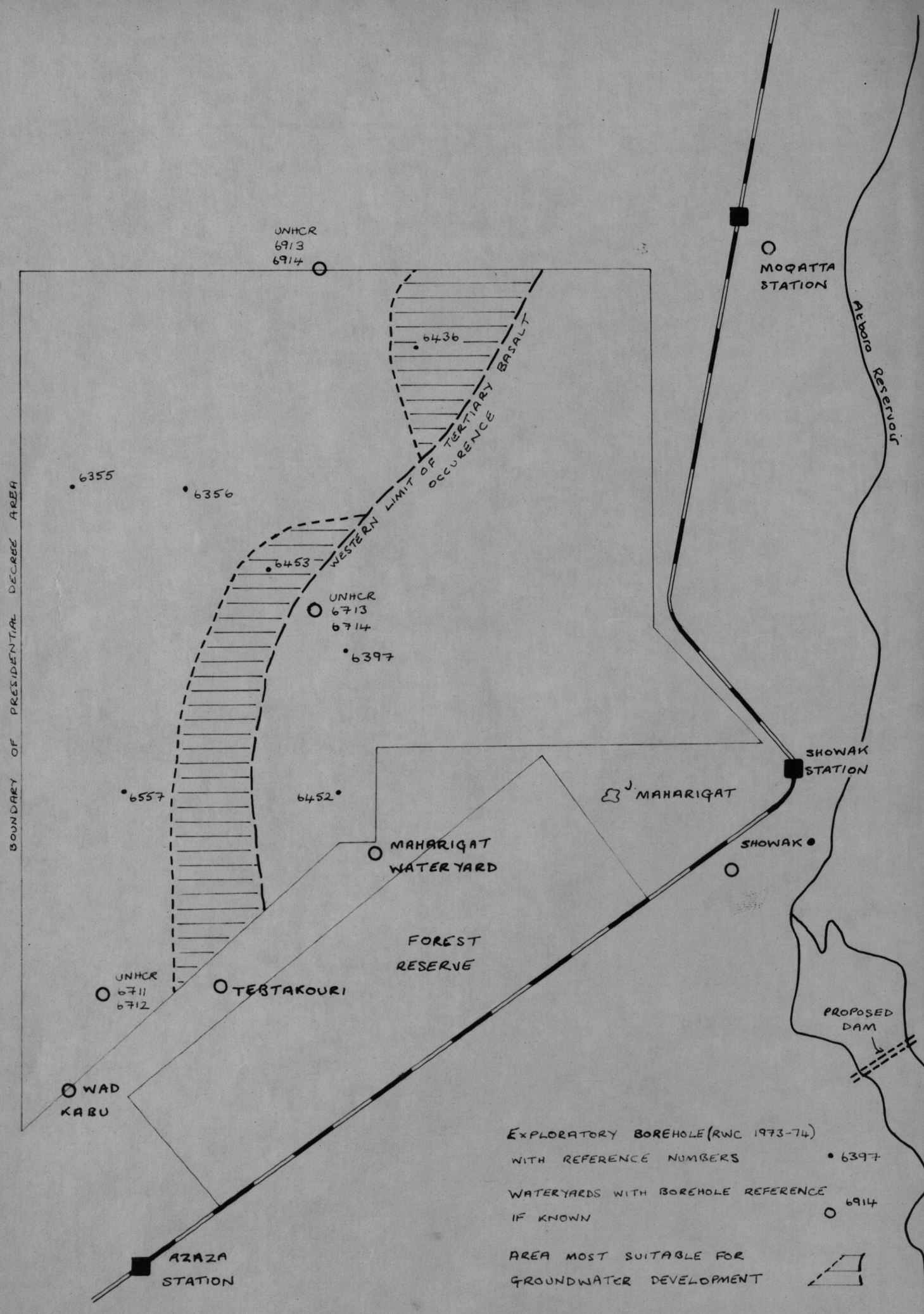
Study existing and proposed construction projects with a view to placing the maximum number of refugees in employment in these projects.

(f) Services outside the Settlement

In discussions with the Provincial Committee for Refugees, prepare outline plans and costs for improving higher order services at Esh Showak and Gedaref in order to cater for the refugee population.

6. Prepare a detailed plan and budget for the full implementation and running of the project for the period June 1976 to June 1978. Submit a report to UNHCR by 31 May, 1976.

GROUNDWATER LOCATION



SURFACE WATER RESOURCES & DRAINAGE

