PD-AAN-040 62
ISN = 30923

PROJECT

WORK PLAN & SCHEDULE

RURAL ROADS IMPROVEMENTS

MBOUT - SELIBABI

SELIBABI - GOURAYE

MBOUT - KAEDI

Contract No. AFR-0214-C-00-3045-00

Project No. 682-0214

USAID/NOUAKCHOTT

ISLAMIC REPUBLIC OF MAURITANIA

JUNE 1983

BY

MORRISON-MAIERLE, INC.

&

OVERSEAS CONSTRUCTION SERVICES

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INTRODUCTION

This Project Work Plan and Schedule (PWP&S) Report has been prepared in accordance with the Statement of Work, article 1.01 as outlined on pages 3, 4, and 5, of the engineering services contract between USAID and Morrison-Maierle, Inc., Consulting Engineers, for the Mauritania Rural Roads Improvement Project AID No.(682-0214).

The overall objective of this project is to provide a year round farm-to-market road network in the southern area of Mauritania. More specifically in the Gorgol & Guidimaka Regions and between the towns of Kaedi-Mbout-Selibabi-Gouraye. Morrison-Maierle, Inc. (M-M) is to serve as the Engineer to the United States Agency for International Development (USAID) Mission in Mauritania and to the Government of the Islamic Republic of Mauritania (GIRM) and the Travaux Publics (TP). The consultant (M-M) will provide the advisory, technical, planning, training and construction management/inspection services in connection with the road construction and/or rehabilitation of approximately 115 Km between Kaedi and Mbout, 50 Km between Mbout (70 Km) and Selibabi and 40Km between Selibabi and Gouraye.

The first members of the project team arrived in Nouakchott, Mauritania, on the 24th of May, 1983. The remaining members arrived on May 28 and May 31, making our team complete with the Chief of Party, Mr. Lee Albee; the Construction Superintendent, Mr. Gerard Garneau; Master Mechanic, Mr. John Nicholson and Field Mechanic, Mr. Arthur Spaeth and two Temporary Duty (TDY) Officers of the consultants, Mr. Paulson and Mr. Larsen. The team proceeded to the construction site on May 30, 1983 and arrived Mbout the afternoon of May 31st.

This report (PWP&S) includes the following scope of work in order to fulfill the requirements of the contract:

1. Preliminary Construction Work Schedule.
2. Training Plan Schedule.
3. Roadway Maintenance Schedule.
4. Design and Inspection Schedule.

The analysis of field investigations and report were completed by Mr. David Paulson, Vice President Engineering Overseas Construction Services Co. (OCS - subcontractor to M-M) and Mr. Larry W. Larsen, Vice President, Eastern Region (M-M) with the help of team members during the period of May 23 through June 30, 1983.

EXISTING ROADWAY CONDITIONS

Km 70 to Selibabi

The existing track from km 70 to the center of Selibabi is 49 Km in length. The track generally follows the least path of resistance avoiding vegetation and sand pockets. The present alignment is composed of very short tangents which deflect to avoid obstacles encountered along the roadway. The topography is composed of gently rolling hills separated by drainage courses. Vegetation is basically composed of small trees and bushes (Savannah) that increase in density further south towards Selibabi. There are presently no existing drainage structures on the alinment of Km 70 to Selibabi. Drainage crossings range from very small channels to channels in excess of 30 meters in width and 4 meters in depth. Earth material for road embankment is generally available from the roadside or from nearby borrow areas. The main concern is the lack of available surfacing material in this area. The quartzite material which was so readily available along the first 70 Km of the Mbout-Selibabi route suddenly disappears at Km 70. From Km 70 to Selibabi only a few small sources of surface material were observed.

Selibabi to Gouraye

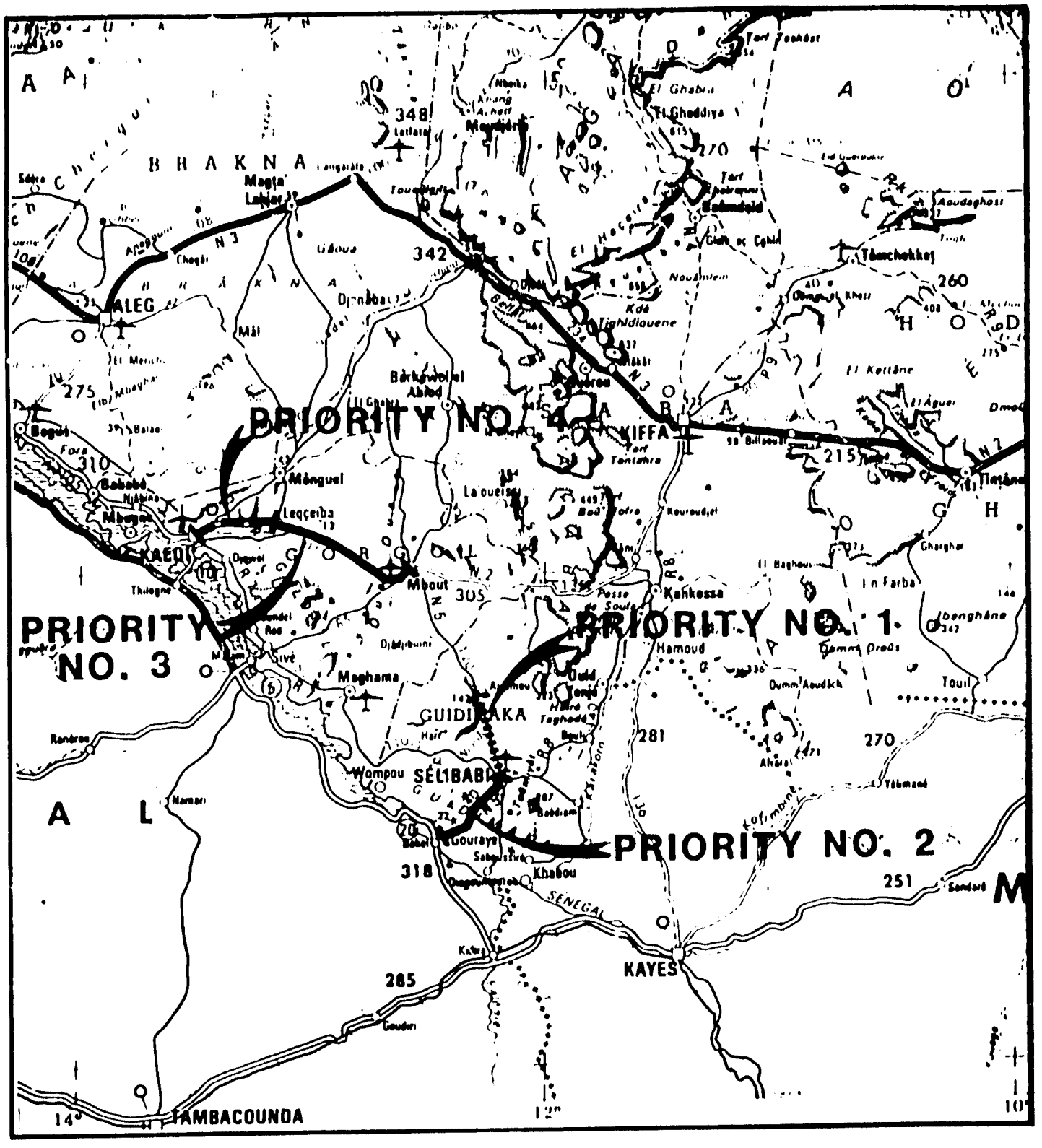
The existing somewhat-improved track from Selibabi to Gouraye is approximately 46 Km in total length. The topography is flat to gently rolling but near Gouraye the topography changes to rolling. The following drainage structures were encountered on the route; five bridges, two 48 inch corrugated metal culverts, three rock radiers, and one functional box culvert. The majority of the bridge super-structures were in fair to poor

condition and inadequate structurally for high axle loads. The bridge water-way openings were also insufficient to handle the runoff during the rainy season. Material for construction of roadway embankment is readily available in this area, but again the main concern is the availability of material for roadway surfacing. Large rock outcroppings were viewed during the field trip but the aggregate from these outcroppings would have to be crushed in order to be used as surfacing material. Further investigation on surfacing materials will have to be conducted during the course of the project to find suitable naturally occuring aggregates close to the project site.

Mbout to Kaedi

The existing track alignment from Mbout to Kaedi is approximately 113 Km in length. The route is basically characterized by two different types of topography. The topography from Mbout to Leqceiba (located at Km 70) is characterized by very flat sections with stone pavement cover separated by drainage channels. Material for road construction and surfacing is readily available in this area. From Leqceiba to Kaedi the topography changes to gently rolling terrain with greatly increased vegetation. Drainage channels are much smaller and more infrequent and the road alignment is much more defined. Material for roadway embankment is readily available, surface material is not nearly so prevalent as in the first 70 Km of the route. There are 28 multiple span concrete bridges located on the route from Mbout to Kaedi all of which are found in the first 70 Km. Structurally all the bridges except one appear to be in sound condtion. All of the structures have one or more of the following problems:

1. Channel alignment
2. Inadequate water way opening
3. Low bridge height
4. Openings clogged with debris
5. Openings filled with sand



PROJECT MAP

MAURITANIA RURAL ROADS IMPROVEMENT PROJECT

There are six existing culvert installations all located in the first 70 Km. Culverts were generally added next to existing bridges to increase the water way capacity. Most of the culverts were filled with sand and/or clogged with debris.

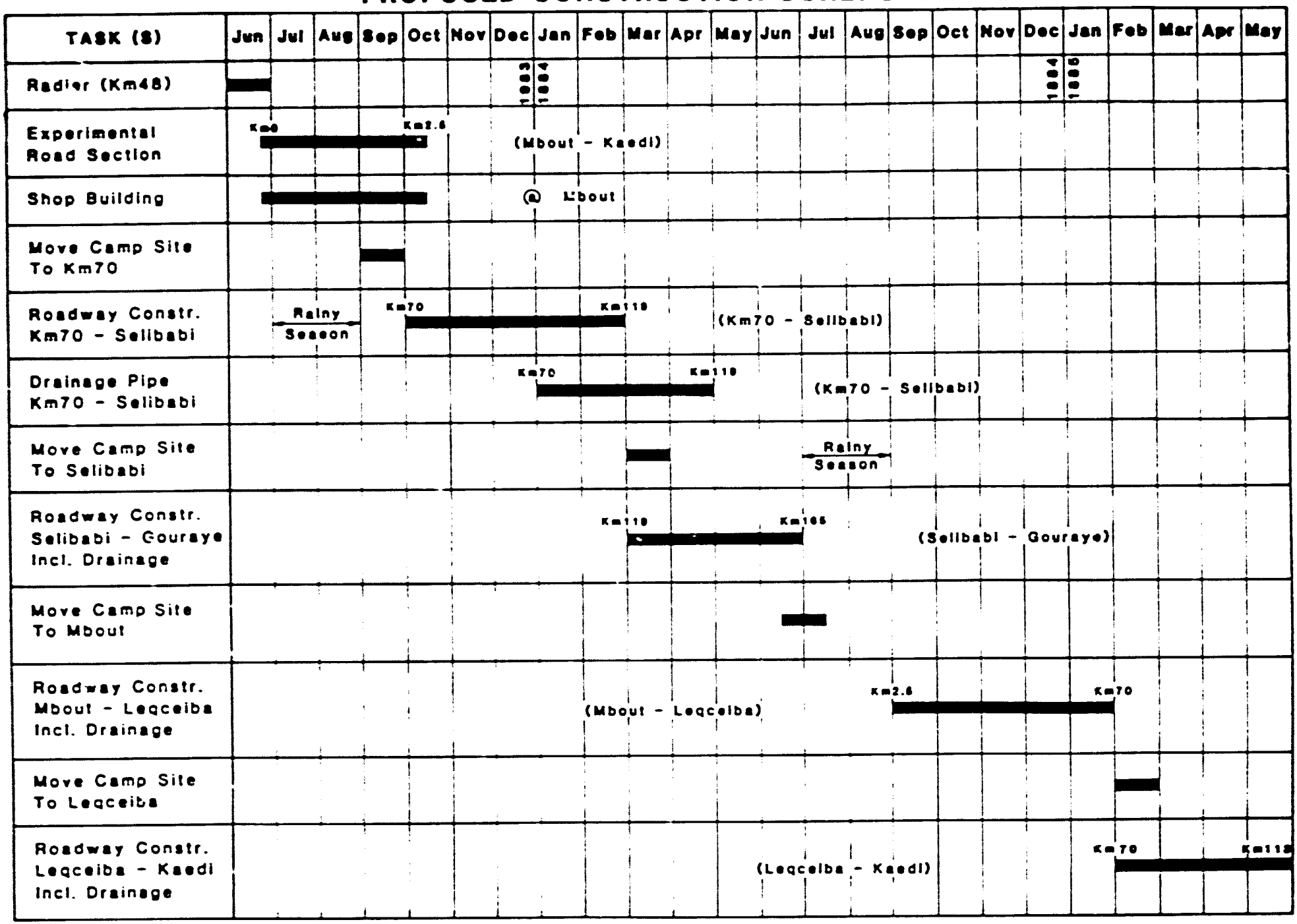
CONSTRUCTION SCHEDULE

This section will provide the Mission with a condensed narrative description of the proposed construction schedule for the duration of the project. The graphic outline of the proposed schedule follows this section and will be refered to as Table 1. We will address the plan in detail and explain what we think to be the most logical, the most economical, and the most feasible method of constructing the farm to market roads.

Our first real construction will begin with a test section of roadway located immediately west of Mbout toward Kaedi and extending from 2½ km to the first and second concrete structures. This section of road was surveyed by the TDY Team early in June, 1983. The construction will consist of the cleaning of the openings of the two bridges, channel changes, an experimental soil cement radier (improved bottom drainage ford) and the subgrade and surfacing of the 2½ km of roadway. This test section will give the construction personnel an idea as to the amount of water and rolling needed for compaction, the capability of the equipment and operators, and the time period needed to complete a km of roadway.

The first phase and number one priority of the project (See PROJECT MAP) is the 49 km south of Mbout, starting at km 70, going southerly to Selibabi. This section of work will also encompass the final construction of the PNUD radier located at km 48. We propose to move part of the team camp near the village of Artemou which is located at approximately km 72. This temporary site will consist of two trailers for living purposes and the office trailer. We will set up camp as soon as possible doing the site work and drilling of a well immediately. The trailers will be moved after the rains have stopped and we should be in a position to start road construction in early October 1983. Our preliminary schedule and time frame estimates a completion on this 49 km section into Selibabi by March 1, 1984. We propose to build this section without installation of any major

TABLE 1
PROPOSED CONSTRUCTION SCHEDULE



drainage structures using only the 260 lineal meters of culvert on the docks in Nouakchott. We will be forced to do this because of the lead time needed to study and secure new drainage structures from offshore purchases. As this first section is completed we will start moving the construction camp to the south in basically the same manner as the move to Artemou. We will also start installation of drainage structures when they arrive in country around the first of January 1984. The next camp move south will probably be in the vicinity of Selibabi. This sequence provides a new road back to the main shop area in Mbout in case we need water, transport facilities or additional equipment.

The second priority of the roadway construction will start at Selibabi and continue on south to Gouraye. Prior to the start of contruction the surveying for design will have been completed either by a subcontractor or by TDY personnel. This section will be easier construction than section one but the area will also lack the surface material needed to complete the roadway. If our estimated production is achieved we should complete this section around July 1, 1984. Once again the construction camp will have to be moved and this move will place the camp back in Mbout to start the rehabilitation of the Mbout-Kaedi section.

The third priority section will begin at km 2.5 west of Mbout and extend to the west to Leqceiba near the bridges crossing the Gorgol River. Roadway and surface material, in this section are probably the best of all sections having aggregate all along the route and in close proximity to the roadway. This section is scheduled for construction between September 1984 through January 1985. One more move for the construction camp will be necessary and will take place in January 1985 and will be located in or near the village of Leqceiba.

The final section of roadway to be rehabilitated is the last 43 km into Kaedi. This section is probably in the best condition now of any section in the project. The rehabilitation will basically follow the exsisting alignment and should be completed to the contract end in May of 1985.

The above narrative should bring to life some of the problems which cannot be avoided. Namely; (1) starting the project in the middle is not the most feasible or economical, (2) surfacing material between km 70 and Gouraye will be hard to find, (3) moving camp four times and locating potable water each time is not desirable.

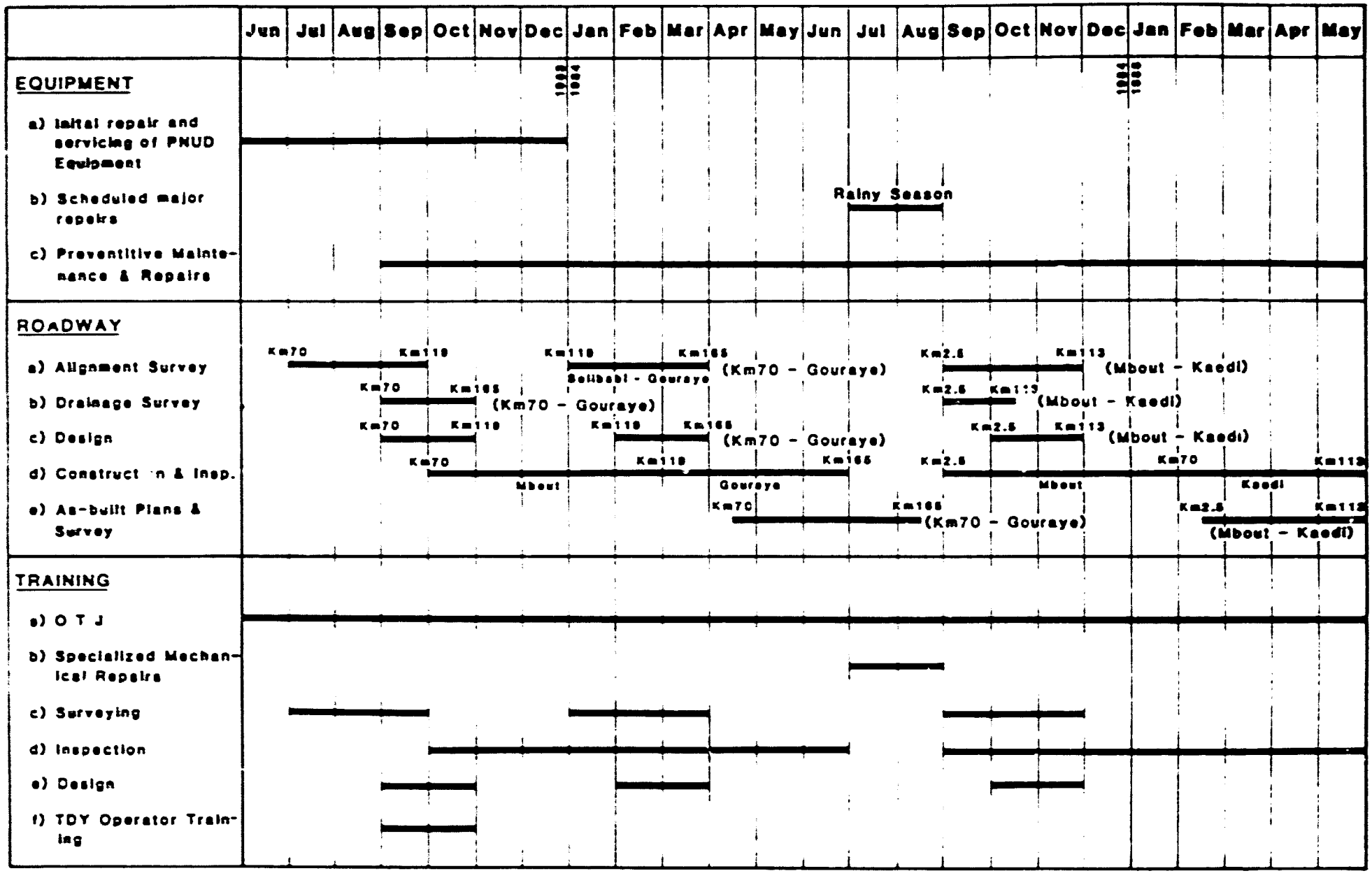
We still feel that if newly acquired TP equipment can be on site in a timely manner and if our team and the local labor force can obtain the expected progress the project can be completed on time and within budget.

WORK SCHEDULE

The proposed Work Schedule is shown immediately after this section and in graphic form and entitled TABLE 2.

The Work Schedule conforms basically to the Construction Schedule and thus will not elaborate unnecessarily on this subject. The initial work components were started on May 31, 1983 and have been continuing since that time. Our preliminary report left with USAID/Nouakchott on June 16, 1983, outlined in detail the projects that were first priority and very necessary to the project. (See ANNEX III.)

TABLE 2
PROPOSED WORK SCHEDULE



ROADWAY MAINTENANCE SCHEDULE

This section will address the maintenance operation of the completed roadway sections. It will also include the 70 Kilometers the PNUD completed prior to our arrival. We will attempt to outline the basic procedures that should be followed in order to maintain a passable and functional roadway and to train the local labor in these procedures so that maintenance can be carried on after the USAID contract is completed.

Four basic functions are needed to insure any kind of an all weather roadway.

1. Blade and haul additional surface material as necessary.
2. Repair any washouts immediately.
3. Clean debris and sand from drainage structures.
4. Add any additional drainage structures as needed when materials are available.

The scheduling of maintenance intervals will be decided upon after the useage can be determined and the kind and type of vehicles using the roadways are known. We would assume at this time a once a month blading would suffice. Costs for maintenance operations are considered incidental and are included in our schedule of total costs because the labor, fuel, equipment and supervision is based on full time usage of the entire fleet and labor forces.

DESIGN AND INSPECTION SCHEDULE

This section shall address the surveying, design, material sources, preliminary drainage structures and available water sources required to complete this project. It will also address inspection procedures and estimated costs of the above.

Surveying shall consist of a preliminary line, P.I. angles and tangent distances. It will include vertical differences of any magnitude and distances to existing drainage channels. This information will be plotted on plan-profile sheets and given to the designer for his useage. (See quote in Annex VIII from Henri Muller for specifics of cost of furnishing a survey crew). Basically this type of surveying will be used in the sections of road between Mbout and Gouraye.

Design shall consists of horizontal and vertical alignments, drainage structure locations and sizes and preliminary cut-fill quantities for haul purposes. On such a low volume road and with the construction procedures to be used one cannot spend a great deal of time in design.

Tabular lists in the Annexes show preliminary drainage structure locations and existing structures (Annexes VI and VII), and proposed borrow and surfacing sources (Annex V). Costs for the above have been included in the costs schedules elsewhere in the report.

Construction inspection and testing will vary depending on the soil types and contruction techniques utilized in the roadway itself. The test section of roadway construction mentioned previously will furnisl the team with hands-on knowledge as to the amount of water, the number of passes for the rollers and some of the soils to be encountered in the construction and the number of tests or testing procedures required to meet the specifications. Costs for design and/or inspection and testing are considered incidental and are included in the overall estimate of costs contained elsewhere in the report.

Water sources will be a problem when starting construction on the first and second phases, (km 70 to Gouraye). There are no positive sources of water avalable in the Selibabi-Gouraya area exepct for the Senegal River which will be inaccessable to large water tankers until the new grade is constructed. The only long term alternative is to drill new wells capable of large volume demand. The volume of water needed for compaction is approximately 400 cubic meters per kilometer using a 10% optimum moisture

factor for maximum densities. With this volume we fear that the aquifer could be damaged for the villagers. Water usage and level will have to be monitored closely to insure that irreplacable amounts are not withdrawn.

TRAINING PLAN

This section will deal with a proposed training plan for the duration of the project and will include but not be limited to the following topics;

1. Equipment Operation and Maintenance Personnel
2. Administrative and Inspection Personnel
3. Surveying and Design Personnel
4. Counterpart Personnel

With the lack of training facilities, including classrooms, visual aids and texts, and with the personnel that are employable having very little or no french language capabilities, the training program will be more than likely an on-the-job (OTJ, Hands-On) program. We would assume that the labor force that worked for the PNUD project prior to our arrival do have some previous training in the operation and maintenance of the existing equipment. We would also assume that this same work force would be returning to work on the USAID project, of which some 25 personnel have been rehired to date. In our short term evaluation of the available personnel and in the condition we found the equipment we feel very strongly that additional training will be required.

Formal training will probably be limited to the major overhauls or major repairs and a one on one exposure to every aspect of equipment operation and preventitive maintenance. We will supplement our team with TDY personnel when needed and at a time when the permanent shop at Mbout is complete and functional. Most formal training courses for the local labor force will take place during the rainy seasons and high wind sand storm seasons and will be scheduled well in advance by the technical assistance team. Material and visual aids, etc. will be decided upon at a later date when the personnel abilities are known.

Survey and design personnel will need immediate training while team personnel or subcontract personnel are engaged in these tasks. We would hope that in the near future local personnel will be available on a day to day basis and in our employment to approve the quality of work. This training will be supplemented by TDY personnel to be scheduled in at the start of the second quarter point of the projects first year of operation.

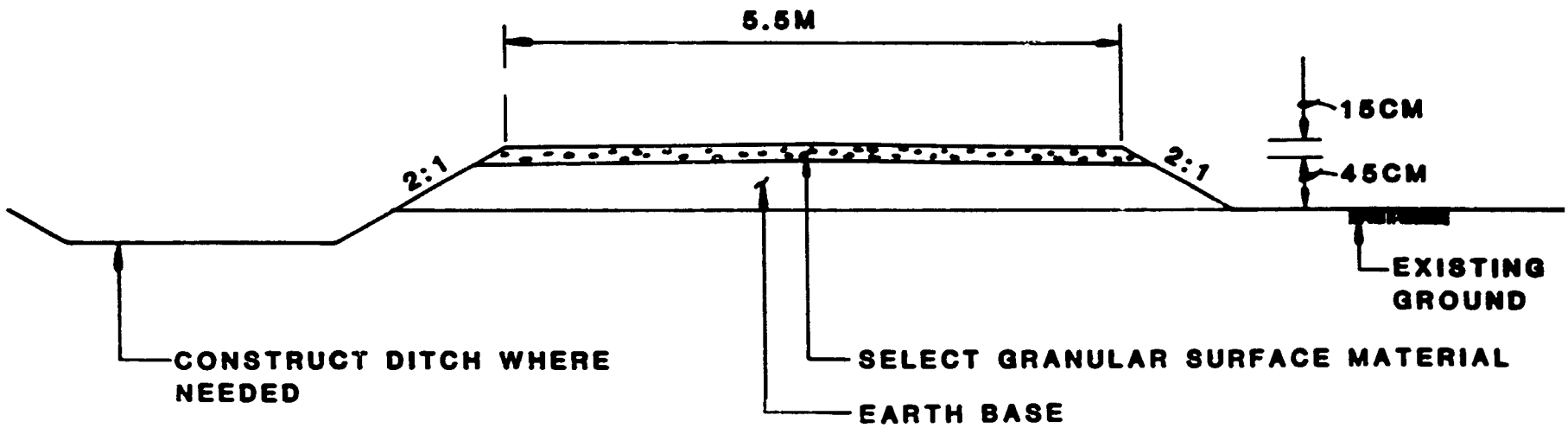
PROPOSED METHODS OF CONSTRUCTION

The addition of the three 621B Caterpillar Scrapers to the existing UN fleet will make it possible to construct an earth embankment section with a minimum thickness of 45 cm. (See PROPOSED TYPICAL CROSS-SECTION). Construction of the earth base course at a minimum of 45 cm above existing ground will provide the following benefits:

1. Reduced damage caused by blowing sand
2. Increased heard room for drainage structures
3. Lateral side ditch drainage
4. Reduction in the amount of surface material required

Construction of the roadway cross section will be done in 2 basic operations. The first operation will be to build the earth base using the 621B scrapers. It is anticipated that hourly production for the 3 scrapers could be as high as 450 M^3/hr (See Production Chart). Allowing for shrinkage it would require approximately 9 hours to construct 1 km of roadway embankment. Considering equipment breakdown factors and increased fill requirements near drainage structures a realistic construction goal should be in the range of 0.5 - 0.6 km/day on the average.

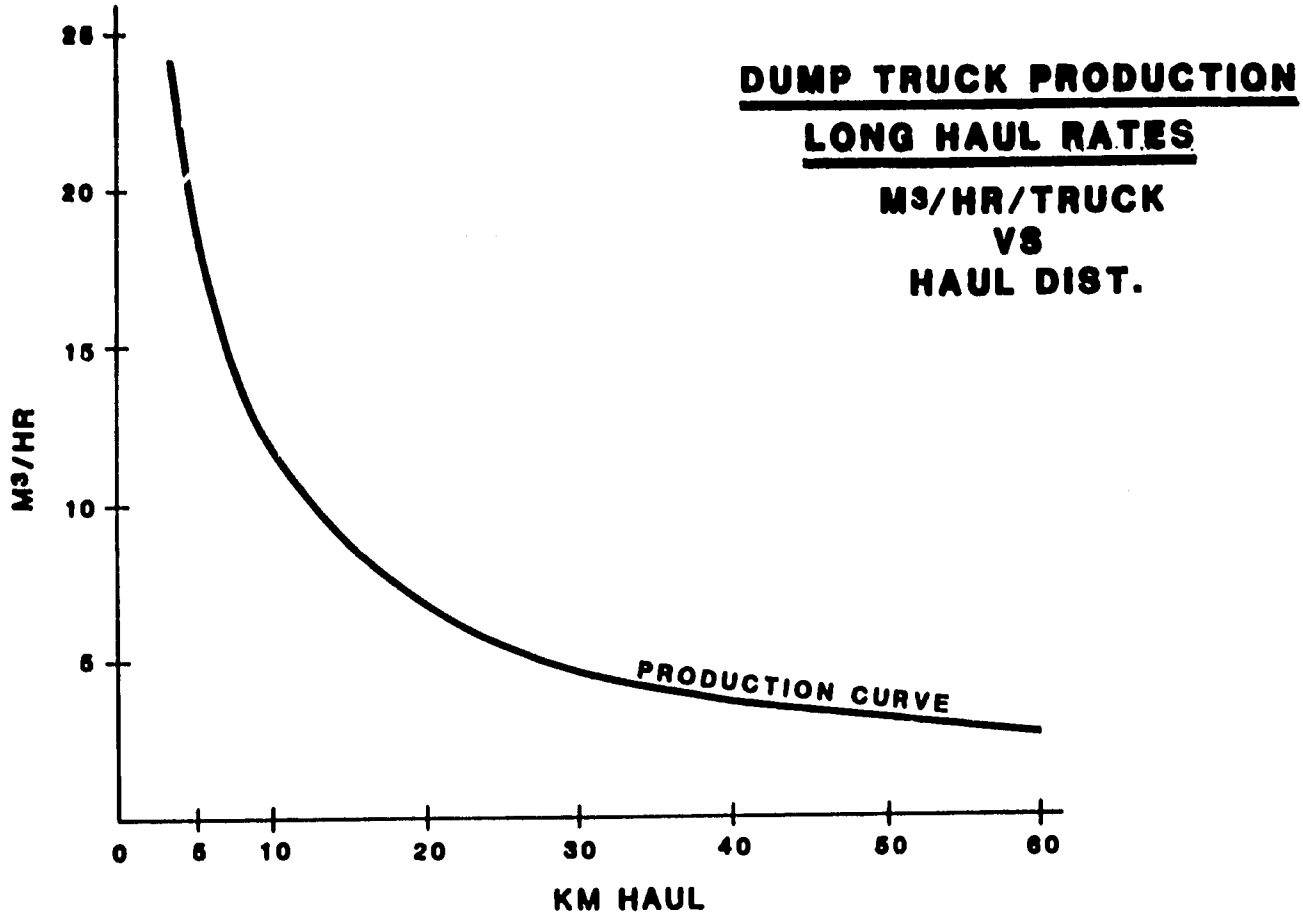
The second construction operation will be to place 15 cm of select granular surfacing on the roadway. This operation will be carried out by using the six Mack Dump Trucks to haul the select material from borrow sites to the roadway. Once the material has been deposited on the roadway it will be shaped and compacted. Calculations show that to achieve production rates of 0.5 - 0.6 km of surfacing per day would require that material borrow sources be within 5-6 km of the road project.

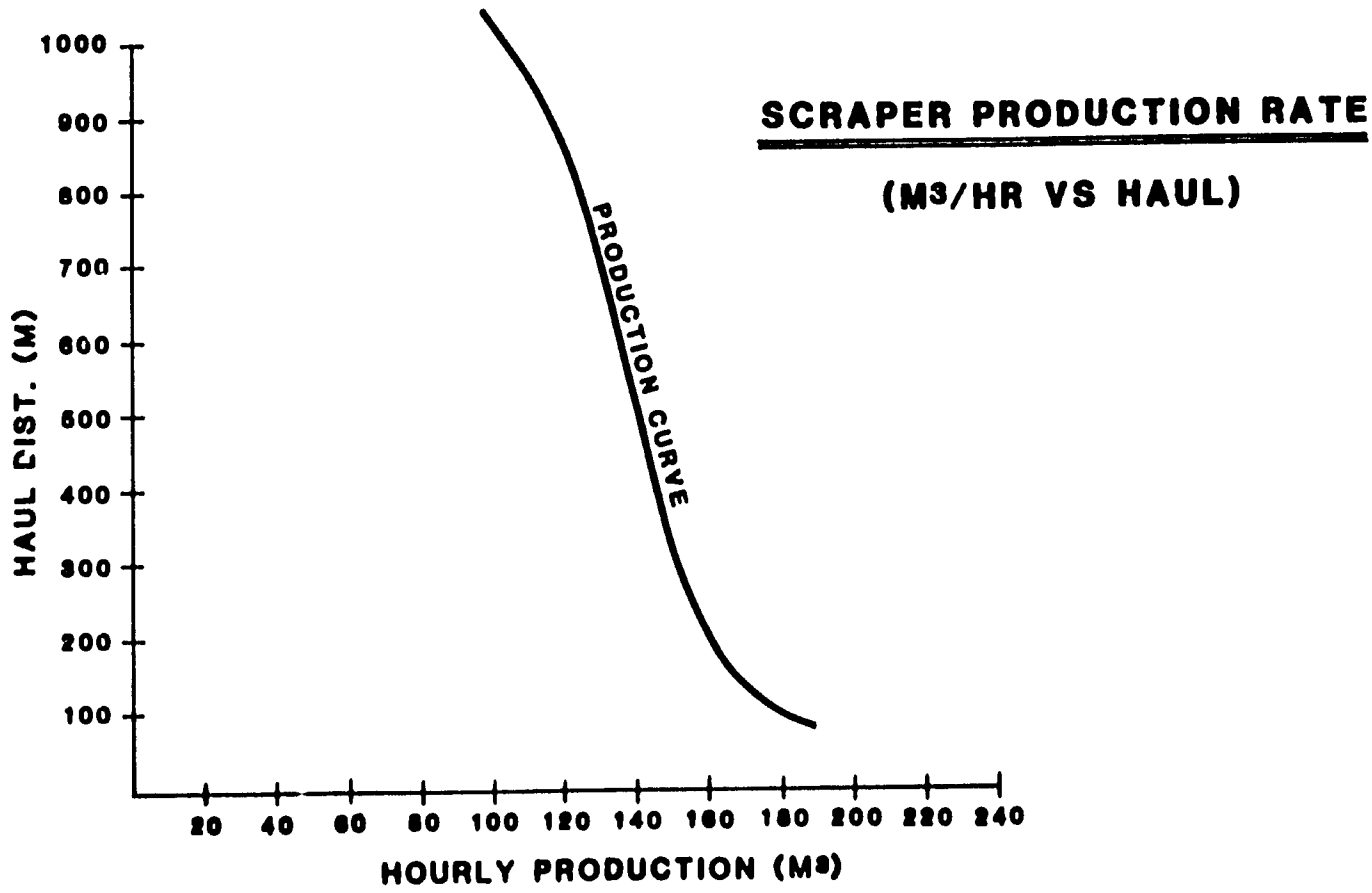


ESTIMATED QUANTITIES REQUIRED PER KILOMETER

EARTH BASE - 3150 M^3/KM
SELECT SURFACE - 870 M^3/KM

PROPOSED TYPICAL CROSS-SECTION


DUMP TRUCK PRODUCTION
LONG HAUL RATES
M3/HR/TRUCK
VS
HAUL DIST.
M3/HR
25
20
15
10
5
PRODUCTION CURVE
0
5
10
20
30
40
50
60
KM HAUL


SCRAPER PRODUCTION RATE
(M3/HR VS HAUL)
HAUL DIST. (M)
1000
900
800
700
600
500
400
300
200
100
PRODUCTION CURVE
20
40
60
80
100
120
140
160
180
200
220
240
HOURLY PRODUCTION (M3)

Location of suitable granular surfacing material appears to be no problem on the Mbout-Kaedi section of the roadway. Large material sources are available as close as 500 M of the present Mbout-Kaedi alignment.

The lack of suitable granular material in the Selibabi-Gouraye region will necessitate longer hauls and lower production rates. It is possible that surfacing operations will lag base construction to the extent that the base crew would have to commence construction on the Mbout-Kaedi section while the surface crew continues to complete the Selibabi-Gouraye section.

STATUS OF EXISTING P.N.U.D. CONSTRUCTION EQUIPMENT

General

After one year of use the PNUD owned equipment is definitely showing its age. The majority of the equipment is plagued with a number of repair problems which are a direct result of the harsh atmosphere in which the equipment was operated. A few pieces of equipment such as one Champion 710 Motor Grader and the Hydraulic Boom Truck are in need of major repairs. Listed below are all the pieces of the mobile equipment and the general equipment problems for each equipment type.

1. MACK DUMP TRUCKS (7)

There are presently seven Mack Dump Trucks. One of the seven Macks is inoperable due to an accident and has subsequently been cannibalized. The six remaining trucks have the following general needs in order to be placed into reliable working condition.

1. Tires - The tires on all the trucks are in need of replacement
2. Dump Bodies - All dump body floors need to be rebuilt
3. Brakes - The majority of the trucks need brake repair
4. Batteries - The majority of the trucks need new batteries
5. Servicing - All trucks need complete lubricant changes, necessary filters and servicing

Due to the absence of any service or repair records it is impossible at this time to predict any major failures. Major problems can only be discovered once construction operations begin and an equipment monitoring system is devised. Trucks 6004-3 & 6004-6 are suspected to possibly have major engine problems because of high oil consumption.

2. MACK FUEL AND WATER TRUCKS (4)

Presently there are three Mack 10,000 L. Water Trucks and one - 10,000 L. Mack Fuel Truck. These trucks have the same general problems as the dump trucks. In addition the water tanks are beginning to show fatigue stress at the frame connections and the water valves need replacement.

3. CHAMPION 710 GRADERS (2)

At present only one of the Champion Graders is in operation. The second grader is in need of a major engine overhaul. Most of the parts for the overhaul are on site but attempting the overhaul without an enclosed dust-free area would be a wasted effort.

The operating champion grader has the following general problems:

1. Tires need replacement
2. Engine overheats under heavy loads
3. Charging system malfunction

4. INTERNATIONAL TD-20E BULLDOZERS (2)

One TD-20E Bulldozer is already in operational status and the second requires new batteries before it can be checked. Both dozers will need undercarriage replacement in the next 500-1000 hours of operation. Both dozers also need complete servicing and adjustment before being placed into operation.

5. MACK LUBRICATION TRUCK (1)

The Lube Truck Chasis is in good condition and requires very few repairs. At present the lubrication system mounted on the truck does not function because the air compressor and its engines are completely worn out. Since the lube truck plays such a vital part in the preventive maintenance of the equipment it is extremely important to receive the parts to repair the compressor as soon as possible.

6. INTERNATIONAL 530 ARTICULATED LOADERS (2)

Both loaders were found deadlined upon arrival at the project site. One has hydraulic pump problems and the other is in need of a fuel injection pump. The loader requiring the fuel injection pump was found to have only the fuel supply blocked with sand. Repair was made and the unit is now operational. The other unit will be diagnosed when batteries are available to start the machine.

7. DYNAPAC DP-22 RUBBER TIRED ROLLER (1)

This unit is functional except for air leaks.

8. REX 910 VIBRATORY ROLLER (1)

The vibrator assembly has been removed and the repair parts are ordered. The unit also has electrical problems and requires a tire replacement.

9. INTERNATIONAL BACKHOE (1)

Good condi ion but requires tires to be operational.

10. MACK LOWBOY TRACTOR-TRAILER (1)

Good condition - needs tires (on order).

ADDITIONAL EQUIPMENT REQUIREMENTS

AQUISITION OF EXISTING T.P. EQUIPMENT

It is recommended that immediate steps be taken by the AID Mission in the aquisition and agreement for repair by the caterpillar dealer in Nouakchott of the following T.P. equipment available in Nouakchott:

1. 3 - 621 B Caterpillar Scrapers
2. 2 - Caterpillar Motorgraders (120 & 120G)
3. 2 - D7F Bulldozers

Repair and delivery of two - 621B Scrapers to the project site should be the first priority. Two of the 621B Scrapers are in need of only minor repairs and their addition to the present PNUD Fleet would greatly improve construction efficiency.

The second priority would be the repair of the Motorgraders since the existing U.N. Graders are in marginal condition.

The third priority would be the repair of the two- D7F dozers. The D7F dozers would be used to relieve the TD-20E's so they can function as push cats.

The final priority would be the repair of the 3rd 621-B which is in need of major engine repair.

Aquisition of the T.P. equipment is an absolute necessity in order to maintain any kind of construction schedule. To load and haul all the required materials with dump trucks only would be extremely costly and inefficient.

REQUIRED NEW EQUIPMENT AND VEHICLES

Transport Vehicles

The first priority would be four new vehicles for on-site transportation as the existing Toyota Land Cruisers are in very poor condition. The replacement vehicles should have the following general specs.

2 Passenger type vehicles (four passenger minimum capacity)
2 Pickup type vehicles

Specifications:

Four wheel drive
Deisel engines
All terrain tires

Air Compressors

Two portable air compressors are required to assemble bolted multiplate arch pipes and for field equipment repair and cutting edge replacement. Listed below are the general spec's for the compressors and the ancillary equipment required.

2 125 - 150 CFM Portable Air Compressors with diesel engines
2 Jack hammers and air hoses
4 3/4 inch drive impact wrenches and sockets for multiplate assembly and field repairs

The air compressors could possibly be aquired from U.S. Excess Property, if available.

Recommended Excess Property Equipment Aquisitions

The following equipment available through U.S. government Excess Property is recommended to supplement the existing fleet.

1) air compressor (2)
2) concrete mixer, 16 cu. ft.
3) semi trailer, flat bed with rack body
4) semi trailer, fuel tank 5,000 gallon capacity
5) 400 gallon portable water trailer
6) 700 gallon fuel trailer
7) Caterpillar D-320 generator set
8) 35 ton lowboy trailer
9) 6 x 6 truck tractor (Mack) with winch
10) 6 x 6 flat bed truck with winch
11) 6 x 6 fuel tanker truck, 1200 gallon capacity

ANNEX I

EXPENDITURE CALCULATIONS (LOCAL COST)

I. FUEL USAGE

Hourly Consumption

3 - 621B Scrapers	@	40 liters/hr.	=	120 L/h
2 - D7F Dozers	@	28 liters/hr.	=	56
2 - TD-20E Dozers	@	35 liters/hr	=	70
3 - Motorgraders	@	18 liters/hr	=	54
2 - Loaders	@	15 liters/hr	=	30
6 - Dump Trucks	@	25 liters/hr	=	150
				480 L/h

Support equipment

Rollers, fuel & water trucks, backhoe

Generators, Low boy & vehicles 50 L/h

Total Hourly Consumption 530 L/h

X 150 Hr/Mo

Total Monthly Consumption = 79,500 Liters

Monthly Cost = 79,500 liters x 21.38 UML =1,699,710 UM

USE 1,700,000

II. LABOR

Once construction begins the total local payroll should be just slightly higher than the payroll for the PNUD project which was approximately 1,000,000 UM per month. It is estimated that a payroll of 1,100,000 UM should be adequate to compensate for the increase in employees due to the acquisition of additional equipment.

III. PARTS AND SUPPLIES

Parts and Supplies acquired locally are estimated at 550,000 UM per month once construction is underway. The expenditures required for parts and supplies are difficult to compute accurately due to varience in needs and lack of sufficient historical data.

IV. REPAIR OF T.P. EQUIPMENT

The cost of repair of the T.P. equipment is per the estimate supplied by the Caterpillar Dealer in Nouakchott.

V. WORKSHOP CONSTRUCTION

The cost of the new workshop facility at Mbout is estimated at 6,200,00 UM.

VI. MONTHLY TABULATION

The following table presents the estimated monthly expenditures for each item.

ESTIMATED MONTHLY LOCAL EXPENDITURES IN OUGUIYA (UM)

MONTH	FUEL	LABOR	PARTS & SUPPLIES	REPAIR T.P. EQUIP	WORKSHOP CONSTR.	TOTALS BY MONTH (UM)	ACCUMULATIVE TOTALS (UM)
1	400,000	150,000	260,000			810,000	810,000
2	400,000	250,000	400,000			1,050,000	1,860,000
3	400,000	350,00	500,000	4,000,000		5,250,000	7,110,000
4	1,200,000	700,000	550,000	6,000,000	3,000,000	11,450,000	18,560,000
5	1,700,000	1,100,000	550,000		3,200,000	6,550,000	25,110,000
6	1,700,000	1,100,000	550,000			3,350,000	28,460,000
7	1,700,000	1,100,000	550,000			3,350,000	31,810,000
8	1,700,000	1,100,000	550,000			3,350,000	35,160,000
9	1,700,000	1,100,000	550,000			3,350,000	38,510,000
10	1,700,000	1,100,000	550,000			3,350,000	41,860,000
11	1,700,000	1,100,000	550,000			3,350,000	45,210,000
12	1,700,000	1,100,000	550,000			3,350,000	48,560,000
13	1,700,000	1,100,000	550,000			3,350,000	51,910,000
14	400,000	350,000	400,000			1,150,000	53,060,000
15	400,000	350,000	400,000			1,150,000	54,210,000
16	1,700,000	1,100,000	550,000			3,350,000	57,560,000
17	1,700,000	1,100,000	550,000			3,350,000	60,910,000
18	1,700,000	1,100,000	550,000			3,350,000	64,260,000
19	1,700,000	1,100,000	550,000			3,350,000	67,610,000
20	1,700,000	1,100,000	550,000			3,350,000	70,960,000
21	1,700,000	1,100,000	550,000			3,350,000	74,310,000
22	1,700,000	1,100,000	550,000			3,350,000	77,660,000
23	1,700,000	1,100,000	550,000			3,350,000	81,010,000

ANNEX II

EXPENDITURE CALCULATIONS (OFFSHORE COSTS)

US DOLLARS

I. SPARES, TOOLS & SUPPLIES & SHOP EQUIPMENT

Current vouchers for spares and tools already on order by USAID are estimated at $400,000. Additional monthly requirements should average at least $15,000 per month including the following general categories.

A. CONSUMABLES
- Tires
- Batteries
- Filters
- Blades

B. Spare Parts

C. Oil and Grease

The basis for the $15,000/mo figure is approximately 10% of the new equipment value.

II. NEW EQUIPMENT

Estimated new equipment requirements are as follows

4 - Project Vehicles	$50,000
1 - Air Compressor	12,000
4 - Radios (SSB Base Station)	6,000
4 - Mobile Radios	4,000
Total	$72,000

III. EXCESS PROPERTY

Estimated CIF Costs

250 CFM air compressor	$ 8,000
16 cu.ft. concrete mixer	4,000
Flat bed semi trailer w/rack	8,000
5000 gal. fuel tank	10,000
400 gal. potable water tank	1,000
700 gal. fuel tank	1,500
D-320 CAT generator set	14,000
35 ton low boy	7,000
6 x 6 truck tractor	28,000
6 x 6 flat bed truck	14,000
6 x 6 fuel tanker (1200 gal)	23,500
Total	$119,000

IV. CULVERTS

Mbout-Gouraye

No. Installations	Dia./Or Span x Rise	Length (Each)	CIF Total Cost
88	.91 x .56m CMPA	10.3 m	90,000
44	1.83 x 1.18 m CMPA	11.9 m	140,000
37	3.05 m 0 CMP	19.5 m	450,000
			$680,000

Mbout-Kaedi

50	.91 x .56 m CMPA	10.3 m	51,000
26	1.83 x 1.18 m CMPA	11.9 m	81,000
10	3.05 m 0 CMP	19.5 m	122,000
			$254,000

The following Table presents the estimated monthly expenditures for offshore items.

ESTIMATED MONTHLY OFFSHORE EXPENDITURES

	SPARES-TOOLS SUPPLIES	NEW EQUIPMENT	EX-PROPERTY EQUIPMENT	CULVERTS MBOUT-GOURAYE	CULVERTS MBOUT-KAEDI	MONTHLY EXPENDITURES	ACCUM. EXPENDITURES
1							
2		50,000				50,000	50,000
3		10,000				10,000	60,000
4	400,000					400,000	460,000
5	20,000	12,000	60,000			92,000	552,000
6	20,000		59,000			79,000	631,000
7	18,000		680,000			698,000	1,329,000
8	15,000					15,000	1,344,000
9	15,000					15,000	1,359,000
10	15,000					15,000	1,374,000
11	15,000					15,000	1,389,000
12	30,000					30,000	1,419,000
13	40,000					40,000	1,459,000
14	15,000					15,000	1,474,000
15	15,000					15,000	1,489,000
16	15,000					15,000	1,504,000
17	15,000					15,000	1,519,000
18	15,000					15,000	1,534,000
19	15,000				254,000	269,000	1,803,000
20	15,000					15,000	1,818,000
21	15,000					15,000	1,833,000
22	15,000					15,000	1,848,000
23	15,000					15,000	1,863,000
24	15,000					15,000	1,878,000

ANNEX III

PRELIMINARY REPORT

Submitted to AID Mission

June 15, 1983

WORK PRIORITIES FOR THE FIRST 4 MONTHS

1. CONSTRUCTION OPERATIONS

1.1 COMPLETE RADIER AT KM 48± (GABIONS)

1.2 EXPERIMENTAL ROAD SECTION

Construct first 2.5 Km roadway from Mbout working toward Kaedi as a test section. Test section to incorporate the following.

A. 45 cm base constructed using motorgrader and dozer

B. Experimental 'shallow' soil cement radier at km 2.3±

C. Channel change to improve hydraulics of existing structure at km 2.5± D. Surface road with 15 cm select material

1.3 PREPARE NEW CAMP SITE AT KM 72± (ARTEMOU)

A. Select site B. Make drainage improvements C. Install sewer & water systems D. Site should be completely prepared before moving house trailers

2. EQUIPMENT

2.1 EXISTING EQUIPMENT (PNUD)

Test, inspect, service and perform all possible repairs on the following priority equipment which will be needed to commence the first section of planned construction operations

A. Champion grader (1)

B. TD-20E dozer (2)

C. International 530 loader (1)

D. Truck-tractor lowboy

E. International loader backhoe

F. Mack dump trucks

It is understood that these prioritios may have to be changed because of lack of spares or inadequate facilities for the performance of major repair work. Each piece of equipment should be thoroughly gone through to insure a minimum amount of downtime once operations are started. Mechanics will have to use their judgement as to which efforts will produce the best results.

2.2 ACQUISITION OF T.P. EQUIPMENT

Priorities for the repair and delivery to the job site of this T.P. equipment are as follows.

A. 2 - 621B CAT Scrapers B. 2 - 120 CAT Motorgraders

C. 2 - D7F CAT Dozers D. 1 - 621B CAT Scraper

The two-621B scrapers which are in need of only minor repairs should be repaired and delivered to the job site with sufficient high mortality parts A.S.A.P. in order that production may begin.

3. CAMPS

3.1 CAMP AT KM 72+ (ARTEMOU)

Site preparation for the new camp at km 72± south of Mbout should begin as soon as equipment is available. Once site is ready and rainy season has passed the team leader and the works superintendent should move to this location to direct construction of the road section from Km 70 - Selibabi.

3.2 CAMP AT MBOUT

The two (2) mechanics will remain at Mbout to carry out repair operations from the new central shop. It is anticipated that one

(1) mechanic will serve in a field service capacity and the other will direct operations of the central shop.

3.3 CAMP LOGISTICS KM 72+ and MBOUT

A. Water Supply (Options)

1. Drill well at Artemou (km 72 Camp) 2. Haul water from Mbout 3. Use water tank at km 50 for potable water at km 72

B. Electrical Power

1. Use new 60 kw gen. set for Mbout camp and shop 2. Move 26 kw gen. set to operate km 72 camp

C. Sewer and water distribution materials available from local sources.

4. REPAIR SHOP AT MBOUT

Construction of a central repair facility at Mbout should begin as soon as possible. The shop is urgently needed to perform major repairs which are not possible in an open air environment. Plans for a facility already exist and could be used with very little modification for the basic building frame. Once the building is erected, interior modifica-tions can be made to suit the operations. The new facility should contain the following basic components.

A. 2 repair bays B. Air tight & conditioned component repair area
C. Parts storage D. Small office E. Restroom

5. ROUTE LOCATION KM 70 - SELIBABI

We suggest hiring a local survey firm on a daily basis for preliminary route location (See quote in Annex VIII). The survey crew will be directed by the team leader and depending on the crew's performance, a decision will be made whether or not to continue retaining their services. Work should start as soon as the crew is available and approval for local expenditure is made.

6. HYDRAULICS

Depending on the severity of the rainy season a decision will be made on when to send out a TDY Hydraulics Specialist for the sizing of drainage structures. Preliminary hydraulic studies will be made by the Morrison-Maierle home offices using quad sheets.

June 1983

PROGRESS REPORT

May 24th — Garneau, Paulson & Larsen arrived Nouakchott @ 1530, was met by Mr. Baron, USAID/NOK, we proceeded to our Hotel and was briefly consulted as to the Mauritanian customs, etc.

May 25 thru May 29 - Spaeth & Nicholson of our team arrived Nouakchott 28. That left only Mr. Albee, C.O.P. left to enter the Country. We spent the time meeting certain officials including the Ambassador Mr. Peck and his assistant Mr. Brin. We met the USAID director Mr. Benedict and his assistant Mr. Goldman. We were introduced to the U.N. people and USAID people whom we will be working with for the next two years. Basically we prepared our team so we could get to our camp site in Mbout.

May 30 - We left Nouakchott @ 1300 and traveled as far as Kaedi, arriving there at 2100.

May 31 - Left Kaedi @ 0800 arriving Mbout @ 1300. We ran into the rain swollen creeks that delayed us. After arriving Mbout we were faced with wiring the camp for electricity. Spent the remainder of the day doing that along with Mr. Poulin, USAID.

June 1 thru June 11 - Our team spent this time doing the following tasks:

1. Inventory of equipment, spare parts and vehicles.
2. Complete inventory of the roads between Mbout-Selibabi, Selibabi-Gouraye and Mbout-Kaedi. Kilometer readings and preliminary drainage survey.
3. Survey and staking of the 1st 2.5 km of the Mbout-Kaedi road to be used as a test section. Our crew to determine construction procedures and equipment conditions.

Our work force now includes some 25 people and have started the construction of the gabion baskets on the radier at Km 48 (Mbout-Selibabi) and the start of putting the equipment into shape for the beginning of construction. Chief of Party, Mr. Albee and Mr. Edeline, UNDP arrived Mbout on the 6th of June.

June 12 -Paulson & Larsen returned to Nouakchott to finalize details pertaining to the construction and equipment.

June 13 thru June 16 -Paulson & Larsen have met with personnel in USAID and private companies to gather information to prepare the final PWP&S report.

Our crew in Mbout has begun some road construction (Radier at KM 48 Mbout-Selibabi) and of course the mechanics have been very busy preparing the equipment. We have made arrangements to purchase excess equipment and also to repair T.P. equipment to give us a more useful construction brigade.

ANNEX IV

TRUCK AND SCRAPER PRODUCTION RATES

SURFACING PRODUCTION RATES

LONG HAUL USING TRUCKS

HOURLY PRODUCTION/TRUCK (M^3/HR)

ASSUMPTIONS:

- Trucks traveling on constructed grade
- Load time 5 min
- Dump Time 2 min
- Average Speed
  - Loaded 45 km/hr (1.33 min/km)
  - Empty 55 km/hr (1.10 min/km)
  - 90% Eff.
  - 7.0 M^3/load (Shrunk M^3)

5 KM HAUL

Cycle time = 5 + 2 + 5 (1.33 + 1.10) = 19.15 min $\frac{19.15}{.90}$ = 21.25 min

(2.43)

10 KM HAUL

Cycle time = 5 + 2 + 10 (2.43) = 31.3 min $\frac{31.3}{.90}$ = 34.8 min

20 KM HAUL

Cycle Time = 5 + 2 + 20 (2.43) = 55.6 min $\frac{55.6}{.90}$ = 61.8 min

40 KM HAUL

Cycle Time = 5 + 2 + 40 (2.43) = 104.2 min $\frac{104.2}{.90}$ = 115.7 min

60 KM HAUL

Cycle Time = 5 + 2 + 60 (2.43) = 152.8 min $\frac{152.8}{.90}$ = 169.8 min

M^3/hr Production Per Truck (Various Haul Dist.)

5 KM HAUL

$$\frac{60 \text{ min}}{21.25 \text{ min/cycle}} \times 7\ M^3/CY = \frac{420}{21.25 \text{ (cycle time)}} = 19.8\ M^3/hr$$

10 KM

$$\frac{420}{34.8} = 12\ M^3/hr$$

20 KM

$$\frac{420}{61.8} = 6.8\ M^3/hr$$

40 KM

$$\frac{420}{115.7} = 3.6\ M^3/hr$$

60 KM

$$\frac{420}{169.8} = 2.5\ M^3/hr$$

SCRAPER PRODUCTION RATE (CAT 621B)
(M^3/HR VS HAUL)

ASSUMPTIONS

621 B CAT Scraper

Average Load = $11M^3$ (Compacted M^3)
$14M^3$ (Loose M^3)

CYCLE TIMES
Load - 1.4 min
Dump - 1.0 min

Haul 100 M	Haul (100M)	.4 min	Return (100M)	.3 min
300 M	Haul (300M)	.7 min	Return (300M)	.6 min
500 M	Haul (500M)	.9 min	Return (500M)	.7 min
1000 M	Haul (1000M)	1.6 min.	Return (1000M)	1.4 min

Average Grade 1%

Total Cycle Times

100 M	3.1 min
300 M	3.7 min
500 M	4.0 min
1000 M	5.4 min

Compacted M^3/Hr @ 85% Eff.

(100M) $\frac{60}{3.1} \times .85\ 11\ M^3/CY = 181\ M^3/hr$

(300M) $\frac{60}{3.7} \times .85 \times 11\ M^3/CY = 151\ M^3/hr$

(500M) $\frac{60}{40} \times .85 \times 11\ M^3/CY = 140\ m^3/hr$

(1000M) $\frac{60}{5.4} \times .85 \times 11\ M^3/CY = 104\ M^3/hr$

ANNEX V

ROADWAY MATERIAL - BORROW FOR SURFACING

Km 70 = 0.0 Km MBOUT - GOURAYE

KM	STATUS	KM	STATUS
60.0	Possible Borrow	20.9	Possible test pits
61.0	Possible Borrow	23.4	Surface Material
63.0	Possible Borrow	27.4	Possible test pits
67.0	Possible Borrow	28.1	Possible test pits
----	KM70.0 = KM 0.0	28.4	Possible test pits
1.3	Possible Material	30.1	Surface Material
2.7	Possible test pits	31.3	VILLAGE
3.6	Possible test pits	31.4	Possible Material
5.5	VILLAGE	31.6	Possible Material
8.1	Possible test pits	32.0	Possible Material
10.0	Possible test pits	32.7	Possible Material
10.5	Possible test pits	39.1	Possible Material
11.8	Surface Material	42.0	Possible Material
12.2	Surface Material	43.0	Possible Material
13.25	Surface Material	51.7	Possible Borrow
14.2	Possible test pits	55.9	Small Material Source
14.5	Possible Borrow	60.4	Small Material Source
14.9	VILLAGE (TASO)	64.0	VILLAGE
15.3	Surface Material	68.7	Pile of Material
17.6	Surface Material	71.95	Pile of Material
18.9	Surface Material	77.0	VILLAGE
19.0	Possible test pits	81.5	VILLAGE
		94.5	GOURAYE

ROADWAY MATERIAL - BORROW FOR SURFACING

SELIBABI SIGN = 0.0 Km MBOUT-KAEDI

KM STATION	KM STATION	KM STATION	KM STATION
4.2	52.8		
6.8	54.0		
7.65	54.4 - 54.8		
8.0	55.0		
8.5	56.1 - 56.8		
14.1	57.1		
14.4	57.4 - 57.7		
16.3	57.8		
22.7 - 22.8	58.35		
23.3 - 23.4	59.1		
24.6	61.2		
27.0 - 27.3	63.5		
28.1	76.6		
29.6	93.7		
33.1	94.4		
35.0	96.5		
37.1	111.2		
37.6			
38.6			
40.5			
41.1			
44.6			
47.6			
48.6			
50.5			

ANNEX VI

DRAINAGE SUMMARY

Km 70 = 0.0 MBOUT - GOURAYE

KM	NEW	EXIST.	PROPOSED&/or SIZE (METERS)	KM	NEW	EXIST	PROPOSED&/or SIZE
2.1	X		Small (0.91 x 0.56)	14.9	X		Small
3.35	X		Medium (1.83 x 1.12)	15.2	X		Small
3.5	X		Small Culvert	15.25	X		Small
4.2	X		Small	15.4	X		Ex. Large
5.0	X		Small	15.5	X		Large
5.9	X		Small	17.7	X		Large
6.6	X		Large (3.05)	17.9	X		Ex. Large (Multiple)
6.7	X		Small	18.1	X		Large
7.1	X		Medium	18.2	X		Small
7.7	X		Small	19.85	X		Small
9.15	X		Medium	20.1	X		Small
9.5	X		Small	20.25	X		Small
9.85	X		Small	21.3	X		Medium
10.5	X		Small	22.55	X		Medium
10.95	X		Medium	22.9	X		Small
11.05	X		Small	24.5	X		Small
12.1	X		Medium	25.0	X		Medium
12.2	X		Small	25.15	X		Small
13.1	X		Small	26.0	X		Small
13.25	X		Medium	26.2	X		Small
13.9	X		Medium	26.3	X		Small
14.25	X		Small	26.7	X		Jungle (Ex. Large)
14.35	X		Small	26.9	X		Jungle (Ex. Large)
14.65	X		Small	27.7	X		Small
17.7	X		Small	28.7	X		Small
29.0	X		Small	36.7	X		Small
29.45	X		Medium	36.95	X		Small
29.95	X		Small	37.8	X		Medium

DRAINAGE SUMMARY

Km 70 = 0.0

MBOUT - GOURAYE

KM	NEW	EXIST	PROPOSED&/or SIZE (METERS)	KM	NEW	EXIST	PROPOSED&/or SIZE
30.3	X		Small Culvert	38.05	X		Medium
31.1	X		Small	38.6	X		Medium
31.4	X		Small	38.8	X		Medium-Large
31.5	X		Medium	40.6	X		Medium
31.9	X		Medium	40.8	X		Medium
32.3	X		Small	41.15	X		Small
32.5	X		Small	41.4	X		Medium
32.75	X		Medium	42.2	X		Medium
32.9	X		Small	42.7	X		Medium
33.05	X		Small	42.95	X		Medium
33.1	X		Small	43.4	X		Small
33.4	X		Medium	43.5	X		Small
33.7			Small	43.8	X		Small
34.05			Small	44.0	X		Medium
34.3			Medium	44.2	X		Small
34.8			Small	44.7	X		Medium
35.0			Medium	45.0	X		Small
35.65			Small	59.6	X		Medium
35.8			Small	60.1	X		Small
49.0		X	Large Radier-Selibabi	60.35	X		Small
50.1		X	Conc.Bridge10.7 x 3.2 3.0 deep	60.6	X		Small
50.95	X		Small	61.1	X		Small
51.1	X		Medium	61.5	X		Exist.Radier (Sm)
52.25		X	I Beam Conc.Bridge Medium	62.0	X		Small
53.3	X		Small	62.8	X		Exist.Radier (Sm)
53.9	X		Small	63.3	X		Small

DRAINAGE SUMMARY

Km 70 = 0.0 MBOUT - GOURAYE

KM	NEW	EXIST	PROPOSED&/or SIZE (METERS)	KM	NEW	EXIST	PROPOSED&/or SIZE (METERS)
54.1	X		Small	64.0		X	1.22 CSP
55.1		X	Conc.Bridge (Med.) 3.6 x 2.7 - 1.5 deep	65.0		X	0.6 x 0.6 Box
55.5	X		Medium	67.9	X		Small
56.2	X		Small	68.45	X		Small
56.3			Small	69.05	X		Small
56.6		X	1.22 CSP	69.6		X	Conc.Br.(Wood Deck) 4.9 x 3.7-4.0 deep
56.9	X		Small				
57.1	X		Medium (Radier?)	70.0		X	Radier (Med)
58.4	X		Small	70.65	X		Small
58.9	X		Small	71.2	X		Small
59.25			Large	71.25	X		Small
71.75	X		Small	92.3	X		Small
73.05	X		Small				
74.0	X		Small				
74.35	X		Medium				
75.2	X		Small				
76.0	X		Medium				
76.1	X		Radier (Med)				
76.3	X		Small				
77.4	X		Small				
77.6		X	Conc. Bridge 4.9 x 3.7-4.0 deep				
77.7	X		Medium				
78.5	X		Medium				
80.7	X		Medium				
81.4	X		Medium				
85.7	X		Small				
87.1	X		Small				
87.3	X		Medium				
88.6	X		Medium				

ANNEX VII

DRAINAGE SUMMARY

SELIBABI SIGN = 0.0 Km MBOUT-KAEDI

KM	EXIST.	NEW	DESCRIPTION	SIZE (M) (L x W)
2.2		X	Culvert	
2.4	X		Conc. Bridge	18 x 4
2.5	X		Conc. Bridge	6.8 x 6
2.5		X	Culvert	
3.65		X	Culvert	
4.4		X	Culvert	
4.55		X	Culvert	
4.6		X	Culvert	
4.8	X		Conc. Bridge	9.1 x 6
7.2	X		Conc. Bridge	11.2 x 4
8.0		X	Culvert	
8.2		X	Culvert	
8.4		X	Culvert	
9.3		X	Culvert	
9.4		X	Culvert	
9.5		X	Culvert	
10.4		X	Culvert	
10.8		X	Culvert	
10.9		X	Culvert	
11.35		X	Culvert	
11.45	X		Culvert	Twin 0.91 0
12.35	X		Culvert	Twin 0.91 0
12.6		X	Culvert	
12.8		X	Culvert	
13.25		X	Culvert	
14.0		X	Culvert	
17.3	X		Conc. Bridge	22.3 x 4
17.5	X		Conc. Bridge	13.4 x 4
17.5	X		Conc. Bridge (Down)	9.1 x 4

DRAINAGE SUMMARY

SELIBABI SIGN = 0.0 Km

MBOUT-KAEDI

KM	EXIST.	NEW	DESCRIPTION	SIZE (M) (L x W)
19.55	X		Culvert	Twin 0.91 0
21.15		X	Culvert	
21.3	X		Conc. Bridge	13.4 x 4
21.5		X	Culvert	
21.6	X		Conc. Bridge	13.4 x 4
23.6	X		Conc. Bridge	11.25 x 4
25.3	X		Conc. Bridge	6.9 x 4
25.3	X		Conc. Bridge	11.25 x 4
25.9	X		Conc. Bridge	4.7 x 6
27.4		X	Culvert	
30.9	X		Conc. Bridge	9.1 x 6
31.95	X		Conc. Bridge	6.9 x 6
31.0	X		6-Culverts	6-0.91 0
31.05	X		Conc. Bridge	9.0 x 6
31.4		X	Culvert	
31.65		X	Culvert	
31.8		X	Culvert	
33.9	X		Conc. Bridge	9.1 x 4
34.0	X		Conc. Bridge	9.1 x 4
34.25	X		Conc. Bridge	11.25 x 4
36.7	X		Conc. Bridge	9.0 x 6
36.8		X	Culvert	
42.6	X		3-Culverts	Triple 0.91 0
42.7		X	Culvert	
43.1	X		Conc. Bridge	22.3 x 4
43.1	X		Conc. Bridge	15.5 x 4
43.1	X		Conc. Bridge	20.1 x 4
43.15		X	Culvert	
45.6		X	Cu vert	
46.95	X		Culvert	0.76 0

DRAINAGE SUMMARY

SELIBABI SIGN = 0.0 Km

MBOUT-KAEDI

KM	EXIST.	NEW	DESCRIPTION	SIZE (M) (L x W)
47.3		X	Culvert	
47.45	X		Conc. Bridge	17.9 x 4
47.45		X	Culvert	
51.4		X	Culvert	
51.65		X	Culvert	
51.75		X	Culvert	
51.9	X		Conc. Bridge	6.8 x 6
53.5		X	Culvert	
54.1		X	Culvert	
54.3		X	Culvert	
55.0		X	Culvert	
55.2		X	Culvert	
55.3	X		Conc. Bridge	13.4 x 4
55.4		X	Culvert	
55.9		X	Culvert	
57.0		X	Culvert	
57.3		X	Culvert	
58.45		X	Culvert	
60.6		X	Culvert	
61.05		X	Culvert	
63.0		X	Culvert	
63.7		X	Culvert	
69.7	X		Conc. Bridge	73.8 x 3.5
69.9	X		Conc. Bridge	37.0 x 3.5
75.65		X	Culvert	
79.3		X	Culvert	
84.1		X	Culvert	
89.23		X	Culvert	
91.2		X	Culvert	
91.7		X	Culvert	

DRAINAGE SUMMARY

SELIBABI SIGN = 0.0 Km

MBOUT-KAEDI

KM	EXIST.	NEW	DESCRIPTION	SIZE (M) (L x W)
92.15		X	Culvert	
93.4		X	Culvert	
95.6		X	Culvert	
98.8		X	Culvert	
100.7		X	Culvert	
101.3		X	Culvert	
101.75		X	Culvert	
102.0		X	Culvert	
102.2		X	Culvert	
102.4		X	Culvert	
102.8		X	Culvert	
103.1		X	Culvert	
103.4		X	Culvert	
103.5		X	Culvert	
104.1		X	Culvert	
107.9		X	Culvert	
108.9		X	Culvert	
109.1		X	Culvert	
109.2		X	Culvert	
109.45		X	Culvert	

LAR/R

ETUDES TOPOGRAPHIQUES HENRI MÜLLER

Reg. Com. N° 186
B.I MA N 001 817V
S M B · CCD 1264

14 JUIN 1983

V/Réf
N/Réf 9784

ANNEX VIII

ARRISON MAIERLE INC
A L'attention de Monsieur LARRY LARSEN
S/C DE Monsieur EDELINE
NOUD NOUAKCHOTT

PROPOSITION DE PRIX

Mise à disposition d'une équipe topographique sur le site de M'BOUT SELIBABY comprenant :

- 1 véhicule 4/4 (plus carburant)
- 1 chauffeur mécanicien
- 1 topographe Mauritanien
- 3 manoeuvres

- MATERIEL

- 1 tachéomètre
- 1 niveau automatique
- 1 distomat DI 4 + accessoires et matériel courant (Trépieds, chaines, boussoles etc...

Prix calculés sur la base de : Intervention de 3 à 4 semaines.

- 6 jours de travail facturés par semaine moyenne de 10 heures par jour. (370.00)
  Prix unitaire..... 19.200 UM/j
  Modalité de paiement : 10% du montant global estimé à la mise en place de l'équipe.
  A la quinzaine, suivant avancement de chantier.

Veui Souhaitant vous intéresser, et restant à votre disposition pour tout renseignement que vous jugeriez utiles de nous demander, veuillez [illegible], Monsieurs, nos sincères salutations.

J. CL. DEJRAVE

Best Available Document