Basic Design Study Report on The Project for Providing Equipment for Ghana Highway Authority Workshops in The Repubric of Ghana

MARCH 1992

JAPAN INTERNATIONAL COOPERATION AGENCY

Basic Design Study Report on The Project for Providing Equipment for Ghana Highway Authority Workshops in The Republic of Ghana
MARCH 1992
JIC

Basic Design Study Report
on
The Project
for
Providing Equipment
for
Ghana Highway Authority Workshops
in
The Repubric of Ghana

MARCH 1992

JAPAN INTERNATIONAL COOPERATION AGENCY

PREFACE

In response to the request of the Government of the Republic of Ghana, the Government of Japan decided to conduct a basic design study on the Project for Providing Equipment for Ghana Highway Authority Workshops and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Ghana a study team headed by Mr. Ryo Yamana, Manager of Machinery Division, First maintenance Department, Second Operation Bureau, Honshu-Shikoku Bridge Authority, from 15 October to 7 November, 1991.

The team held discussions with the officials of the Government of Ghana and conducted a field survey at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Ghana in order to discuss of drafting the final report and the present report was prepared.

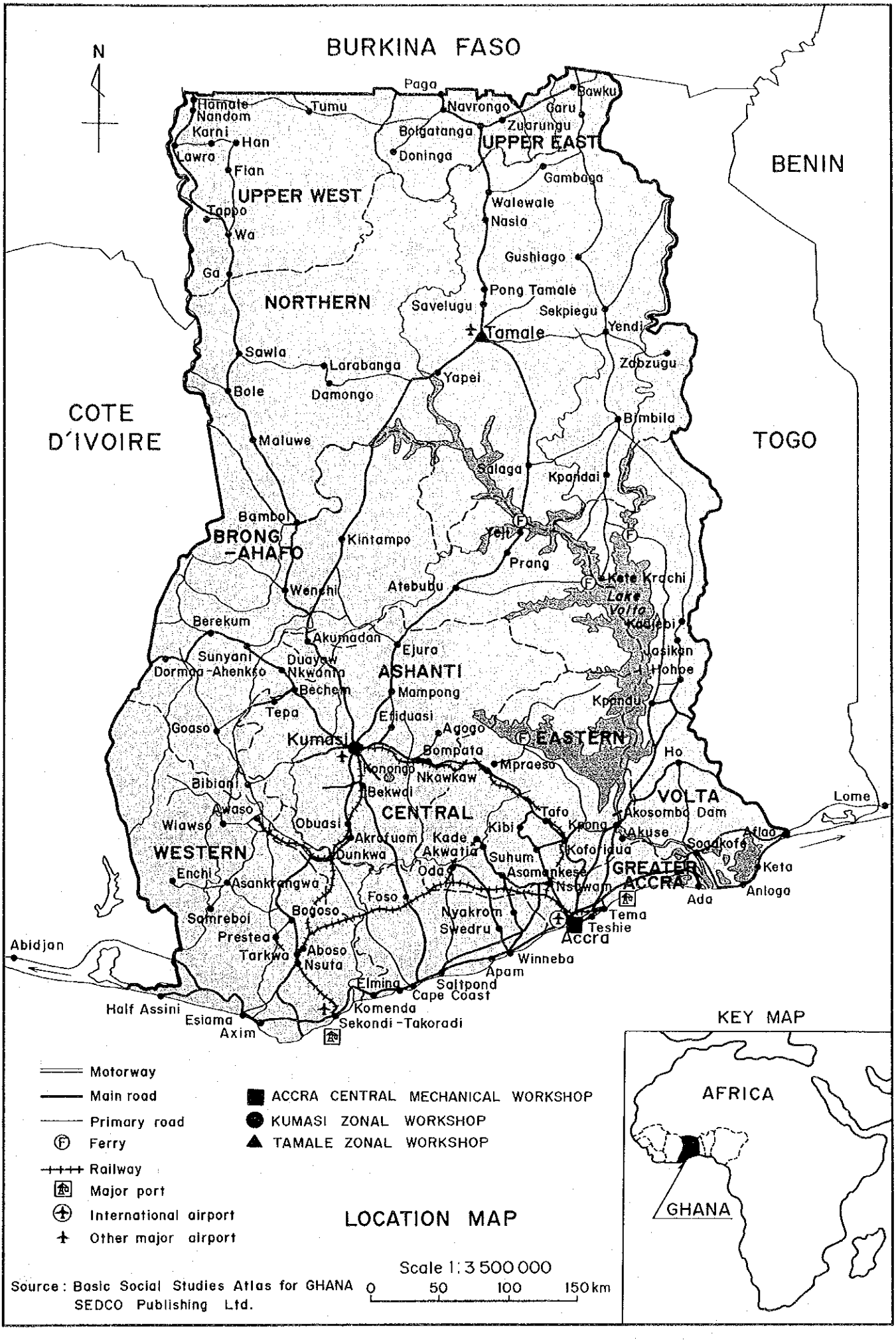
I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between the two countries.

I wish to express my sincere appreciation to the officials of the Government of the Republic of Ghana for their close cooperation extended to the teams.

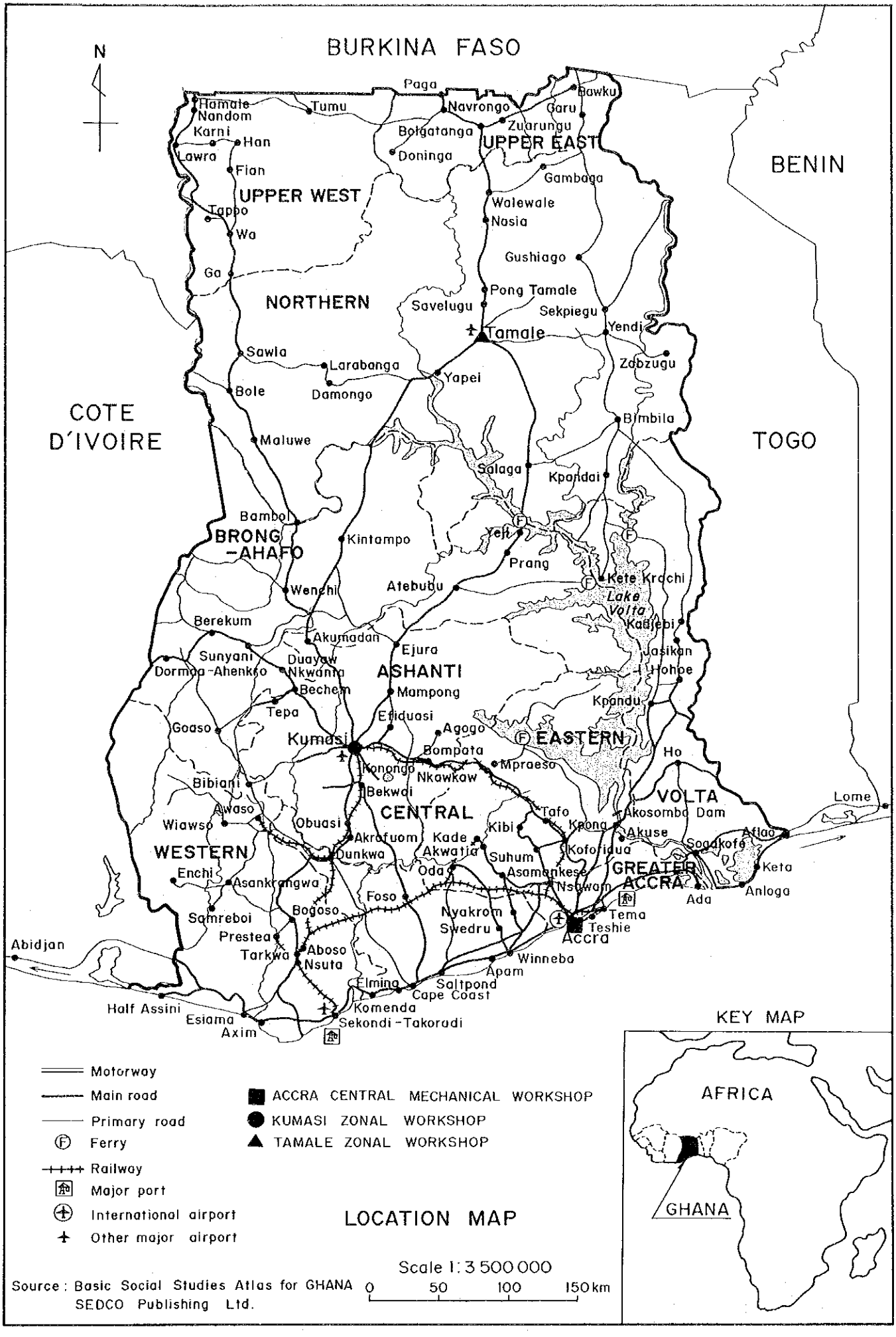
March, 1992

Kensuke Yanagiya

Kensuke YANAGIYA
President
Japan International Cooperation Agency



Source: Basic Social Studies Atlas for GHANA
SEDCO Publishing Ltd.


N
BURKINA FASO
BENIN
TOGO
COTE D'IVOIRE
Paga
Bawku
Hamale
Nandom
Tumu
Navrongo
Garu
Karni
Bolgatanga
Zuarungu
UPPER EAST
Lawra
Han
Doninga
Fian
Gambaga
UPPER WEST
Walewale
Tappo
Nasia
Wa
Gushiago
Ga
Pong Tamale
NORTHERN
Savelugu
Sekpiegu
Yendi
Tamale
Sawla
Larabanga
Zabzugu
Yapei
Bole
Damongo
Bimbila
Maluwe
Salaga
Kpandai
Bamboi
BRONG -AHAFO
Kintampo
Yeji
Prang
Kete Krachi
Lake Volta
Wenchi
Atebubu
Berekum
Kadjebi
Akumadan
Ejura
Jasikan
Sunyani
Duayaw Nkwanta
ASHANTI
Hohoe
Dormaa-Ahenkro
Bechem
Mampong
Kpandu
Tepa
Efiduasi
Goaso
Agogo
Kumasi
EASTERN
Bompata
Ho
Konongo
Mpraeso
Nkawkaw
Bibiani
Bekwai
VOLTA
Lome
Awaso
CENTRAL
Tafo
Akosombo Dam
Wiawso
Obuasi
Kibi
Kpong
Akuse
Afiao
Akrofuom
Kade
Sogakofe
WESTERN
Dunkwa
Akwatia
Koforidua
Suhum
Keta
Enchi
Oda
Asamankese
GREATER ACCRA
Asankrangwa
Nsawam
Anloga
Foso
Ada
Bogoso
Nyakrom
Tema
Samreboi
Swedru
Teshie
Prestea
Accra
Abidjan
Tarkwa
Aboso
Winneba
Nsuta
Apam
Elmina
Saltpond
Cape Coast
Half Assini
Komenda
Esiama
Sekondi-Takoradi
Axim
KEY MAP
AFRICA
GHANA
Motorway
Main road
Primary road
Ferry
Railway
Major port
International airport
Other major airport
ACCRA CENTRAL MECHANICAL WORKSHOP
KUMASI ZONAL WORKSHOP
TAMALE ZONAL WORKSHOP
LOCATION MAP
Scale 1:3 500 000
0 50 100 150 km
Source: Basic Social Studies Atlas for GHANA
SEDCO Publishing Ltd.

Accra Central Mechanical Workshop (CMW)

Kumasi Zonal Workshop (KZW)

Tamale Zonal Workshop (TZW)

SUMMARY

SUMMARY

Ghana is located approximately in the center of west Africa facing to the gulf of Guinea on the south and, is bordered on the east by Togo, on the north by Burkina Faso and on the west by Ivory Coast. The population of Ghana is currently estimated to be 14.6 million with an average annual growth rate of 2.6% during 5 years between 1985 and 1991.

The economy of Ghana is sustained mainly by agriculture, forestry, fisheries and mining resources. In 1989 the sector comprising crop production, livestock, fisheries and forestry contributed to about 49% of Gross Domestic Product (GDP), while the manufacturing industries provided only 10% of GDP.

The Government of Ghana launched the Economic Recovery Programme in 1983 (the First ERP 1984/86) with assistance of the World Bank and IMF. A second ERP was launched for the period 1987/89, and the result has been encouraging, with an annual economic growth of 5% in 1989.

Ghana had reasonably well developed its trunk road network of 14,430 km. However, the road network had suffered more than a decade of neglect of proper maintenance and almost all the roads have deteriorated. Recently, the Government of Ghana has continued to implement the road rehabilitation and maintenance programmes (4th Highway Project and Transport Rehabilitation Project) with the assistance of the World Bank, and the road network developed gradually and now play key role in transport media in order to depend on 80% of passenger traffic and more than 75% of freight traffic.

The Ghana Highway Authority (GHA) under the supervision of Ministry of Roads and Highways (MRH) controls the maintenance and rehabilitation of 14,430 km of trunk roads. Periodic maintenance and rehabilitation works are predominantly executed by contract while GHA's own work forces perform about 15% of the work load. Within routine maintenance, works requiring equipment are mainly executed by GHA.

In the direct control system, it need the fully equipped workshops in order to use effectively GHA's construction equipment. The GHA has a total of 33 workshops which are divided into three types: 3 zonal workshops which carry out major repair and rehabilitation, 8 regional workshops which carry out periodic servicing, and 22 district workshops which carry out routine servicing. However, in the 3 major workshops their equipment have become obsolete and been least functioning. Both the World Bank and the Japanese Government have provided Ghana with some equipment, using 4th Highway project grant and 1981/83 grant aid, respectively, in order for the Authority to operate the project smoothly. The establishment of the Mobile Maintenance Unit (MMU) was only made possible by the Japanese Grant Aid.

Thus GHA requested Japanese Government to implement the Project under the grant aid programme. Japanese Government, upon the request of Ghana Government, decided to conduct the basic design study and Japan International Cooperation Agency (JICA) dispatched Basic Design Study Teams twice to Ghana during the period of October 17, 1991 through November 5, 1991 and January 23, 1992 through January 31, 1992.

The result of survey and analysis of data collected revealed the following.

The rehabilitation of the 3 major workshops is highly indispensable. This will make it possible for the GHA to execute routine maintenance of the 14,430 km of trunk roads and about 15% of 4,500 km periodic maintenance and rehabilitation within the period (i.e. 1991-1993)

As the result of discussion, it was found that the requirement of the Government of Ghana will be limited only to equipment and spare parts for repairs of existing construction equipment.

After the Exchange of Notes between Japanese and Ghana Governments, the service of consultant will commence. The detailed design will then be done, to be followed by preparation of tender/contract documents. It is expected to take about 3.5 months for tendering to be executed after completion of consultant contract. After

the verification of the contract, shipping and installation of equipment will start. The construction period will be about 12 months.

The Ghana Highway Authority (GHA) shall be the implementing agency for the Project under the jurisdiction of the Ministry of Roads and Highways (MRH). GHA shall supervise the management and maintenance of the equipment after installing of them.

The implementation of the Project will promote the Periodic Maintenance Project in the Public Investment Programme and also greatly enhance the routine maintenance operations in Ghana.

From these various points of view, it is recommended the Project be implemented as immediately as possible under the Japan's Grant Aid.

BASIC DESIGN STUDY

ON

THE PROJECT

FOR PROVIDING EQUIPMENT

FOR GHANA HIGHWAY AUTHORITY WORKSHOPS

IN

THE REPUBLIC OF GHANA

TABLE OF CONTENT

LIST OF TABLES

List of Figures

APPENDIX

CHAPTER 1

GENERAL

CHAPTER 1

GENERAL

1-1 Objective of the Basic Design Study

After independence in 1957, the Republic of Ghana used to have had a well developed transport system, but at present, it suffered from more than a decade of neglect of proper maintenance due to the serious economic depression spanning the entire 1970's and early 1980's. Thus, the capacity of transporting farm products to the domestic market and principal export commodities such as cocoa and timber to the export port were seriously damaged.

In the first ERP launched in 1983, emphasis has been placed on the maintenance of the transportation system and the improvement of organizations concerned with transport. This effort has received the support of the Government of Japan, the World Bank and other aid agencies, and they have been granting the equipment to Ghana, mainly for road construction and paving.

The Ghana Highway Authority (GHA), an autonomous body, under the supervision of Ministry of Roads and Highways (MRH) manages maintenance and construction of 14,430 km of the primary and secondary road network including road construction design. The GHA also executes the routine maintenance by the regional and district office including Accra central offices. While some progress has been made, only about 4000 km of the fundamental road network remains in good condition, with more than 70% of the remaining network being in the category of medium to severe failure, and the continual cooperation of the international aid agencies for road construction and rehabilitation and the strengthening of the function of road maintenance are strongly required.

The road construction and maintenance equipment have been granted by the assistance of international aid agencies including Japan's Grant Aid in 1981/83. However, eventhough having the 3 major workshops,

GHA's equipment have become obsolete, and their repairs of construction and maintenance equipment have been hampered.

Thus, the Government of Ghana intends to rehabilitate and strengthen these workshops and has requested the Government of Japan to implement the Project under the grant aid programme.

The major workshops which will be rehabilitated and strengthened are as follows:

(1) Accra Central Mechanical Workshops: CMW
(2) Kumasi Zonal Workshops: KZW
(3) Tamale Zonal Workshops: TZW

1-2 The Basic Design Study Team

In response to a request from the Government of Ghana, the Government of Japan decided to conduct a basic design study. Accordingly, JICA sent to the Republic of Ghana a study team headed by Mr. Ryo YAMANA, Manager of Machinery Division, First Maintenance Department, Second Operation Bureau, Honshu-Shikoku Bridge Authority, twice for the periods from October 17 to November 5, 1991 and January 23 to January 31, 1992, and the Government of Ghana and JICA exchanged "Minutes of Discussions" (attached as Appendix 5). The Team was to conduct the basic design of necessary and proper sizes of equipment.

1-3 Content of the Basic Design Study

The Basic Design Study Team conducted the following studies and surveys with the close cooperation of officials of relevant agencies of the Government of Ghana. (See attached Appendix 3)

(1) Confirmation of content of the Request
(2) Examination of significance and size of the Project equipment
(3) Study of administration and management system of the Project
(4) Study of road construction/reconstruction, rehabilitation and maintenance plan

(5) Examination of presently existing construction and maintenance equipment

(6) Examination of present condition of 3 major workshops

(7) Survey of private workshops for construction and maintenance equipment

(8) Study of training system for mechanics

CHAPTER 2

BACKGROUND OF THE PROJECT

CHAPTER 2

BACKGROUND OF THE PROJECT

2-1 Background of the Republic of Ghana

2-1-1 Land and Population

(1) Geography

Ghana is situated approximately at the center of West Africa and it is bordered on the south by the Gulf of Guinea, on the east by Togo, on the north by Burkina Faso, and on the west by Ivory Coast. The coastline with the Gulf is about 560 km long. The total area of the country is approximately 239,000 sq.km, about two third that of Japan.

Geographically, the land is divided into four zones as follows:

1) Coastal scrub and grassland
2) Tropical rain forest land in Western Region
3) Moist semi-deciduous forest land ranging from the western border with Ivory Coast to the central part of Ashanti Region, and
4) Northern and eastern dry land.

The largest river running through Ghana is Volta, and Black and White Volta are its upstream tributaries. The Volta originates from Burkina Faso, runs down along the border with Ivory Coast and traverses the eastern part of Ghana. The Volta lake made by Akosombo Dam is the largest man-made lake in the world, with the water area of 8,400 sq.km. There are large rivers, such as Pra, Ankobra and Tano, besides Volta, all of which arise from the Ashanti Region and flow down into the Gulf of Guinea. (See Fig. 2-1)

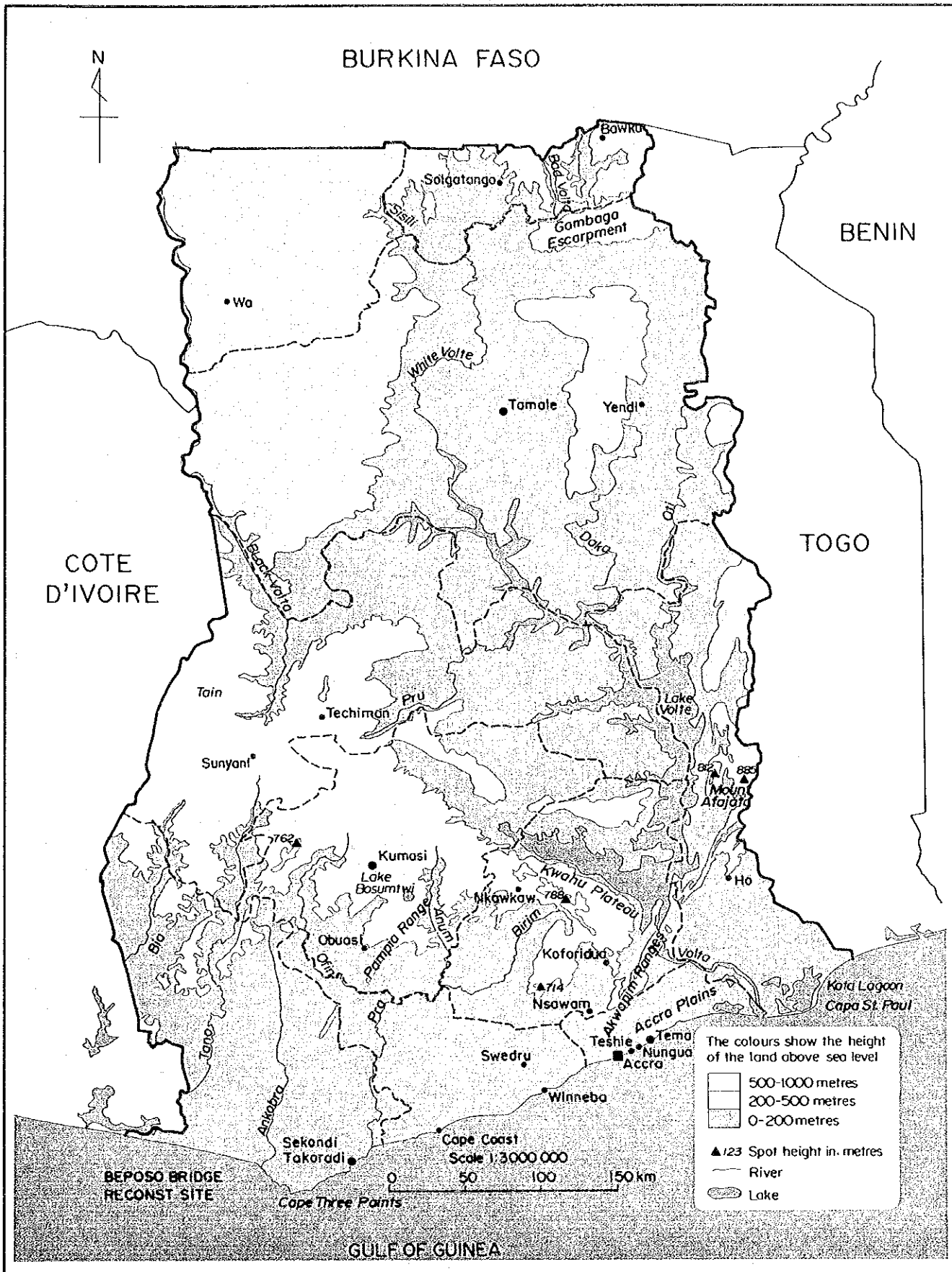


Fig. 2-1 TOPOGRAPHIC MAP

Source : Basic Social Studies Atlas for GHANA
SEDCO Publishing Ltd.

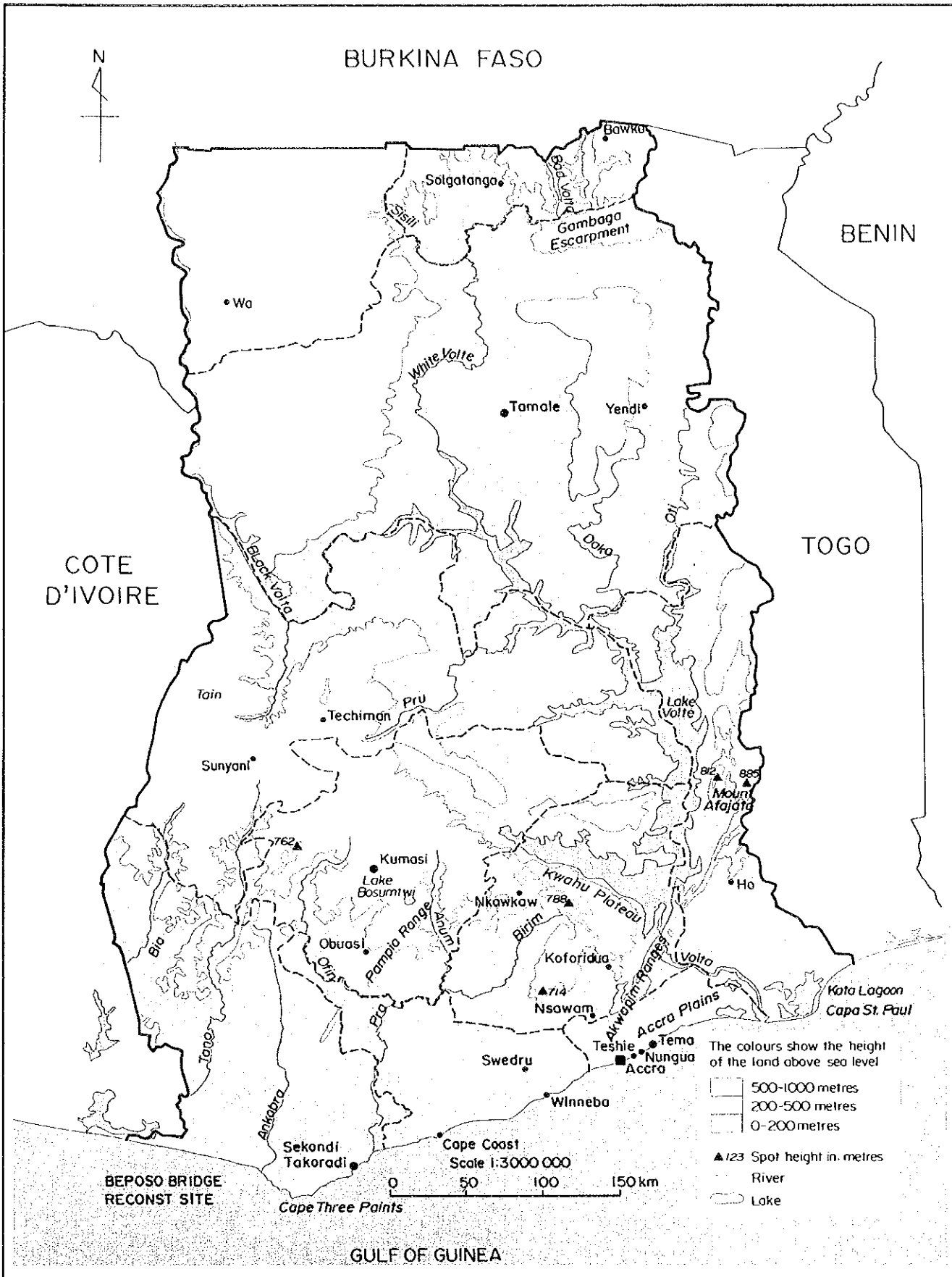


Fig. 2-1 TOPOGRAPHIC MAP

Source: Basic Social Studies Atlas for GHANA
SEDCO Publishing Ltd.

The climate of Ghana is tropical with dominant influences of so called "Harmataan", the hot and dry north-eastern trade winds and the comparatively cool and wet south-western trade winds blowing from the southern gulf. The temperature varies by regions from 20°C (lowest) to 37°C (highest). It shows generally, highest value in March and lowest in August. The humidity is almost 80% over the whole country except for the northern dry land. Rainfall is heavy in the south-western part and light around Accra and the Eastern Region. The rainly season extends from April through September.

(2) Population

The population of Ghana is currently estimated to be 14.6 million with an annual growth rate of about 2.6% for the period 1985-1991. It will reach 19.0 million or more in 2000 if the existing growth rate continues. Of the total population, 32% lives in the urban areas (Fig. 2-2). The population density is 52 per one sq.km (Table 2-1). Although the population is divided into many tribes, Ga (Accra), Ewe (Wouthеastern Volta) and Akan (Middle-western area) are major tribes.

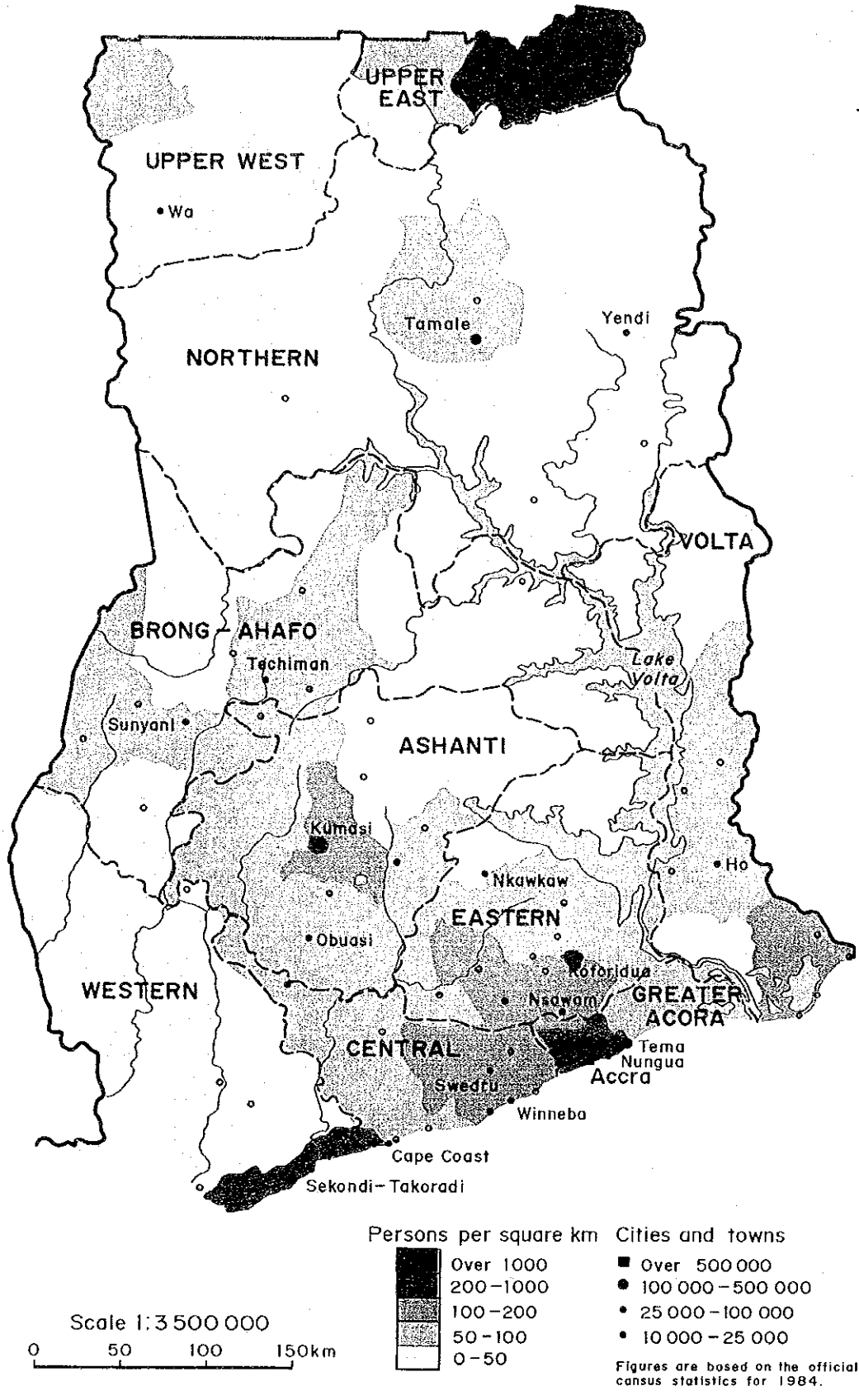


Fig. 2-2 POPULATION DISTRIBUTION

Source: Basic Social Studies Atlas for GHANA
SEDCO Publishing Ltd.

Fig. 2-2 POPULATION DISTRIBUTION

Source: Basic Social Studies Atlas for GHANA
SEDCO Publishing Ltd.

Table 2-1 Population and Density by Region (1984 Census)

Region	Area (Sq.km)	Population	Density
Total country	238,533	12,296,081	52
Western	23,921	1,142,335	48
Central	9,826	1,143,023	116
Greater Accra	3,245	1,431,099	441
Eastern	19,323	1,680,890	87
Volta	20,570	1,211,907	59
Ashanti	24,389	2,090,100	86
Brong Ahafo	39,557	1,206,720	31
Northern	70,384	1,164,583	17
Upper West	18,476	438,008	24
Upper East	8,842	772,744	87

Source: "Quarterly Digest of Statistics March 1991"
Statistical Service, Accra, Ghana

2-1-2 Structure of Industry

The economy of Ghana is dominated by the Agricultural sector including sub-sector of livestock, forestry and fishery, as shown in Table 2-2. Cocoa accounts for the largest proportion of foreign exchange earned.

In 1989, the agricultural sector accounted for 49.0%, and cocoa sub-sector alone provided 19.8% of GDP. The revenue of Ghana has been largely influenced by the fluctuation of production and price of cocoa and products exported accounts for about 75% of the major export commodities as shown in Table 2-3.

Though Ghana has been endowed with mineral resources such as bauxite, manganese diamond and gold, the mineral resource sector's export accounts for 25% of the major export, and it is the next principal export to Japan after cocoa. The manufacturing industry's contribution to GDP remained less than 10% in 1989, despite the

successive Ghanaian administration's accumulated efforts to move away from sole dependence on cocoa and aim at industrialization.

Table 2-2 General Domestic Product by Industries (million Cedis)

	1987	1988	1989
Agriculture	377,430	421,529	693,974
Agriculture & Livestock	266,077	367,080	470,119
Cocoa	66,029	92,034	137,532
Forestry & Logging	34,606	47,604	64,376
Fishing	10,768	14,810	21,947
Industry	121,743	174,139	237,012
Mining & Quarrying	13,630	20,795	26,310
Manufacturing	73,720	100,535	141,814
Electricity and Water	13,270	22,562	26,310
Construction	21,115	30,247	45,587
Services	245,257	353,327	473,277
Transportation & Communications	27,524	44,430	60,524
Trade & Hotel	137,962	198,879	264,802
Banking, Insurance, Real Estate	19,250	22,562	38,041
Government Services	54,123	72,993	97,565
Other Services	6,398	8,463	12,345
Imported Service Charges	-11,206	-14,810	-19,464
Import Duties	12,724	17,010	32,415
GDP in Purchasers' Values (US$)	185	235	335
Population (Million)	13.39	13.74	14.10

Source: "Quarterly Digest of Statistics March 1991"
Statistical Service, Accra, Ghana

Table 2-3 General Domestic Product by Industries

	1987	1988	1989
Cocoa Beans			
Value (million Cedis)	63,873	85.788	143,168
Volume (Tons)	198,000	203,000	330,000
Bauxite			
Value (million Cedis)	850	1,738	2,471
Volume (Tons)	226,000	300,000	239,000
Manganese			
Value (million Cedis)	1,206	1,738	2,815
Volume (Tons)	239,000	295,000	239,000
Diamond for Industry			
Value (million Cedis)	700	710	1,371
Volume (Tons)	397	306	246
Gold			
Value (million Cedis)	24,205	49,417	39,806
Volume (Tons)	10,092	10,981	12,003
Total			
Value (million Cedis)	94,834	140,002	189,631

Source: "Quarterly Digest of Statistics March 1991"
Statistical Service, Accra, Ghana

2-1-3 Economic Recovery Programme

In 1983, Ghanaian economy had been on the verge of annihilation by a failure of an economic policy, a rise in oil price, aggravation of international economies and a long drought. The same year, the Government of Ghana planned the First Economic Recovery Programme (ERP 1984/86) under World Bank and IMF's guidance and appealed to the authorities concerned assistance after presentation to the Consultative Group on Ghana in Paris.

Since the initiation of ERP 1984/86, significant improvements in economic growth and development have been made, with many of the broad objectives outlined at the inception of the programme achieved.

The adoption of prudent monetary and fiscal policies and the implementation of a wide range of far-reaching structural reforms have helped to create an enabling environment for sustained economic growth.

From the experience gained in 1984 in implementing the ERP, the Government of Ghana continued to forge ahead in 1985 with a broadening and strengthening of policies, and their improved implementation in several areas (ERP 1986/88).

In the latest second ERP 1987/89, the major macro-economic objectives are set forth as follows:

1) GDP growth of about 5% per annum implying an increase of at least 1.5% per annum in per capita income.

2) The inflation rate declining from about 20% to below 15% by 1988.

3) Revenue growth based upon a reformed tax structure and significant administrative changes that will increase the revenue to GDP ratio from 10% in 1985 to about 14% in 1988.

4) Total expenditures are expected to increase from 15% to about 22% of GDP by 1988, entailing a recurrent expenditure share of about 11% throughout and an increase in the share of development

expenditure from about 5% to about 11% by 1988, with the distribution of these expenditures being based on a recently completed assessment of public expenditure priorities in the recurrent areas, and of a core three-year public investment programme.

5) The investment ratio increases from 10% to about 17% of GDP, with the share of domestic savings rising from 4% to about 10% of GDP by 1988.

6) Significant export growth aimed at increasing the export GDP ratio from about 10% to 19% of GDP, while the import/GDP ratio increase from about 15% to 25% of GDP.

7) The overall deficit/GDP ratio including projects financed by external aid rises from about 5% to about 8% in 1986 through the period, with foreign financing rising from about 4% to about 7%, while the domestic financing remains at 1% throughout the period. (See Table 2-4)

Table 2-4 Major Macro-Economic Projection in ERP 1986/88 (%)

	1985	1986	1987	1988
Gross Rates				
GDP (1984 prices)	5.3	5.5	5.0	4.5
Price Reduction (against previous Year)	20 - 25	18 - 20	15 - 18	12 - 15
Share of GDP (Market Prices)				
National Accounts				
Consumption	95	95	90	90
Investment	10	14	16	17
National Savings	4	6	8	10
Foreign Savings	5	8	8	7
Budget				
Total Revenue	10	12	13	14
Total Expenditures	15	20	22	22
Recurrent	10	11	11	11
Capital (Including projects by external aid)	5	6	10	11
Special Efficiency Programme				
Overall Balance	-5	-8	-9	-8
Financed by:				
Foreign (net)	4	7	8	7
Domestic (net)	1	1	1	1
Balance of Payments				
Exports	10	14	17	19
Imports	-15	-20	-25	-25

Source: Progress of the Economic Recovery Programme 1984-86 and Policy Framework, 1986-88, Report prepared by the Government of Ghana for the Third Meeting of the Consultative Group for Ghana, Paris, November, 1985.

Table 2-5 shows the Sectorial Investment in ERP 1986/88 and the biggest percentage of more than 20% in Roads and Highways sector. It has been definitely shown by the Table that the Government of Ghana put great emphasis on the Roads and Highways sector.

Table 2-5 Sectorial Investment in ERP 1986/88
(1985 price, million Cedis)

	Expenditure proposed	Share %	Foreign Financing Committed
1. Agriculture	9,511	12.4	2,834
2. Mining	10,549	13.7	4,788
3. Energy	11,023	14.3	11,235
4. Industry	2,572	3.3	848
5. Roads and Highways	15,576	20.3	5,712
6. Transport and Communications	15,057	19.6	7,964
7. Social Sector	6,662	8.7	704
(of which Water)	(2,162)		(236)
(" Education)	(2,500)		(228)
(" Health)	(2,000)		(240)
8. Other	5,850	7.6	-
Total	76,800	100.0	34,085

Source: Progress of the Economic Recovery Programme 1984-86 and Policy Framework, 1986-88, Report prepared by the Government of Ghana for the Third Meeting of the Consultative Group for Ghana, Paris, November, 1985.

2-1-4 Present Situation of Economy

The economy in 1989 has been distinctly recovered mainly in the agricultural sector by favour of good weather and virtue of the implementation of the ERP 1984/86 and 1987/89.

The growth rate of economy in 1989 showed +5.5% for the previous year and the inflationary tendency became calm as shown in Table 2-6. The production of principal export commodities such as cocoa, gold, manganese, bauxite and timber has steadily been restored.

Table 2-6 Main Economic Indicators 1986/89
(Average Annual Change %)

	Consumer Price Index	Real GDP		Export	Import
		Total Per	Per Capita		
1986	4543.1	4.8	2.1	40.0	120.1
1987	6352.0	4.8	2.1	5.2	14.3
1988	8343.9	5.8	3.2	12.0	2.4
1989	10449.3	5.5	2.7	-	-

2-2 Outline of Transport Sector

2-2-1 General

Since the first Economic Recovery Programme (ERP 1984/86) was launched, a special emphasis was placed on the physical rehabilitation of the transport infrastructures for principal export commodities, as one of the key instruments to rebuild the national economy as well as institutional improvement of the transport-related organization.

Ghana's transport system, as shown in Fig. 2-3, comprises:

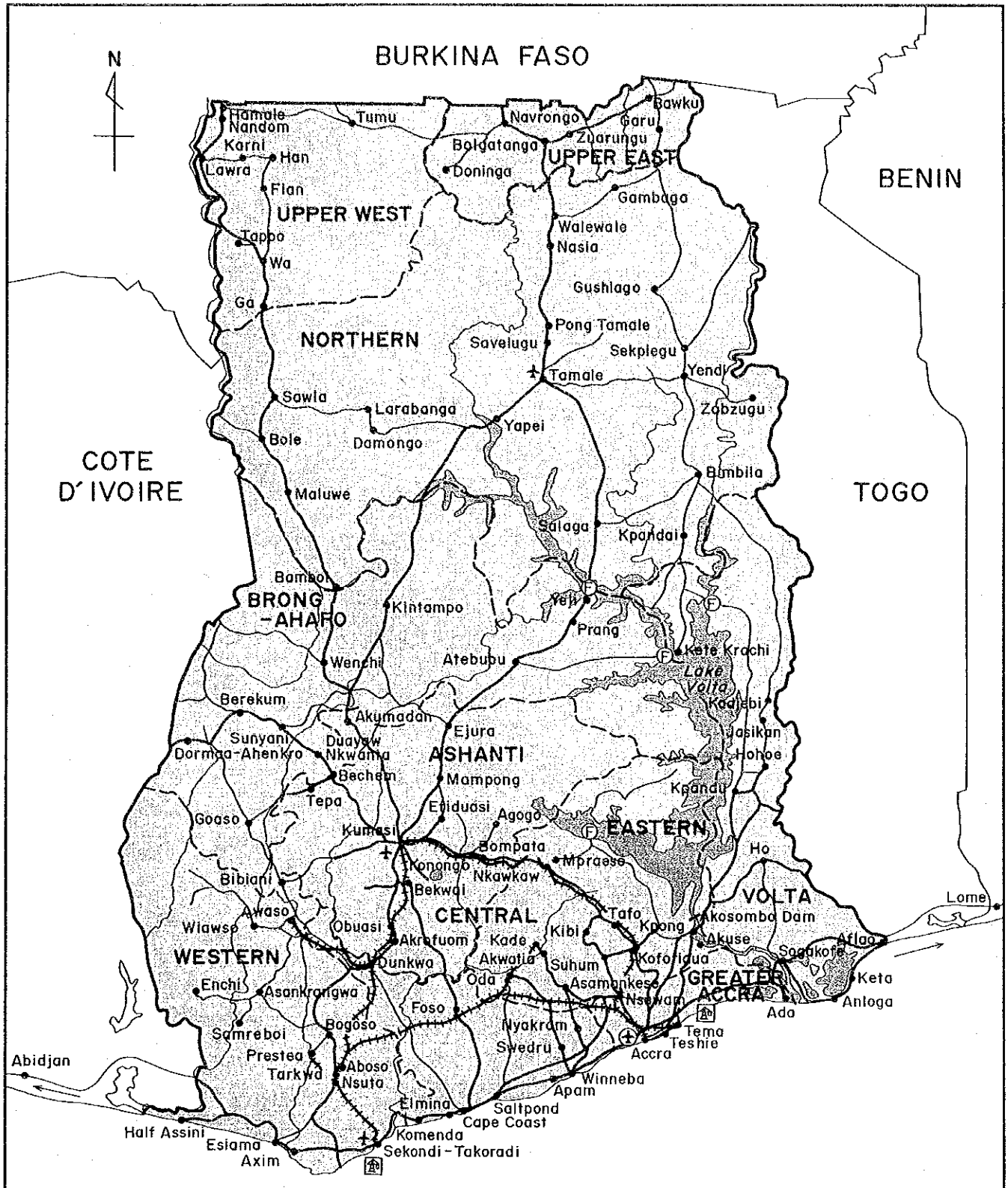


Fig. 2-3 TRANSPORT SYSTEM

Source: Basic Social Studies Atlas for GHANA
SEDCO Publishing Ltd.

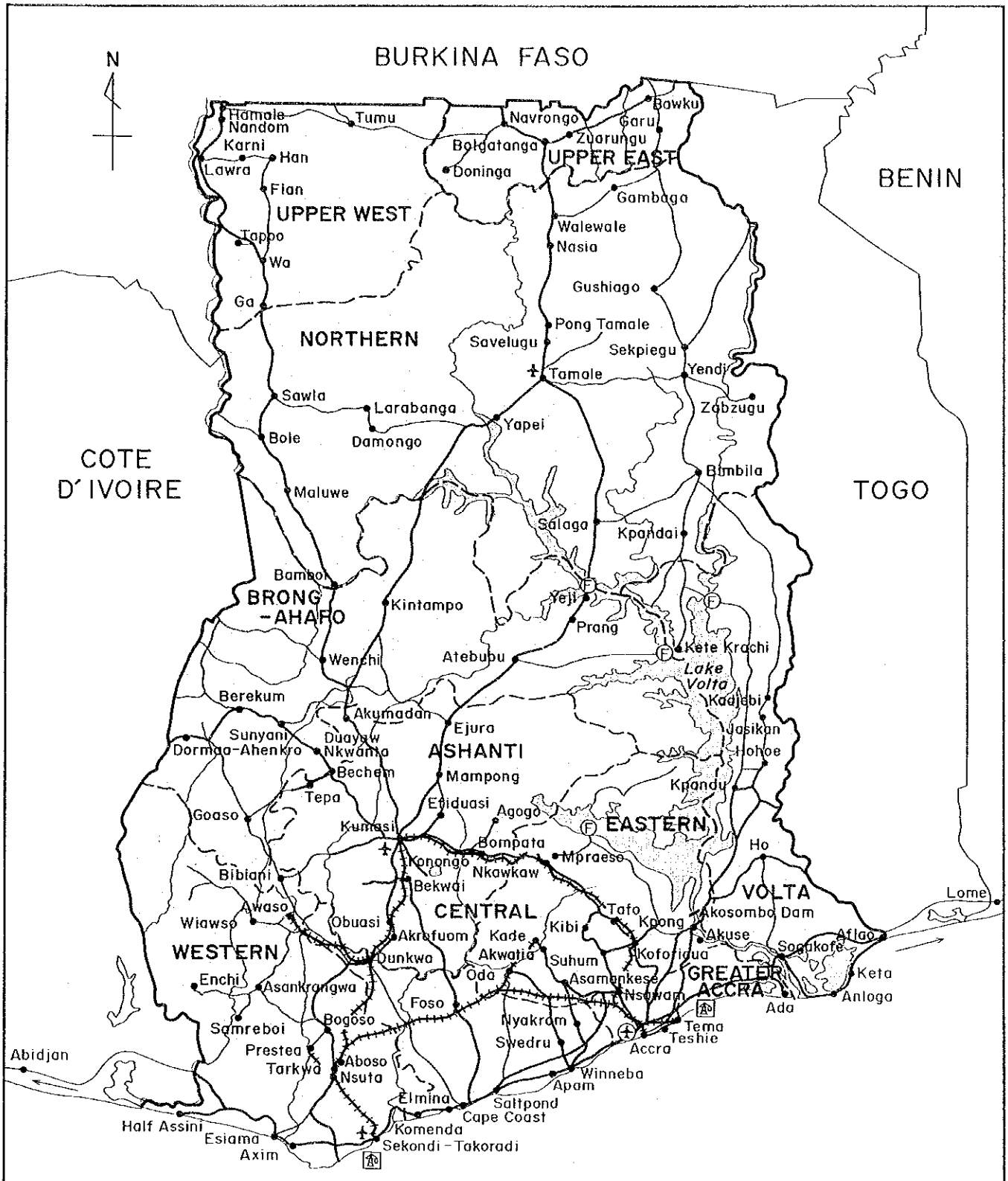


Fig. 2-3 TRANSPORT SYSTEM

Source: Basic Social Studies Atlas for GHANA
SEDCO Publishing Ltd.

1) a network of 14,430 km of primary/secondary roads and 1,700 km of urban arterial roads, and about 21,000 km length of feeder roads.

2) a 950 km railway system

3) two major deepwater ports and three small fishing ports.

4) a small inland water transport system over the Volta lake.

5) a national maritime shipping company, and

6) an international airport at Accra and three main domestic airports as well as a national airline.

As shown in Fig. 2-4, the administration of the transport sector is handled by two ministries: the Ministry of Roads and Highways (MRH), which oversees road investment and maintenance, and the Ministry of Transport and communications (MTC), which deals with all other transport subsector and overall transport policy and planning.

The three agencies under the MRH comprises:

1) the Ghana Highway Authority (GHA), autonomous body which manages maintenance and construction of the primary and secondary roads,

2) the Department of Feeder Roads (DFR) which handles maintenance and construction of feeder roads, and

3) the Department of Urban Roads which was set up in 1983 to look after urban roads.

These relationships are shown in Fig. 2-5.

The total length of roads in Ghana is 37,130 km, and which is composed of trunk roads of 14,430 km long and feeder roads of 21,000 km long as shown in Table 2-7 and urban roads 1,700 km. The length of paved roads is 6,004 km which constitutes about 42% of the trunk road network. The remainder is of gravel or earth. As these roads had not

Fig. 2-4 Organization chart of Transport and Communication Sector

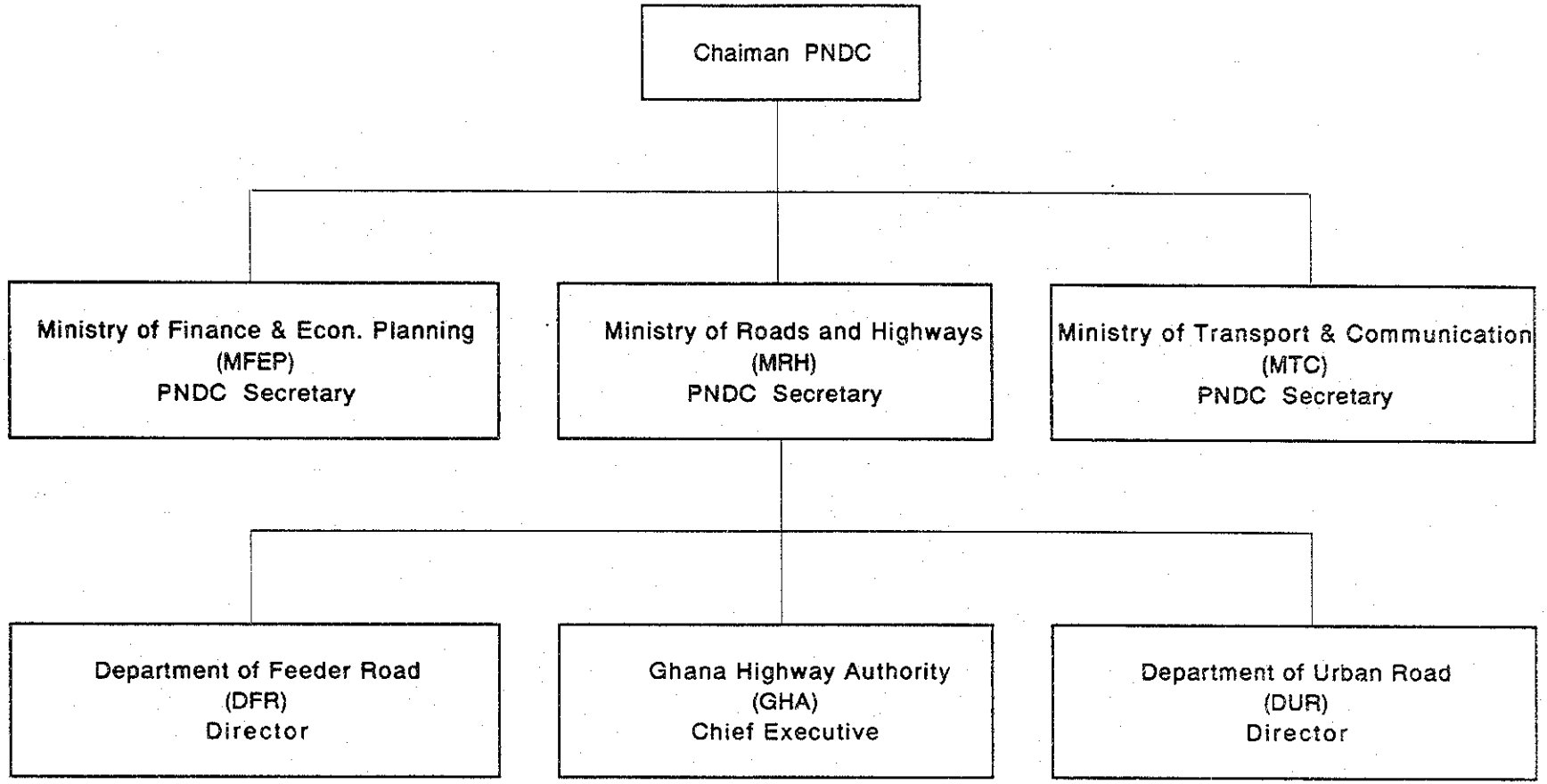
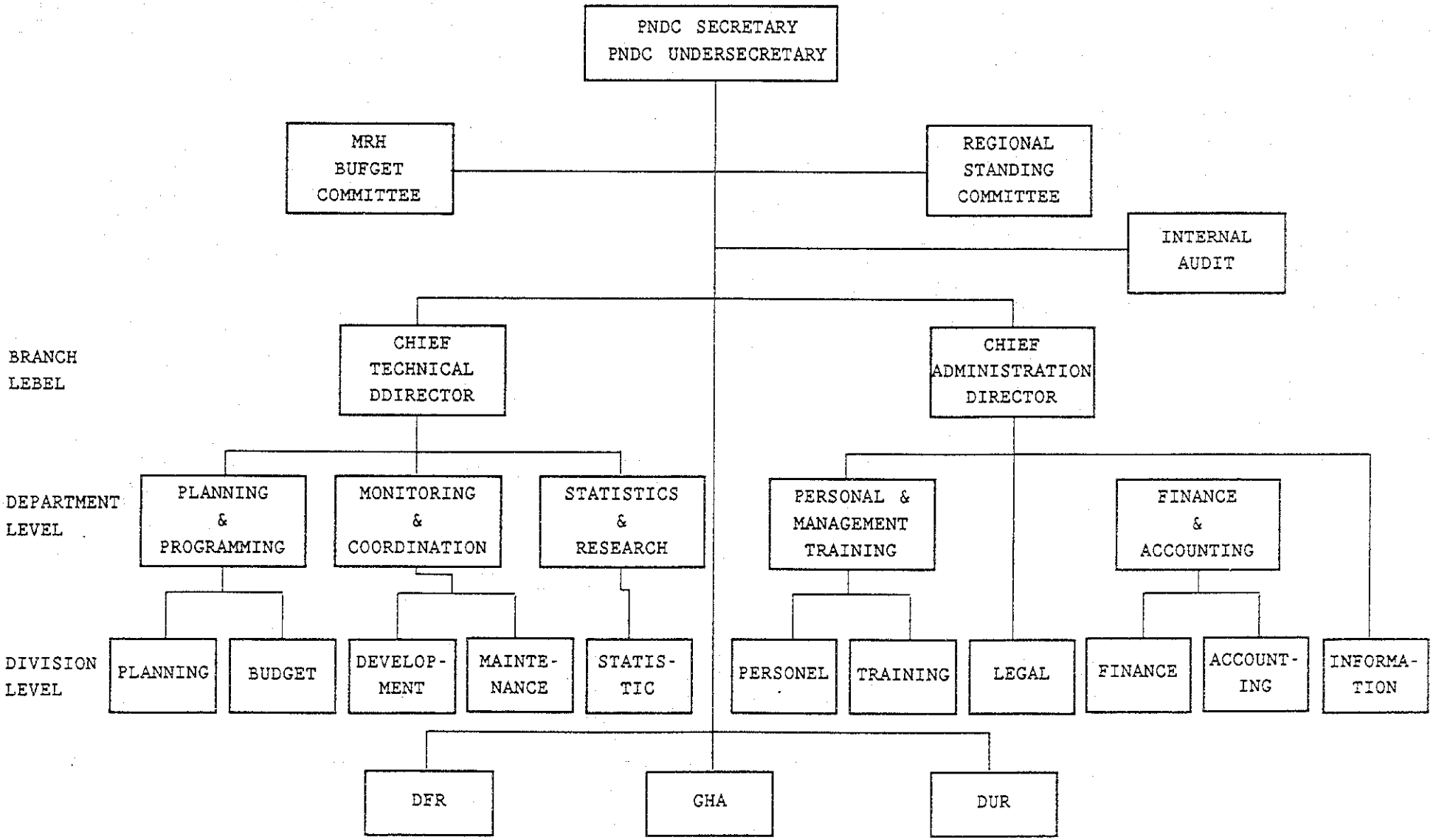


FIG.2-5 ORGANIZATION CHART OF MINISTRY OF ROADS AND HIGHWAYS



been well maintained in 1974 through 1981, as aforementioned, they generally deteriorated and even the primary trunk roads connecting the principal cities need major rehabilitation or repairs. The secondary and feeder roads are damaged more and this discourages drivers from making long distance trips, resulting in exceptionally high vehicle operating costs.

Table 2-8 gives the number of privately owned vehicles with roadworthy certificates. Recently the number of vehicle is increasing, especially the passenger cars doubled.
Table 2-9 shows the fuel consumption. The fuel consumption directly correlates the movement of the vehicles.
In Ghana, the 75% of freight and 80% of passenger make use of road transport.

Table 2-7 Road Length by Region

(Unit: Km)

Region	Trunk Road			Feeder Road
	Paved	Gravel	Total	
Greater Accra	441	27	468	817
Volta	600	911	1,511	1,927
Eastern	1,108	782	1,890	2,383
Central	1,131	278	1,409	1,991
Western	437	1,065	1,502	2,243
Ashanti	878	516	1,394	3,328
Brong Ahafo	716	1,124	1,840	3,357
Northern	539	2,251	2,790	2,421
Upper East	144	391	535	952
Upper West	10	1,081	1,091	1,448
Total	6,004	8,426	14,430	20,867

Source: Ghana Highway Authority, 1991 Budget Estimates

Table 2-8 Vehicles Registered

	Passenger cars	Motor Cycle	Public Vehicles	Goods Vehicles	Trailer	Special Cars	Busses	Total
1983	3,908	1,965	1,952	1,864	4	159	412	9,264
1984	3,255	2,627	418	2,341	10	97	446	9,194
1985	5,182	2,155	852	2,732	40	300	326	11,599
1986	4,067	2,786	813	3,320	18	465	407	11,876
1987	6,383	2,603	1,391	3,525	16	520	443	14,881
1988	12,266	2,146	1,964	4,259	1	271	592	21,499

Sources: Quartery Digest of Statistics, March 1991

Table 2-9 Fuel Consumption (Thousand Litres)

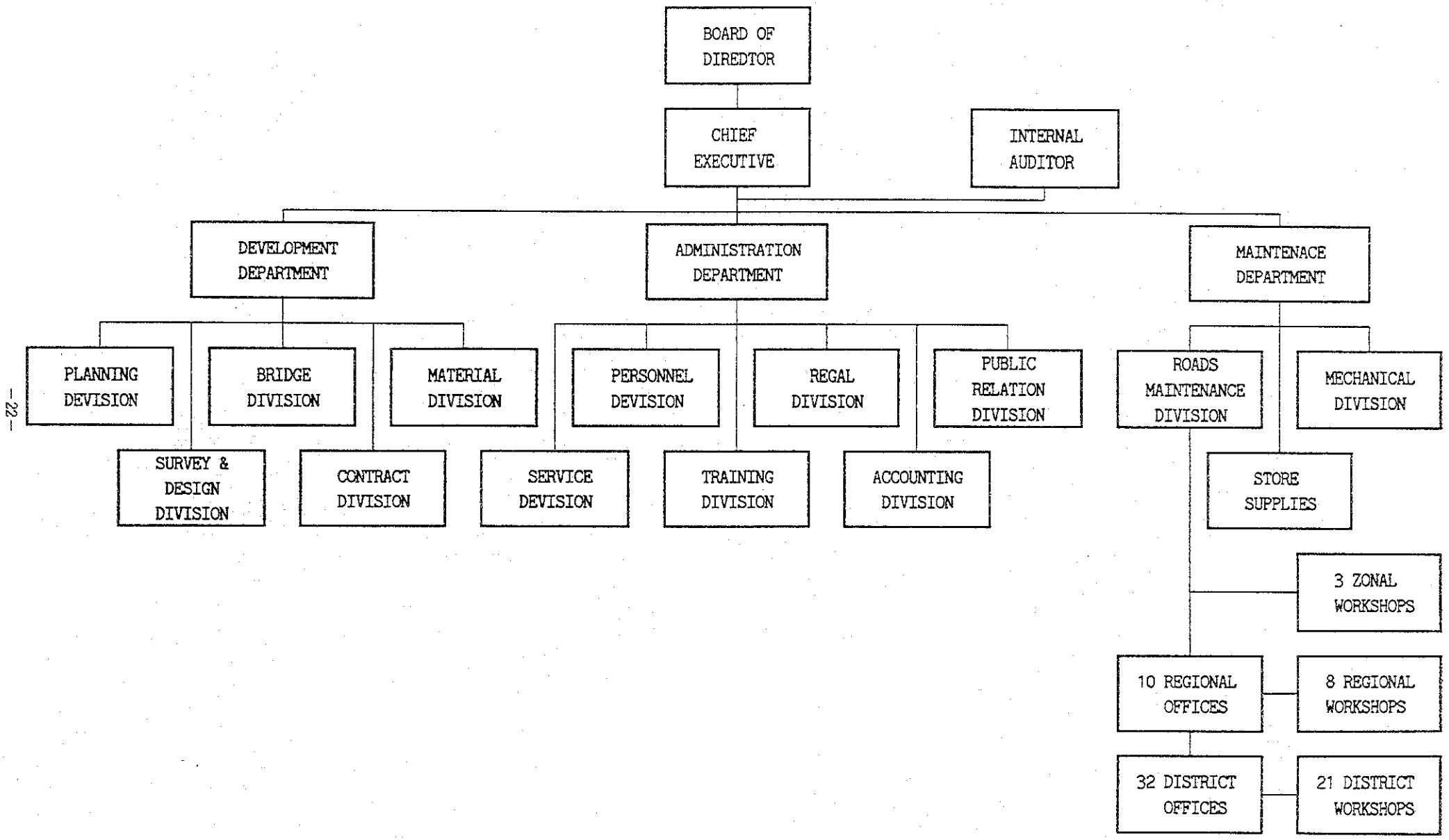
	Diesel Oil	Gasoline	Total	% Change Over Previous Year
1985	282,900	269,508	551,408	
1986	299,352	289,265	588,617	+ 6.7
1987	324,492	307,455	631,497	+ 7.4
1988	377,984	322,646	700,633	+10.9
1989	441,295	322,060	763,355	+ 8.9

Sources: Quartery Digest of Statistics, March 1991

2-2-2 Ghana Highway Authority (GHA)

Ghana Highway Authority (GHA) which implement the Project was established in 1974 as an autonomous body with its own Board of Directors appointed by the Government. Fig.2-6 gives organization chart of GHA. It spreads over one central office in Accra, 10 regional offices and 32 district offices.

FIG. 2-6 ORGANIZATION CHART OF GHANA HIGHWAY AUTHORITY



It carries out the majority of routine maintenance on the 14,430 km of trunk roads and about 15% of 4,500 km periodic maintenance and rehabilitation within the project period (i.e. 1991-1993).

The road maintenance if divided into routine and periodic, the former is pothole patching, shoulder reshaping, side-ditch cleaning and grass cutting by district office while the latter is regravelling, resealing and resurfacing by regional office.

GHA has 3 zonal, 8 regional and 22 district workshops in order to repair and maintain GHA's construction equipment (Table 2-10) which are used for routine and part of periodic maintenance. Table 2-10 gives GHA's workshops and Fig.2-7 shows its location map.

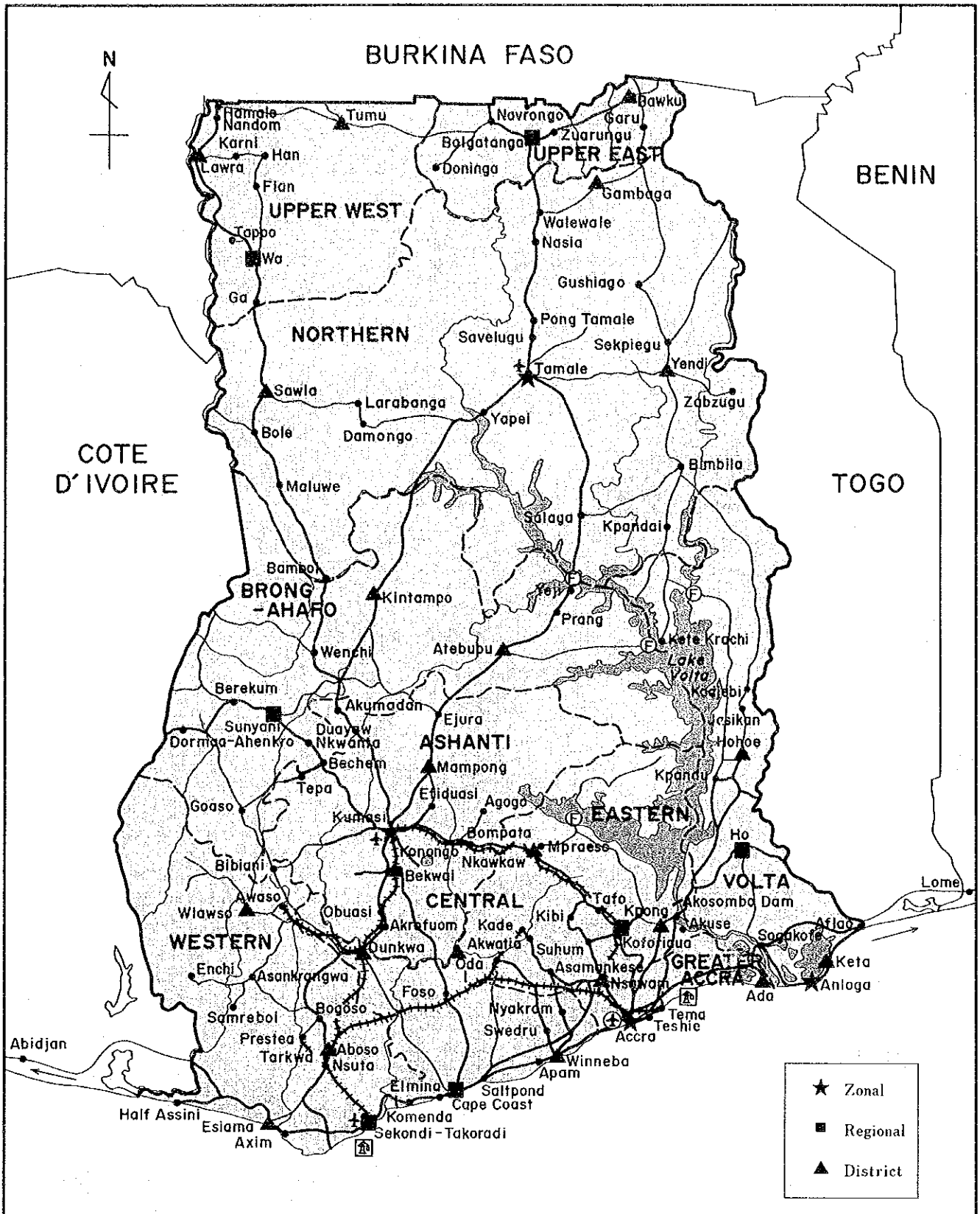


Fig. 2-7 GHA'S WORKSHOP LOCATION MAP

Scale 1 : 3 500 000

Source: Basic Social Studies Atlas for GHANA
SEDCO Publishing Ltd.

0 50 100 150 km

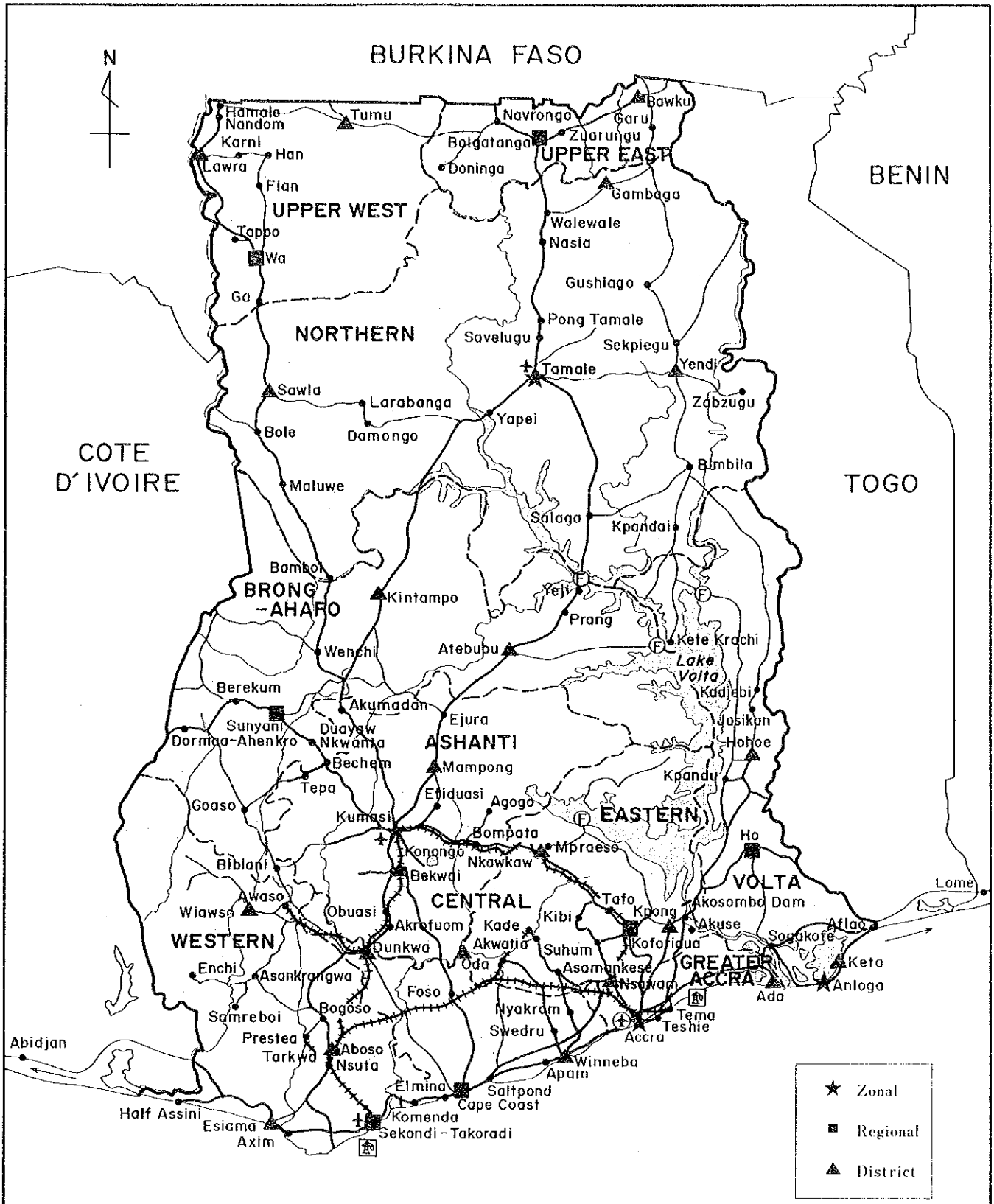


Fig. 2-7 GHA'S WORKSHOP LOCATION MAP

Scale 1 : 3 500 000

Source: Basic Social Studies Atlas for GHANA
SEDCO Publishing Ltd.

0 50 100 150 km

Table 2-10 Ghana Highway Authority Workshop

Zonal Workshop		Regional Workshop		District Workshop	
Name	Region	Name	Region	Name	Region
CENTRAL	GREATER	ACCRA	ACCRA NORTH	GREATER ACCRA	ADA GREATER ACCRA
KUMASI	ASHANTI	HO	VOLTA	WINNEBA	CENTRAL
TAMALE	NORTHERN	KOFORIDUA	EASTERN	DUNKWA	"
		CAPE COAST	CENTRAL	HOHOE	VOLTA
		TAKORADI	WESTERN	KETA	"
		SUNYANI	BRONG AHAFO	NKAWKAW	EASTERN
		BOLGATANGA	UPPER EAST	AKIM ODA	"
		WA	UPER WEST	SOMANYA	"
				NSAWAN	"
				TARKWA	WESTERN
				AXIM	"
				WIAWSO	"
				MAMPONG	ASHANTI
				BEKWAI	"
				KINTANPO	BRONG AHAFO
				ATEBUBU	"
				YENDI	NORTHERN
				SAWLA	"
				GAMBAGA	"
				BAWKU	UPPER EAST
				TUMU	UPPER WEST
				LAWRA	"

2-2-3 Ghana Highway Authority Construction Equipment

GHA has about 1,035 of construction equipment which are used for routine and periodic maintenance works through its own work force. These equipment include 97 of equipment granted by Japan's Grant Aid in 1981 and 1983 and these are allocated to Mobile Maintenance Unit (MMU). Table 2-11 gives construction equipment by Japan's Grant Aid and Table 2-12 gives GHA's construction equipment by region.

Table 2-11 GHA's Construction Equipment by Japan's Grant Aid

Item	1981	1983	Total
Bitumen Distributor	3	2	5
Bulldozer	3	4	7
Fuel Tanker	2	-	2
Motor Grader	6	5	11
Pick-up (4 x 2)	7	2	9
Pick-up (4 x 4)	1	-	1
Tire roller	2	2	4
Prime Mover	2	1	3
Road roller	3	3	6
Tipper	33	26	59
Tractor	4	3	7
Vibrating Roller	3	4	7
Water Tanker	4	4	8
Wheel Loader	4	4	8
Excavator	1	1	2
Low Bed Trailer	1	1	2
Total	79	62	141

Table 2-12 GHANA HIGHWAY AUTHOLITY INVENTORY OF DISTRIBUTED CONSTRUCTION EQUIPMENT

EQUIPMENT	ASR	BAR	BMU	CTR	ETR	GAR	GHQ	NTR	UER	UWR	VER	WER	MMU 1	MMU 2	TOTAL
Bitumen Distributor	1	1	1		1	1	1	1	1		1	1	3 (3)	2 (2)	15 (5)
Bitumen Tanker												2		1	3
Air compressor	3	1		1	3	1		1				2			12
Crane			1			2						2		1	3
Bulldozer	3	2		1	2		1	2	1		1	2	4 (3)	5 (4)	24 (7)
Dump Truck	2				3										5
Fuel Tractor	3		1		1	1			2		1	1		1	10
Forklift	2					1	2	1	1		1	2			8
Fuel Trailer							2(2)					2		1	2 (2)
Generating Set	1				2	1	2	1				2		1	7
Lubricant Unit	1	1		1	1	1		1	1	1	1	1	1	1	12
Mini Bus	2			1	1		7	1	1	1	1	1		1	16
Mini Mobile Workshop	1	1		1	1	1		1	1	1	1	1	1	1	12
Motor Grader	6	5		5	6	2		5	3	3	4	4	6 (6)	6 (6)	55 (11)
Pedestrian Roller	2	3	1	5	4	2	1	1			3	2	3	5	32
Pickup (4x2)	16	12	4	12	15	11	24	12	8	7	11	4	10 (7)	10 (2)	156 (9)
Pickup (4x4)	4	3		3	1		15	2	1	1	2	7	1 (7)	1	40 (1)
Tyred Roller	1	1		1		1		1	1		1	1	2 (2)	2 (2)	12 (4)
Prime Mover	2						6	3				3	2 (2)	1 (1)	12 (30)
Road Roller	1			2	1	3	1				1	1	3 (3)	8 (3)	21 (6)
Tip/Trailer	10	13		8	17	3	2(2)	14	5	10	10	17	1	4	112
Tipper	5	4	3	4	8	6	4	3	2	2	4	2	33 (33)	26(26)	106 (59)
Tractor	10	13		10	16	2	3	21	8	13	11	18	4 (4)	3 (3)	132 (7)
Traxcavator (D/Shovel)	1				1			1				2		1	3
Van Truck	1	1		1	1		1	1	1	1	1	1			10
Vibrating Roller	1	1		1	1		1	1	1	1	1	1			7 (7)
Asphalt Cutter	2	2		2	4	1		1			1	2		1	15
Water Tanker	1	2		1			2	2	1		1	1	4 (4)	4 (4)	19 (8)
Wheel Loader	2	1		1	4	1	2	1			1	1	4 (4)	4 (4)	22 (8)
Excavator												2	1 (1)	1 (1)	2 (2)
Soot Mixer (Portable)							1					2		1	1
Emulsion Sprayer	10	7		11	14	4	2(2)	4	2	1	7	6	2	2	70
Crushing Plant	1				1							2		1	2
Bus						1	4					2		1	5
Trailer	2						5	2				2	1 (1)	1 (1)	11 (2)
TOTAL	101	78	11	77	117	48	101	87	40	41	69	85	89 (77)	91 (62)	1,035 (141)

Note
ASR : Ashanti Region
Bar : Boring Ahafo Region
BMU : Bridge Maintenance Unit
CTR : Central Region
ETR : Eastern Region
GAR : Grater Accra Region
GHQ : GHA Head Quater
NTR : Northern Region
UER : Upper East Region
UWR : Upper West Region
VTR : Volta Region
WER : Western Region
MMU : Mobile Maintenance Unit
( ) : By JAPAN's GRANT AID

Source:
(1) GHANA HIGHWAY AUTHOLITY Equipment Inventory List
(2) JAPAN'S GRANT AID Equipment Inventory List

2-2-4 Accra, Kumasi and Tamale Workshops

In Accra Central Mechanical Workshop, Kumasi Zonal Workshop and Tamale Zonal Workshop, the repair equipment for construction equipment were supplied before independence, and have become obsolete and been least functioning. The present condition of equipment in those workshop is as follows:

Table 2-13 (1/2) Present condition of Equipment in Zonal Workshops

Item	Accra Central W/S	Kumasi W/S	Tamale W/S
(1) Chassis Repair	There is a need to have an overhead travelling crane and hot and high pressure washer, etc. in the chassis repair shops to help with the dismounting and or mounting of heavy components, such as engine, undercarriage, transmission components, etc.	Main control areas are middle and northern part of Ghana as Zonal workshop. When disassembling and repairing the components, it can not use an overhead travelling crane, because the workshop has not enough strength to support the crane. Also other repairing equipment such as portable crane, hydraulic jack, air compressor, etc. are not provided enough. Therefore, repairing work is neither safe nor reliable.	
(2) Engine Repair	Many engines and crankshaft removed for repair are left on the floor, waisting because of lack of repair machine tools and the crankshaft grinder, and honing machine is out of order.	Repairing the diesel engines, but there are not enough repairing tools, and the quality is not certified.	Repairing the gasoline engines, but there are almost no repairing equipment except 2 ton crane and an air compressor. Therefore, work is being done without any certificate.
(3) Engine Dynamometer	It is impossible to confirm the performance after the engine overhauling because there is no facility.	Same as Accra Central Workshop.	

Table 2-13 (1/2) Present condition of Equipment in Zonal Workshops

Item	Accra Central W/S	Kumasi W/S	Tamale W/S
(4) Hydraulic Components Repair	Dump trucks or work equipment of construction machineries are mounting hydraulic cylinders. When assembling or disassembling the equipment, the hydraulic cylinder mounting unit is a must.		
(5) Electric Component Repair	Electric tester is there but out of order because there are no repair parts.	There are no accurate testers.	Same as Accra Workshop
(6) Fuel	There is a Fuel Injection Test stand of Bosch type but out of order, and there is no Cummins test stand.	Bosch type test stand is working, but there is no Cummins test stand.	There is no test room.
(7) Machine	Machine Shop All machines should be replaced with new ones because of lack of accuracy.		
(8) Welding and Fabrica-tion	Welding and Fabrication Room Welding and fabrication work are being done using old techniques. Oil press equipment must be provided to repair vehicles.		
(9) Battery Service	Battery Service Shop There are purifiers in the three workshops but they need to be replaced because of age.		
(10) Tire Service	Tire Repair Shop None of the workshops is equipped with satisfactory machines.		
(11) Painting	Painting Bay There is no infrared rays bulb for drying in any of the workshops.	There is no painting room.	
(12) Washing Machine	Cleaning Bay There is the outdoor cleaning bay in every workshop but no steam producing facility.		

2-3 Development Plan in Roads and Highways Subsector

2-3-1 Public Investment Programme (PIP)

A 3-Year Public Investment Programme 1991/93 has been established to aim at the efficient use of public resources, which is the weakest point in the management of present economic system, within the framework of the Economic Recovery Programme (ERP). The First PIP was introduced in 1986 and at present 3rd PIP 1991/93 is being implemented.

In present 3rd PIP, most of investment will be used for the continual improvement and extension of the economic and social infrastructure for promotion of private enterprise. As a result, it is a target to extend real GDP into 5% and reduce inflation rate to 10% in 1993.

Within the PIP the investment programme to the transport sector has been established as follows:
The UNDP, IDA and other donors have been helping to strengthen the planning and implementation capabilities of MRH and MOTC and finance the following three project:

1) 4th Highway Project.

2) Transport Rehabilitation Project 1 and

3) Transport Rehabilitation Project 2.

The sector's investment programme for the 1991/93 planning is primary geared towards the continual maintenance, rehabilitation and refurbishment of essential transport and communications infrastructure and rolling stock to enable the sector contribute effectively to the country's Economic Recovery Programme (ERP).

To this end, total incremental investment of 846,137 million Cedi of which 499,583 million Cedi represents the foreign and 346,554 million Cedi the local cost component will be made in 56 top priority project programmed for execution during the plan period.

2-3-2 Investment Programme for Roads and Highways

Roads and Highways continue to constitute a major focus of the PIP and for 48 projects, the total investment of 195,913 million Cedi was appropriated for about 23% of the planned total incremental investment of 846,137 million Cedi.

The GHA is managing 36 projects and 125,332 million Cedi was appropriated for these projects. Table 2-14 shows the GHA's Projects in 1991/93.

Table 2-14 GHA's Project of Public Investment Programme in 1991/93

Project Name	Cost (Mil Cedi)	Financing Plan (Cost: Mil. Cedi)
Periodic Maintenance Project	39,314	IDA,OECF,UNDP, ADB, 25.212
Reconstruction of Nwasam-Anyiman	2,265	Under negotiation
Kintampo-Yapei-Tamale Road Project	3,739	GOG
Rehabilitation of Kumasi-Tepa Road	1,110	GOG
Rehabiltiation of Tepa-Brekum Road	4,664	GOG
Reconst. Yamoransa-Anwiankwanta Road	4,771	OECF 3.315
Reconstruction of Sogakope-Aflao Road	2,031	IDA
Reconstruction of Kaneshie-Mallan Road	1,298	GOG
Kumasi City Road	5,156	GDR, a part of barter
Construction of Asukawkaw Bridge	125	GOG
Construction of Lower Volta Bridge	2,348	KFW, foreign portion
Project Study and Preparation	935	Romania, a part of barter
Rehabilitation of Kumasi-Mampong Road	2,327	ECDG, foreign portion
Rehabilitation of Kumasi-Kintampo Road	1,944	OECF, under negotiation
Reconstruction of Tamale-Paga Road	1,039	OECF, foreign portion
Beposo Bridge Project	1,343	JGA
Minor Bridge Project	1,539	EEC
Reconst. of Fumbisi Valley Bridge	3,065	ECDG, foreign portion
Elubo-Asekrom Road Construction	2,442	EEC
Awaso-Bibiani-Nobekaw Road Rehabili.	2,559	EEC, a part of foreign & local
Nobekaw-Mim-Bediakokrom Road Rehabili.	2,278	EEC, a part of foreign & local
Agona-Tarkwa Road Rehabilitation	2,526	EEC
Logistic Support Project	3,923	GOG
GHA Building Project	813	IDA, foreign portion
Sabala-Srogboe-Keta Road Rehabili.	1,549	GOG
Daboasi-Takoradi Road Repair	1,273	GOG
Accra City Centre Improvement	2,117	GOG
Road Safety and Marking Project	1,157	IDA, foreign portion
Bailey Bridge Reconst. Project Phase 2	4,693	ECGD, foreign portion
Road Mainte. Backlog Clearance Phase 2	7,334	IDA, foreign portion
Ring Road West Reconstruction Project	6,225	GOG
Rehabilitation of Tema-Akosombo Road	3,458	KFW, foreign portion
Anyiman-Kumasi Road Asphaltic Overlay	1,425	GOG
Footbridge		
Const. of Br. over River Oti at Dama	813	Under negotiation with JGA
Const. of Br. over River Oti at Saba	1,228	Under negotiation
Total	125,332	

Note: GOG: Government of Ghana, GDR: German Democratic Republic,
OECF: Overseas Economic Cooperation Fund of Japan, JGA: Japan's Grant Aid
KFW: Central Bank of West Germany
ECGD: Export Credits Guarantee Department of G. Britain

Source: Public Investment Programme, 1991-1993, Project Profile and Summary Table, Roads and Highway, April 1991, Ministry of Finance and Economic Planning

2-4 Outline and Concept of the Request

The Rehabilitation of the 3 major workshops is highly indispensable. This will make it possible for GHA to execute routine maintenance on the 14,430 km of trunk roads and about 15% of 4,500 km periodic maintenance and rehabilitation within the project period (i.e. 1991-1993).

(1) Accra Central Mechanical Workshop (CMW)
(2) Kumasi Zonal Workshop (KZW)
(3) Tamale Zonal Workshop (TZW)

In case of direct control, it is necessary that workshops should have enough repair facilities for effective using the construction equipment of GHA. GHA has totally 33 workshops (see Table 2-11). District workshops are for minor maintenance, regional workshops are for daily maintenance, and three zonal workshops are for repairing and maintaining the equipment that can not be carried out at districts and regional workshops.

Even though three zonal workshops have repairing machines which are well maintained, but they are old so that they are not working sufficiently.

It is necessary for quick repair of workshop rehabilitation for smooth implementation of the 4th road rehabilitation plan of the 3rd public investment plan including above 675 km road maintenance and rehabilitation of three zonal workshops listed below.

(1) Accra Central Workshop
(2) Kumasi Workshop
(3) Tamale workshop

As mentioned before, GHA cannot repair the construction machines because parts of road construction equipment are also in shortage.

CHAPTER 3

OUTLINE OF THE PROJECT

CHAPTER 3

OUTLINE OF THE PROJECT

3-1 Objective

The problems that the three existing zonal workshops face presently are summarized as follows:

(1) The buildings of the workshops which were constructed before the Independence of Ghana have become old.

(2) The repair equipment installed at the workshops have aged and become obsolete.

(3) As there are not enough repair equipment at the workshops, mechanical staff and mechanics thereof are, in fact, obliged to be idle regardless many construction equipment brought therein for repairs.

The objective of the Project is to restore and renew the functions of the existing workshops as described before.

3-2 Review of the Content of Request from the Government of Ghana

3-2-1 Rationality and Necessity of the Project

GHA is scheduled to execute the routine maintenance of 14,430 km of trunk roads and about 675 km of periodic maintenance by its own workout forces, within a framework of Periodic Maintenance Project 1991/93, which has been included in the Three Years Public Investment Programme as described in Chapter 2.

In order to achieve the efficient use of the construction equipment owned by GHA, the urgent rehabilitation of the above stated three workshops is considered indispensable.

If there are no spareparts, the work is inefficient eventhough the workshop will be improved. Spare parts are very important to repair the construction equipment.

This time the Ghana Government is requesting rehabilitation for the existing workshop as follows;

(a) These three workshop have big capacity and good condition for setting machines than the other workshops.

(b) Their locations are located in big towns in Ghana, so purchasing the repairing materials (iron plate, steel materials, and electric parts) are very easy.

(c) Recruiting and keeping the Workforces are relatively easy.

Table 3-1 Ghana Highway Authority's Periodic Maintenance Programme

	Road Length (km)	Amount		Total Amount (US$)
		Local (US$)	Foreign (US$)	
1991				
Regravelling	1,147	5,333,550	12,444,950	17,778,500
Resealing	160	1,440,000	3,360,000	4,800,000
Resurfacing	330	4,950,000	11,550,000	16,500,000
Sub Total	1,637	11,723,550	27,354,950	39,078,500
1992				
Regravelling	1,224	5,691,600	13,280,400	18,972,000
Resealing	212	1,908,000	4,452,000	6,360,000
Resurfacing	295	4,425,000	10,325,000	14,750,000
Sub Total	1,731	12,024,600	28,057,000	40,082,000
1993				
Regravelling	765	3,557,250	8,300,250	11,867,500
Resealing	235	2,115,000	4,935,000	7,050,000
Resurfacing	165	2,475,000	5,775,000	8,250,000
Sub Total	1,165	8,147,250	19,010,250	27,157,500
Total	4,533	31,895,400	74,422,500	106,318,000

3-2-2 Review of the Implementation and Operation Plan of the Project

There are 140, 55, and 52 mechanical staff and mechanics in Accra, Kumasi and Tamale workshops respectively, under the auspices of the Mechanical Division of Maintenance Department in Accra, that is composed of ten senior management staff (See Fig. 2-6). Thus, the GHA is regarded to have enough capacity to implement the Project.

The study team reviewed the itemized expenditure in 1990 and the budget in 1991 of GHA shown in Table 3-2, and considers it will be very viable to implement and operate the Project in terms of the securement of required management and budgetary preparation.

Table 3-2 Expenditure in 1990 and budget in 1991 of GHA

Item	Expenditure in 1990 (Cedi)	Budget in 1991 (Cedi)
Personal Emoluments	1,550,756,000	1,526,981,000
Travelling & Transport Expenses	384,656,000	954,665,000
Plant & Equipment Operating Expenses	199,722,000	860,726,000
Material & Supplies Expenses	931,818,000	2,245,064,000
Miscellaneous Expenses	146,151,000	600,800,000
Total	3,213,153,000	6,188,236,000

Source: Ghana Highway Authority "Budget Estimates 1991"

3-2-3 Review of Relationship of the Project to the Project of Similar Nature or Programme Assisted by the Foreign Donor Agencies

Although GHA has been given an assistance by IDA of a training programme of the mechanics including the provision of spare part shelves for the construction equipment, the assistance of rehabilitation of repair equipment of the workshops is not presently donated by or does not request to the foreign donor agencies.
The study team thus sees that there is presently no overlapping of the proposed Project with any other project of similar content.

3-2-4 Verification of the Requested Repair Equipment

(1) Required repair services and equipment

Generally, the construction equipment of the government are being repaired at own workshop.

GHA is also in the same condition.

The details of repairing content are shown on Table 3-3, and the summary is as follows;

- Changing the new parts instead of damaged parts
- Repairing by weld or forging
- Welding to wearing parts and forming
- Producting the new parts by machinery
- Confirming the quality by testing machine.

At present GHA has almost all repairing machineries, but these have been used for already 45 to 50 years after manufactured. So, their 50 percent of machineries are lack of function or out of order, and other machines are working, but not in good condition.
Therefore, every machinery which we are studying for the project are mainly restoring of machines, using the spare parts.

Table 3-3 shows the required repair services and equipment therefore.

Table 3-3 Repair services and equipment

Services	Contents of Services	Required Equipment
Removal and Installation of heavy component	Engine, Transmission, Steering Clutch, Under Carraige	Crane, Hydraulic Press Parts Cleaner, Air Compressor, Floor Crane
Under Carraige	Overhaul, Adjustment, Assembly	Track Roller Collar Remover, A C Welder Track Press, Shoe Bolt Impact Wrench with Stand, Floor Crane, Air Compressor
Engine Repair	Overhaul, Adjustment, Assembly	Engine Positioner, Part Cleaner, Hydraulic Press, Bearing Heater, Cylinder-head Hydraulic Test Stand, Cylinder Boring Machine, Valve Refacer, Valve Seat Grinder, Mobile Floor Crane, Cylinder Honing Machine
Engine Test	Efficiency Test of Engine	Engine Dynamo Meter
Fuel Pump	Fuel Injection Pump Test, Fuel Injection Nozzle Test	Fuel Injection Pump and Nozzle Tester
Electric System	Total Efficiency Test	Starter, Generator Test Bench, Alternator
Battery	Charge, Water Purify	Silicon Quick Charger Water Purifier
Hydraulic System	Total Efficiency Test	Hydraulic Cylinder Service Stand
Tire	Removal of Tire, Repair	Hydraulic Tire Remover Brake Linking Riveter
Manufacture of Parts	Manufacture of Parts	Precision Engine Lathe Upright Drilling Machine, Hck Saw Machine, Universal Milling Machine, adial Drilling Machine, Crank Shaft Grinder
Welding & Fabrication	Welding & Fabrication	Body Frame Repair System, Hydraulic Shop Press
Painting & Cleaning	Painting & Cleaning	Hot-water High-pressure Washer, Steam Cleaner Airless Spray Unit, Infrared Rays Stand

3-2-5 Necessity of technical cooperation

As a result of the study, the study team sees that the technical capacity of staff and mechanics of each workshop is fairly appreciable and concludes a limited technical cooperation will be only required at the delivery and erection stages covering approximately two weeks in connection with the provision of the repair equipment under the Project supported grant programme.

3-2-6 Basic policy for Aid

The study team recommends that the Project could be implemented within Japan's Grant Aid because the positive impact accrued and viability of the Project have been duly ascertained and the executing capacity of the recipient country has been also assured which is satisfying the institutional conditions required for the introduction of Japan's Grant Aid.

Consequently, the outline of the Project will be determined and the basic design will be followed.

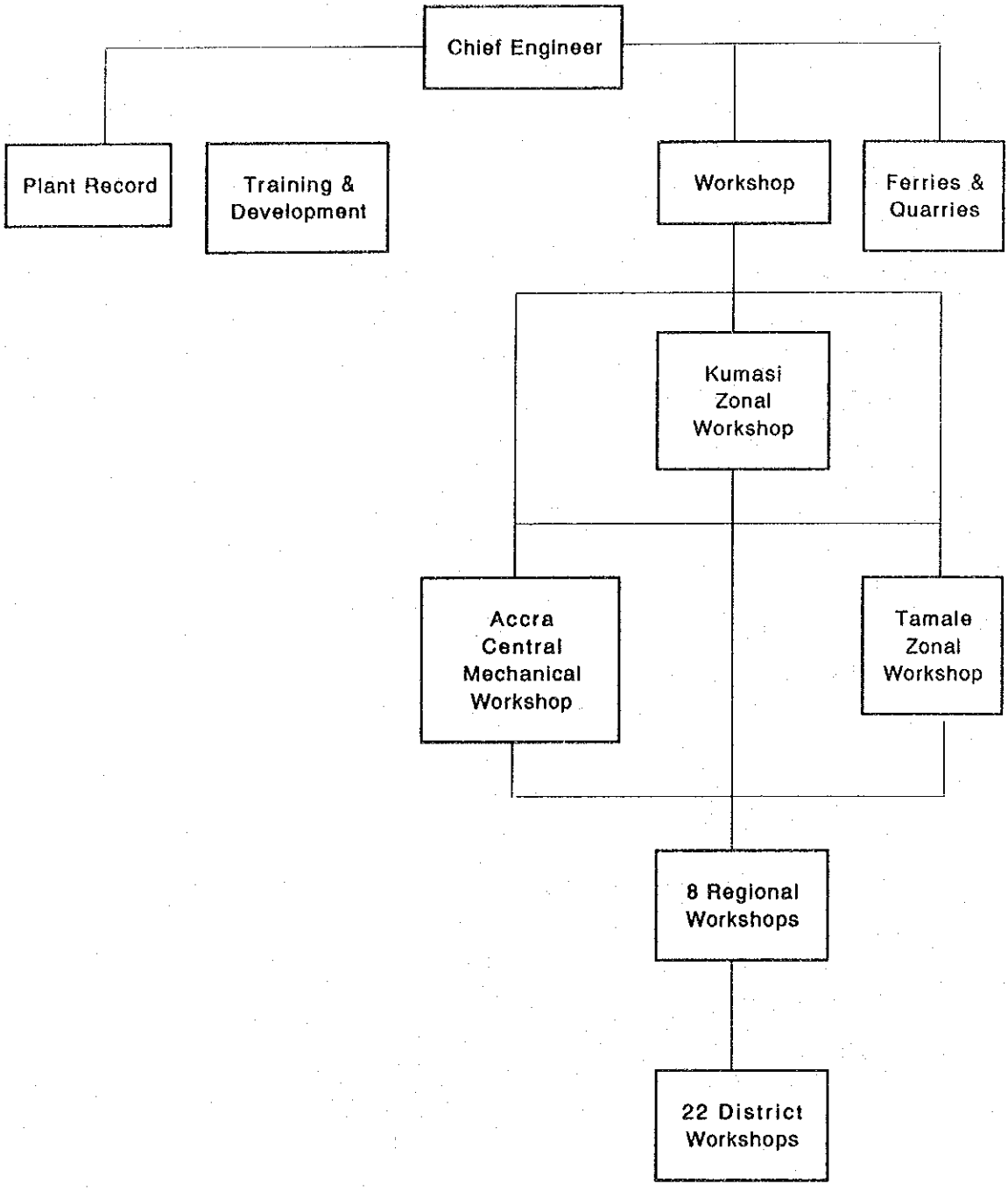
3-3 Outline of the Project

3-3-1 Implementing period and its organization

The Ghana Highway Authority under the jurisdiction of the Ministry of Roads and Highways shall be the executing agency. Specifically the Mechanical Division of the Authority will carry out the day to day operation. The organization of the Mechanical Division is shown on Fig. 3-1.

There is a Chief Engineer at the Head Quarter of the GHA, who supervises all GHA's workshops. At three Central/Zonal workshops, qualified mechanical staff and mechanics are assigned under the control of the Chief Engineer.

Fig. 3-1 Organization Chart of Mechanical Division of GHA



The training of the mechanical staff and mechanics are provided, as a routine, by the Training and Development section of the Mechanical Division.

3-3-2 Outline of the required repair equipment

As shown on Table 3-3, Accra Central Mechanical Workshop as Ghana's Central Workshop covers the entire southern region and carries out engine overhaul and repairing undercarriage which can not be carried out by other workshops; thus, the study team has decided to provide the workshop with all equipment necessary to be able to handle all possible repair works. Kumasi and Tamel zonal workshops serve the repair works that can not carried out at regional or district shops. Also, Accra Central Mechanical Workshop occupies 47% of total vehicles and equipment in the southern three regions of central and western districts around Accra and the remainder scatters over 8 regions.

Listed below are the equipment to be granted mainly to Accra Central Mechanical Workshop since it is not economical if other local workshops are equipped with the same as Accra Workshop.

1. Mobil Gantry Crane
2. Equipment under carriage
   (Truck-press, Mounting and Dismounting Shoe-bolt equipment, etc.)
3. Workshop Equipment
   (precision Lathe, Radial Drilling Machine, Crankshaft Grinding Machine, etc.)

Moreover, it is recommended that Hydraulic System and Fuel Injection Pump Tester are to be equipped at Kumasi Zonal Workshop in order to serve Tamale region.

3-3-3 Maintenance and management plan of the repair equipment

The maintenance and management system of the repair equipment introduced under this Project is considered as well established as described in Section 3-3-1. The project intends to provide enough spare parts for the aided equipment in case of requiring the repair works.

CHAPTER 4

BASIC DESIGN

CHAPTER 4

BASIC DESIGN

4-1 Design Policy

4-1-1 Natural condition

It will be necessary to evade possibly the rainy and sand storm (Harmataan) seasons for the delivery and erection of the equipment and the precise machine such as Fuel Inejction Pump Tester and Machine Tools.

It is seldom, but the power outrage still occurs. However, the object of the project is the delivery and erection of the workshop equipment; therefore, it will be not necessary to provide the emergency power supply.

4-1-2 Employment of local contractor and materials

All the electric wiring, air piping works, railing for the mobile gantry crane and their materials for the erection and operation of the repair equipment are provided under this Grant Aid Programme and the resources locally employed will be only labour, cement, aggregate and sand.

Hence no cost will be born by the Ghanian side.

4-1-3 Procurement of equipment from the third countries

The equipment which are procured from the third countries include Fuel Inejction Pump, Cylinder Boring Machine, Cylinder Honing Machine and Crank Shaft Grinder. These quipment shall be imported directly to Ghana from the third countries.

4-1-4 Implementation Schedule

The delivery and erection of the repair equipment will be finished within 12 months.

4-2 Basic Plan

As described in 3-3-2, the Central workshop in Accra will be equipped with all the repair functions. On the other hand, the zonal workshops both in Kumasi and Tamale will be installed with limited functions categorized as under the middle level repair services. Table 4-1 shows the repair equipment which are distributed to the above mentioned workshops.

Also, Table 4-2 shows the construction equipment which were granted by the Japanese Grant Aid in the past and required the spare parts urgently.

Table 4-1(1/2) GHANA HIGHWAY AUTHORITY'S THREE MAJOR WORKSHOPS REPAIR EQUIPMENT

EQUIPMENT	SPECIFICATIONS	ACCRA	KUMASI	TAMALE	FUNCTION & USAGE
Chassis Repair Shop					
Mobile Gantry Crane	3 ton	1	-	-	Dismounting and Mounting of Heavy Component
Portable Gantry Crane	3 ton	1	1	1	Movable, Dismounting and Mount
Parts Cleaner	150 Lit.	1	1	1	Washing of Disassembling Parts
Tool Cabinet		8	5	5	For Heavy Equipment
Mobile Floor Crane	3 ton	2	2	2	Movable, Lifting heavy Parts
Wheel Alignment System	10-16", 14-22.5"	2	2	2	Adjusting Shaft and Wheel
Hydraulic Shop Press	35 ton	1	1	1	Disassembling and Assembling Insert Part
Undercarrage Repair Shop					
Roller Collar Remover	700kg/cm^2, 10ton	1	1	1	Disassembling Roller of Construction Equipment
AC Arc Welder	24 KVA	2	1	1	
Track Press	230 ton	1	-	-	Dismounting Truck Link & Pin, Bushing of Bulldozer
Shoe Bolt Impact Wrench		1	-	-	Dismounting and Mounting Shoe Bolt
Engine Repair Shop					
Engine Positioner	3 ton	3	2	2	Mounting Parts for Engine Body
Parts Cleaner	150 lit.	1	1	1	
Hydraulic Shop Press	17.5 ton	1	1	1	
Piston Heater	0-300 c 3 KW	1	1	1	Bearing Heating for Install
Cylinder Head Test Stand	5-10 kg	2	1	1	Engine Cylinder Head Test after Assembling
Cylinder Boring Machine	56-120 mm dia.	1	-	-	Cylinder Inside Grinding
Cylinder Honing Machine	50-150 mm dia.	1	-	-	Cylinder Inside Surfacing
Valve Refacer	100 mm dia.	2	1	1	Grinding Piston Valve
Valve Seat Grinder	38-160 mm	1	1	1	Grinding Piston Valve Seat
Mobile Floor Crane	2 ton	2	1	1	For Removing Engine Assembly
Engine Dynamometer					
Dynamometer		1	1	1	Testing Engine Performance After Assembly
Tool Set		1	-	1	
Fuel Pump Repair Room					
Fuel Inj. Pump Tester (Bos)		1	-	-	Testing fuel Inj. Pump Performance (Bosch)
Fuel Inj. Pump Tester (Cum)		1	1	-	Testing fuel Inj. Pump Performance (Cummins)
Cummins Injector Tester		1	1	-	
PT System Tool Kit		1	1	-	Special tool Set
Bosch Pump Tool Set		1	1	-	Special Tool Set
Parts Cleaner	150 lit.	1	1	-	
Electric System Repair Shop					
Gene. Starter Test Bench	25 HP, 3.7 KW	1	1	1	Testing Starting Engine Performance
Tool Set		2	1	1	
Alternater Scope		1	1	1	Adjusting Electric Current
Battery Service Shop					
Silicon Quick Nomal Charger	AC - 6.5 KVA	2	1	1	Quick chareger of Battery
Water Purilier	25 lit./H	2	1	1	

Table 4-1(2/2) GHANA HIGHWAY AUTHORITY'S THREE MAJOR WORKSHOPS REPAIR EQUIPMENT

EQUIPMENT	SPECIFICATIONS	ACCRA	KUMASI	TAMALE	FUNCTION & USAGE
Hydraulic Repair Shop					
Hyd. Cylinder Stand	Max.Torq.4000kg.m	1	1	-	Disassembling and Assembling Hydraulic Cylin.
Tool Set		1	1	-	For Hydralic Cylinder Tool
Tire Repair Shop					
Hyd. Tire Removing Tool	24.00-35.00, 10t	1	1	1	Hydraulic Type Tool for Dismounting / Mounting
Wheel Balancer	rim dia. 10-24"	1	1	1	
Brake Lining Livetter	5 ton	1	1	1	Repairng Break Lining
Machine Shop					
Engine Lathe (L)	Dist. 2,500 mm	1	-	-	
Engine Lathe (M)	Dist. 1,500 mm	1	1	1	
Upright Drilling Machine		2	1	2	
Hack Saw Machine		2	1	1	Cutting Steel or Iron Bar
Universal Milling Machine	Max.750x270x400mm	1	-	1	
Radial Drilling Machine	Dist. 1,565mm	1	-	-	
Crankshaft Grinder	Dist. 1,200mm	1	-	-	
Welding and Fabrication Shop					
Body Frame Repair Equipment		1	1	1	
Hyd. Shop Press	100 ton	1	1	1	Forming Thick Plate
Paint and Cleaning Bay					
Hot and H/Pressure Washer	1,600 lit./H	2	1	1	Washing Equipment
Steam cleaner		2	1	1	Washing Pisassemble Parts
Airless Spray Unit	2.7 lit/min	2	1	1	Spraying Dust
Infrared Rays Set	8 bulb/set	4	4	4	Drying Painted Material
Compressor Room					
Screw Type Air Compressor	22KW, 7kg/cm^2	1	1	1	For Main Work Shop
Air Compressor	3.7KW, 9.9kg/cm^2	1	1	-	For Repair Shop
Tool Room					
Torque Multiplier	1,200kg.f.m	1	1	1	Tightening Nut of heavy Equipment
Surface Plate	600x900x100mm	1	1	1	
Magnetic Flow Detector		2	1	1	
Diesel Timing & Tacho Mate		1	1	1	
Special Tool					
Master Pin Service Tool		1	1	1	Cutting Shoe assembly of Bulldozer
Sprocket Remover & Install		1	1	1	Dismounting/Mounting Sprocket of Bulldozer
Cylindor	70+100ton (each)	1	1	1	
Mobile Workshop	Chassis 4x2	-	1	1	For Emergency Repairing at Working Site
Spare Parts for Vehicle		1	-	-	
Consumable Parts		1	1	1	

4-3 Implementation Plan

4-3-1 Basic Policy

The procurement of repair equipment of this project under the Grant Aid Programme will include piping and wiring works. The construction work at site shall thus include the erection of repair equipment, piping for air supply and electric wiring.

4-3-2 Construction supervision

A Japanese consulting firm will supervise the Project starting from the procurement of equipment, erection work, piping and initial guidance to operation of the equipment.

4-3-3 Procurement of repair equipment

The equipment procured from the third countries shall be directly imported to Ghana.

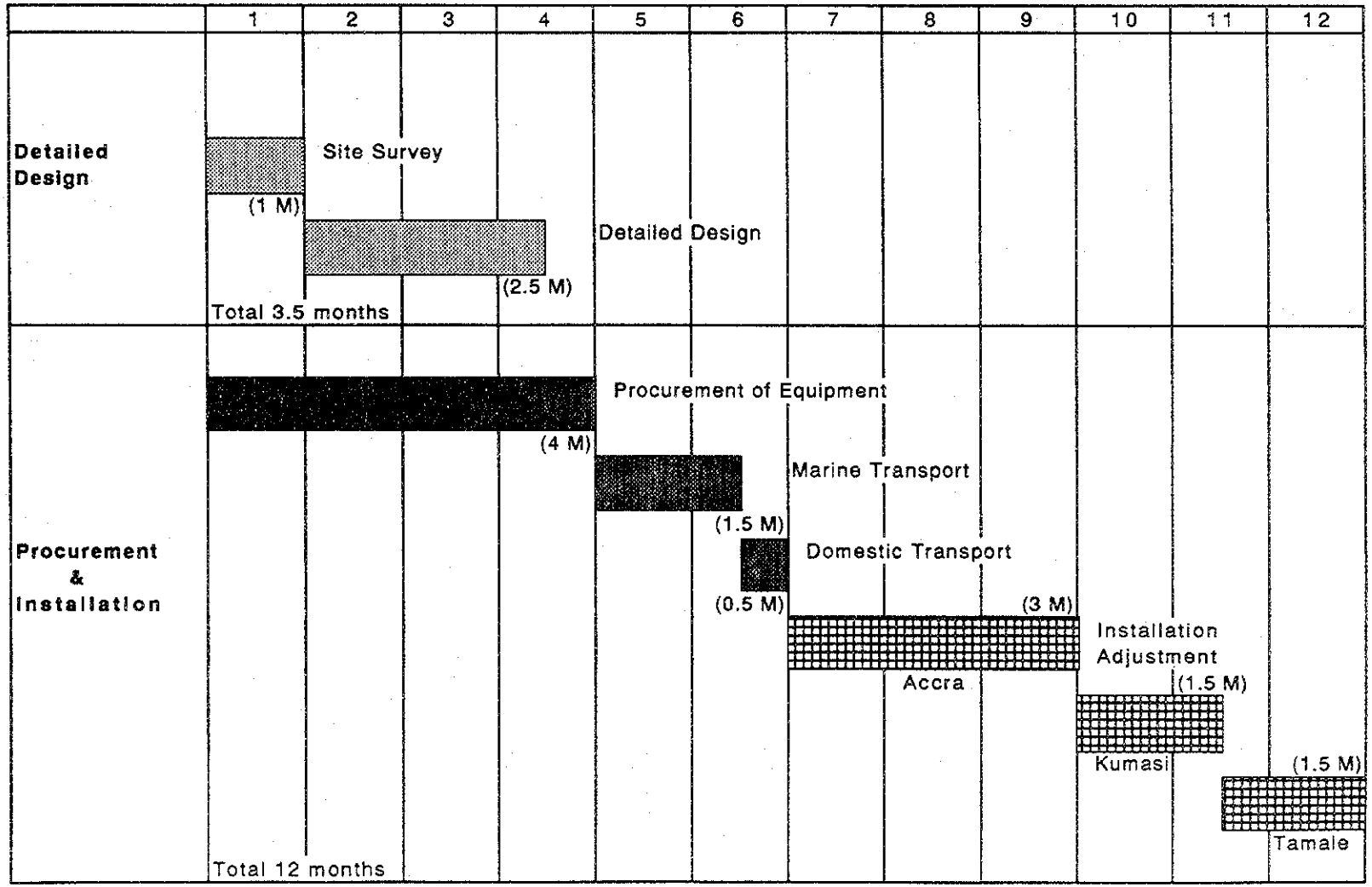
4-3-4 Implementation schedule

The implementation shcedule of this Project is given in Fig. 4-1.

Table 4-2 Construction Equipment List for Urgently Required Parts of Japan's Grant Aid

No.	Construction Equipment	
1	Bitumen Distributor	
2	Bulldozer	
3	Motor Grader	
4	Road Roller	
5	Trailer	
6	Dump Truck	4x2
7	Dump Truck	6x4
8	Vibrating Roller	
9	Wheel Loader	

Fig. 4-1 Implementation Schedule



CHAPTER 5

CONCLUSION AND RECOMMENDATION

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5-1 Conclusion

The Project is to rehabilitate the GHA's 3 major workshops which carry out major repair and rehabilitation of vehicles and construction equipment transferred from the district and regional workshops. However, the quipment in the 3 major workshops have become obsolete and been least functioning.

The rehabilitation of the 3 major workshops is highly indispensable. This will make it possible for the GHA to execute routine maintenance of the 14,430 km of trunk roads and about 15% of 4,500 km periodic maintenance.

The implementation of the Project will promote the Periodic Maintenance Project in the Public Investment Programme and also greatly enhance the routine maintenance operation of the Authority (GHA).

5-2 Recommendation

The implementation for the Project will be justified and it is recommended that the Project be executed as soon as possible under the Japan's Grant Aid.

After the Project is completed, GHA shall conduct routine and periodic maintenance for the project equipment including the staff training.

APPENDIX

APPENDIX 1 List of Members of Survey Team

JICA sent the following Basic Design Study Team in the period from October 16 to November 6, 1991.

Name	Designation	Title
Ryo YAMANA	Team Leader	Manager, Machinery Division, First Maintenance Department, Second Operation Bureau, Honshu-Shikoku Bridge Authority
Yuki ARATSU	Project Coordinator	Second Basic Design Study, Division, Grant Aid Study and Design Department, JICA
Toshio CHIKEN	Maintenance and Operation Planner	Construction Project Consultants, INC.
Shirou NOGUCHI	Maintenance Equipment Planner 1	Construction Project Consultants, INC.
Akira SHIMA	Maintenance Equipment Planner 2	Construction Project Consultants, INC.

JICA also dispatched the following Team for explanation and discussion on Draft Final Report, in the period from January 22 to January 31, 1992.

Name	Designation	Title
Ryo YAMANA	Team Leader	Manager, Machinery Division, First Maintenance Department, Second Operation Bureau, Honshu-Shikoku Bridge Authority
Takashi SHIMOWAKARA	Project Coordinator	Second Training Division, JICA Tokyo International Center, Hatagaya
Toshio CHIKEN	Maintenance and Operation Planner	Construction Project Consultants, INC.
Shiruo NOGUCHI	Maintenance Equipment Planner 1	Construction Project Consultants, INC.

APPENDIX 2 Survey Schedule

First Survey (from October 15 to November 7, 1991)

	Date	Place	Description
1	Oct. 15 (Tu)	(Amsterdam)	Leaving for Ghana by KL 862
2	Oct. 16 (W)	Amsterdam/Accra	Arriving at Accra by KL 587
3	Oct. 17 (Th)	Accra	Courtesy Call to Embassy of Japan Ministry of Finance & Econ. Planning, Ministry of Roads and Highways, GHA
4	Oct. 18 (F)	Accra	Meeting & Inspection at Accra Workshop
5	Oct. 19 (Sa)	Accra/Kumasi	Moving to Inspecting Kumasi
6	Oct. 20 (Su)	Kumasi/Tamale	Moving to Tamale
7	Oct. 21 (M)	Tamale/Kumasi	Inspecting Tamale Workshop
8	Oct. 22 (Tu)	Kumasi/Accra	Inspecting Kumasi Workshop
9	Oct. 23 (W)	Accra	Meeting & Collecting Data, Inspecting Caterpillar at Champion Workshop
10	Oct. 24 (Th)	Accra	Final Meeting with GHA on Minutes of Discussion
11	Oct. 25 (F)	Accra Amsterdam	Signing of Minutes of Discussion Courtesy Call to Embassy of Japan Ministry of Finance &Econ. Planning, Ministry of Roads & Highways Team Leader and Project Coordinator leaving Accra for Tokyo
12	Oct. 26 (Sa)	Accra	Analyzing Data
13	Oct. 27 (Su)	Accra	Analyzing Data
14	Oct. 28 (M)	Accra/Winneba/Accra	Inspecting Winneba District Workshop
15	Oct. 29 (Tu)	Accra/Koforidua/Accra	Inspecting Koforidua District Workshop
16	Oct. 30 (W)	Accra/Tema/Accra	Visiting GMTC
17	Oct. 31 (Th)	Accra	Collecting & Analyzing of Data
18	Nov. 01 (F)	Accra	Collecting & Analyzing of Data
19	Nov. 02 (Sa)	Accra	Collecting & Analyzing of Data
20	Nov. 03 (Su)	Asin Foso/Accra	Visiting Route 17 Road
21	Nov. 04 (M)	Accra	Collecting & Analyzing of Data
22	Nov. 05 (Tu)	Accra/Amsterdam	Courtesy Call to Embassy of Japan Leaving Accra for Tokyo by KL 586
23	Nov. 06 (W)	Amsterdam	
24	Nov. 07 (Th)	Tokyo	Arriving at Narita by KL 861

Second Survey (from January 21 to February 2, 1992)

	Date	Place	Description
1	Jan. 21 (Tu)	(London)	Leaving Ghana by BA 008
2	Jan. 22 (W)	London/Accra	Arriving Accra by BA 079
3	Jan. 23 (Th)	Accra	Courtesy Call to Embassy of Japan Ministry of Finance & Econ. Planning, Ministry of Roads & Highways, GHA
4	Jan. 24 (F)	Accra	Meeting with GHA
5	Jan. 25 (Sa)	Accra	Collecting & Analyzing Data
6	Jan. 26 (Su)	Accra	Collecting & Analyzing Data
7	Jan. 27 (M)	Accra	Meeting with GHA
8	Jan. 28 (Tu)	Accra	Meeting with GHA
9	Jan. 29 (W)	Accra	Signing of Minutes of Discussion Courtesy Call to Embassy of Japan Ministry of Finance & Econ. Planning, Ministry of Roads & Highways Team Leader & Project Coordinator Leaving Accra for Tokyo
10	Jan. 30 (Th)	Accra	Collecting Data
11	Jan. 31 (F)	Accra/London	Leaving Accra for Tokyo by BA 078
12	Feb. 01 (Sa)	London	
13	Feb. 03 (Su)	Tokyo	Arriving Narita by BA 007

APPENDIX 3 Member List of Concerning Party in the Recipient Country

1. Ministry of Finance and Economic Planning (MFEP)

MR. G. Cann	Director of International Economic Relation Division

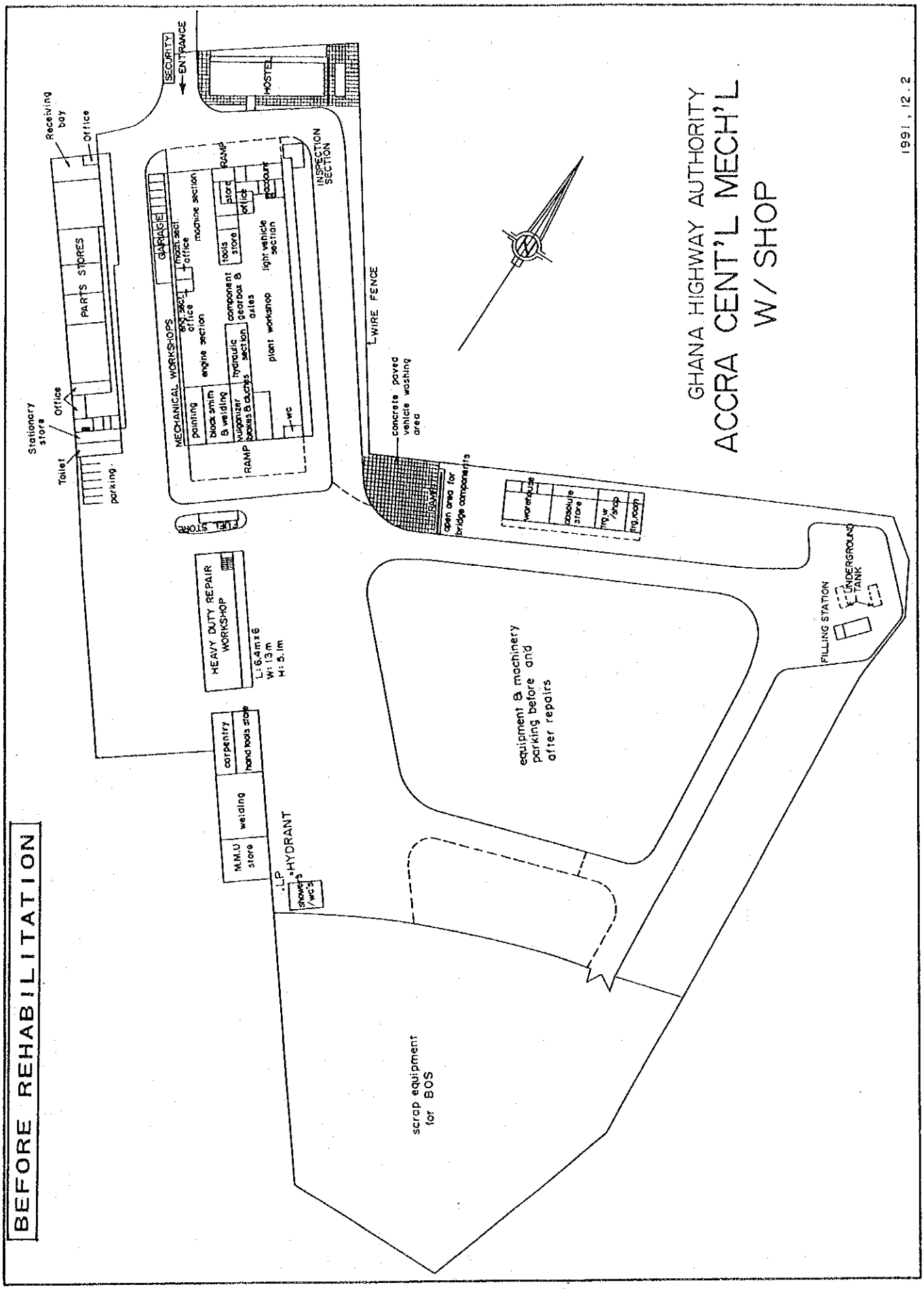
2. Ministry of Roads and Highways (MRH)

Lt.Col. Comnrey	His Excellency, PNDC Secretary for Roads and Highway

3. Ghana Highway Authority (GHA)

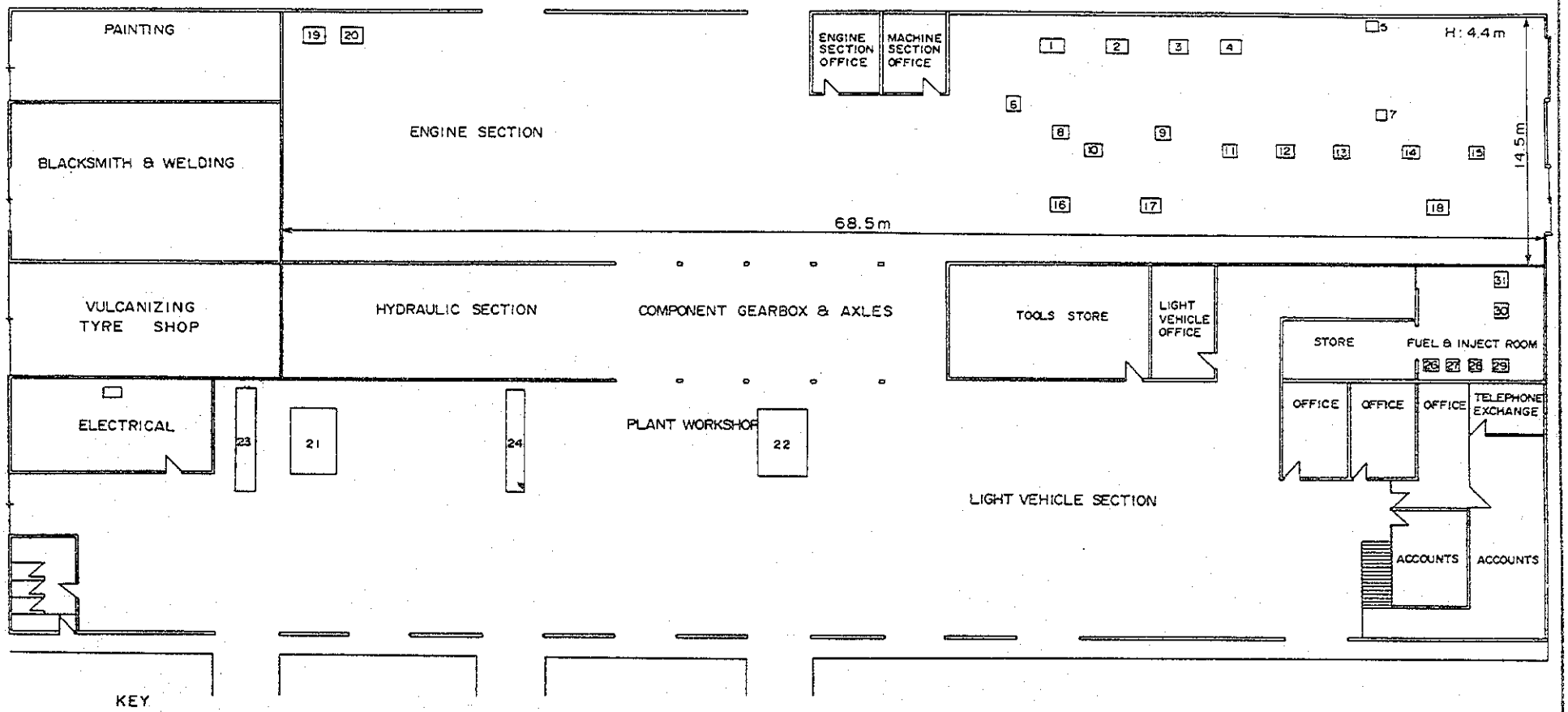
Mr. H. A. O. Quaynor	Chief Executive
Mr. H. D. Pappoe	Deputy Chief Executive (Administration)
Mr. K. Abbey Sam	Deputy Chief Executive (Maintenance)
Mr. J. V. August	Deputy Chief Executive (Development)
Mr. J. C. Targo	Chief Engineer (Mechanical)
Dr. K. A. Addai	Chief Engineer (Bridge)
Mr. M. G. Anafi	Chief Engineer (Planning)
Mr. E. A. Opoku	Manager of Accra Central Mechanical Workshop
Mr. Osafo	Manager of Kumasi Zonal Workshop
Mr. Adam	Manager of Tamale Zonal Workshop
Mr. Nkuruma	Manager of Winneba District Workshop
Mr. Bortie	Manager of Koforidua Regional Workshop
Mr. D. K. Anyang	Project Engineer of Mobile Maintenance Unit II
Mr. H. B. Zakbla	Staff of Head Office
Mr. Billy Donkor	-ditto-
Mr. J. E. Ayetey	-ditto-
Mr. S. M. Tetteh	-ditto-
Mr. J. E. Sampong	-ditto-
Mr. J. A. Afful	Stores Manager

Appendix 4 Layout of Repair Equipment in each Workshops



GHANA HIGHWAY AUTHORITY
ACCRA CENT'L MECH'L W/SHOP
MAIN WORKSHOP

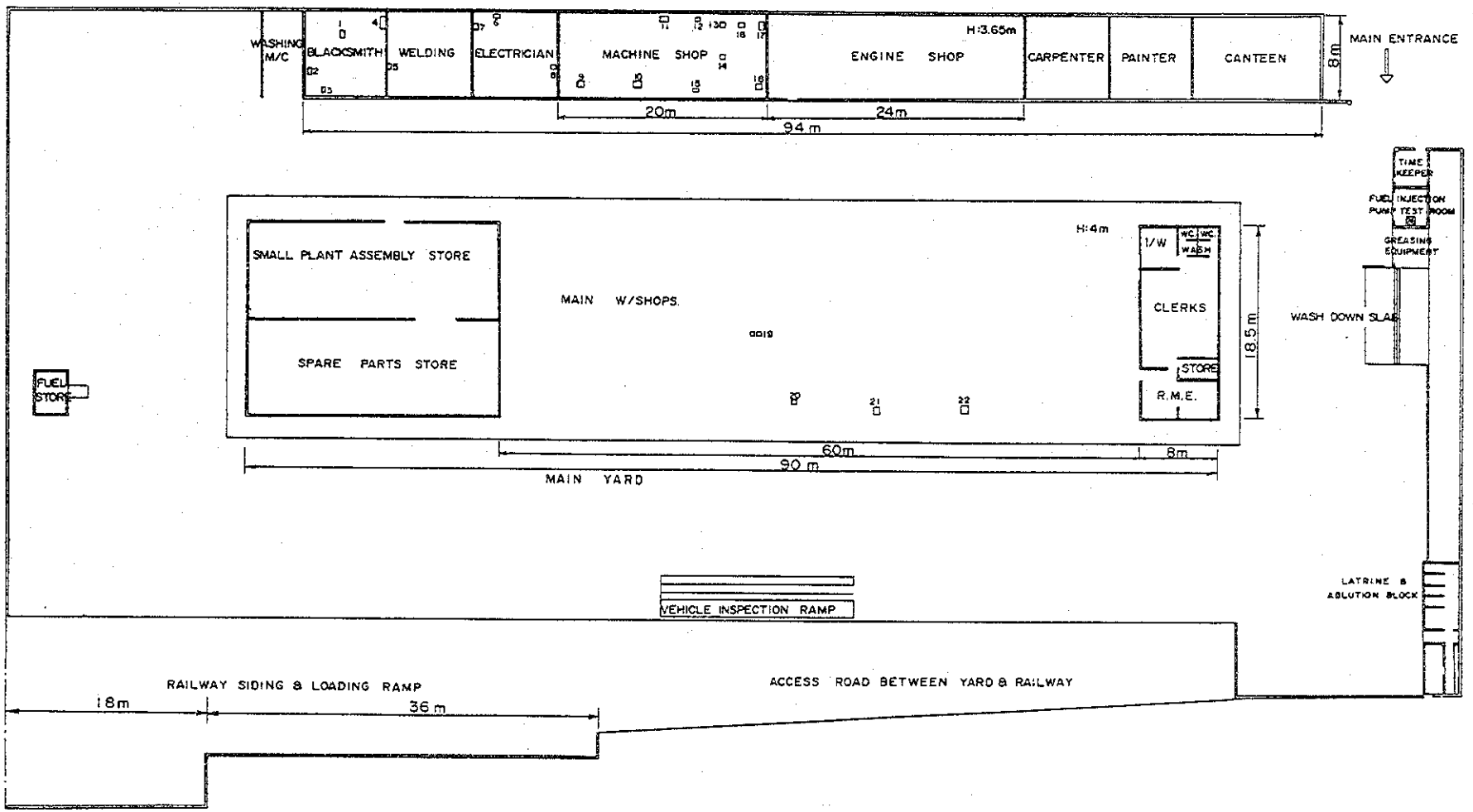
BEFORE REHABILITATION



KEY

1	Crankshaft Grinder	13	Milling Machine	25	Electrical Test Bench
2	Shaping Machine	14	Drilling Machine "Pillar"	26	Nozzle Reseating Machine
3	Shaping Machine	15	Drilling Machine "Radial"	27	Lapping Machine
4	Lathe Machine	16	Cylindrical Grinding Machine	28	Lapping Machine
5	Grinding Machine	17	Turret Lathe Machine	29	Nozzle Testing Machine
6	Power Saw.	18	Lathe Machine	30	Universal Testing Stand
7	Grinding Machine	19	Honing Machine	31	Wil-Bar Test Stand
8	Brake Drum Lathe	20	Honing Machine		
9	Lathe Machine	21	Vehicle Lifter		
10	Drilling Machine	22	Vehicle Lifter		
11	Milling Machine	23	Pit		
12	Milling Machine	24	Pit		

GHANA HIGHWAY AUTHORITY
KUMASI REG. MECH'L W/SHOP



KEY

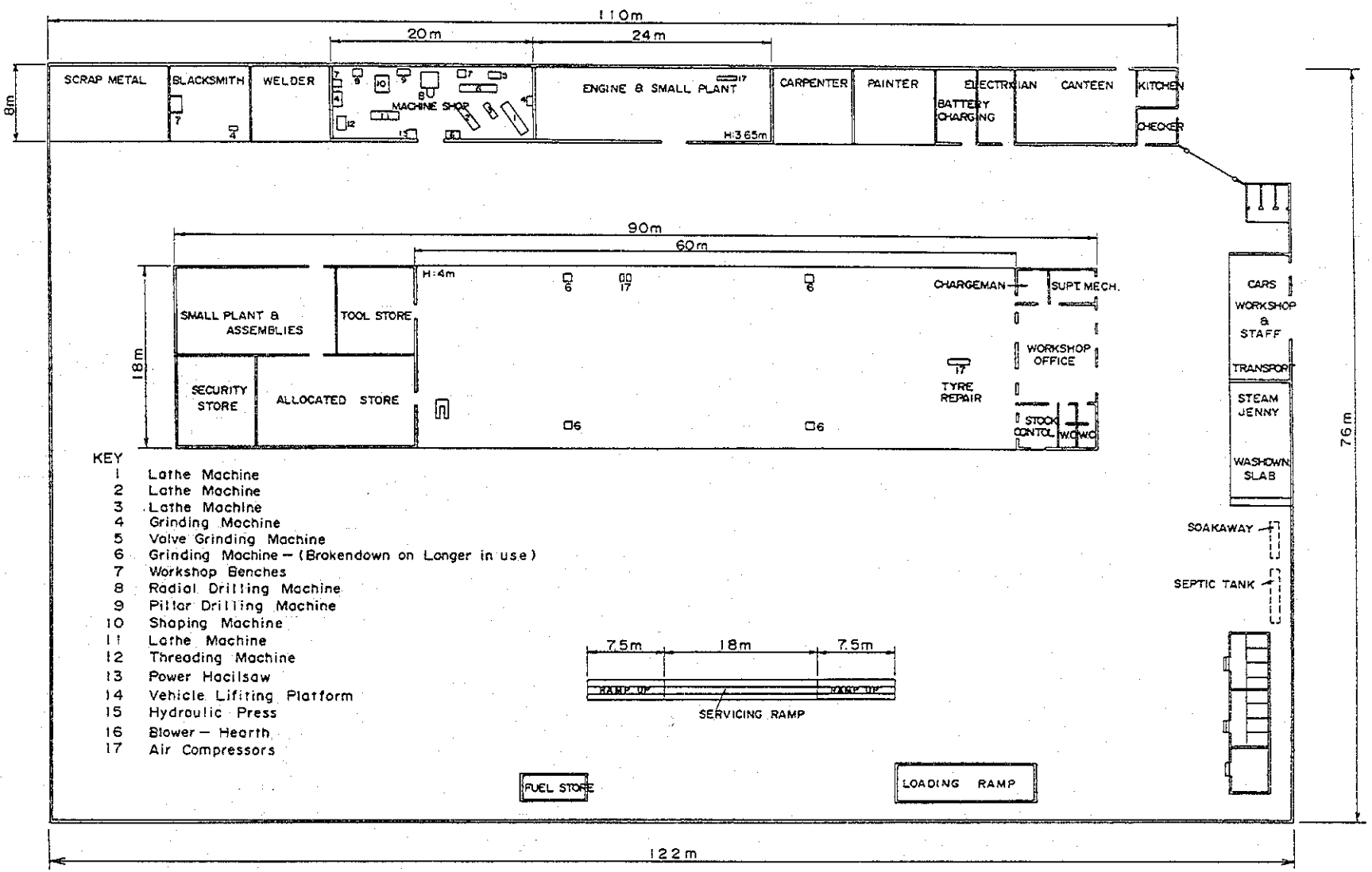
1 Blacksmith's Health
2 Grinding Machine
3 Hydraulic Press
4 Water Tank
5 Welding Transformer
6 Digfill Water Plant
7 Battery Charger
8 Spark Plug Cleaner
9 Pillar Drill Machine
10 Lathe
11 Power Hacksaw Machine
12 Pillar Drill Machine
13 Lathe
14 Lathe
15 Lathe
16 Milling Machine
17 Shaping Machine
18 Lathe
19 Air Compressor
20 Tire Remover
21 Car Lifting Platform
22 Chargeman's Office

BEFORE REHABILITATION

1991, 12.2

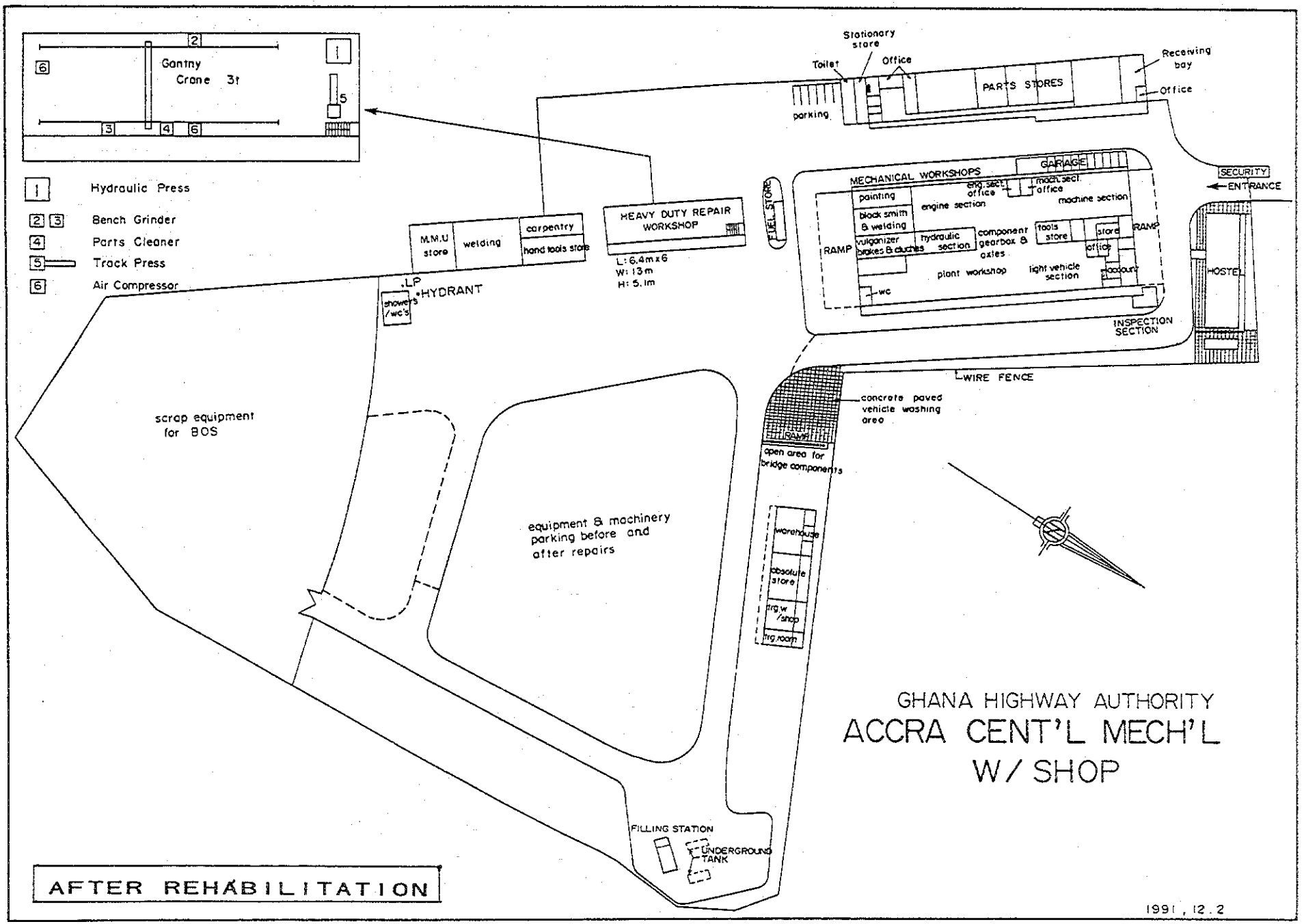
BEFORE REHABILITATION

GHANA HIGHWAY AUTHORITY
TAMALE REG. MECH'L W/SHOP



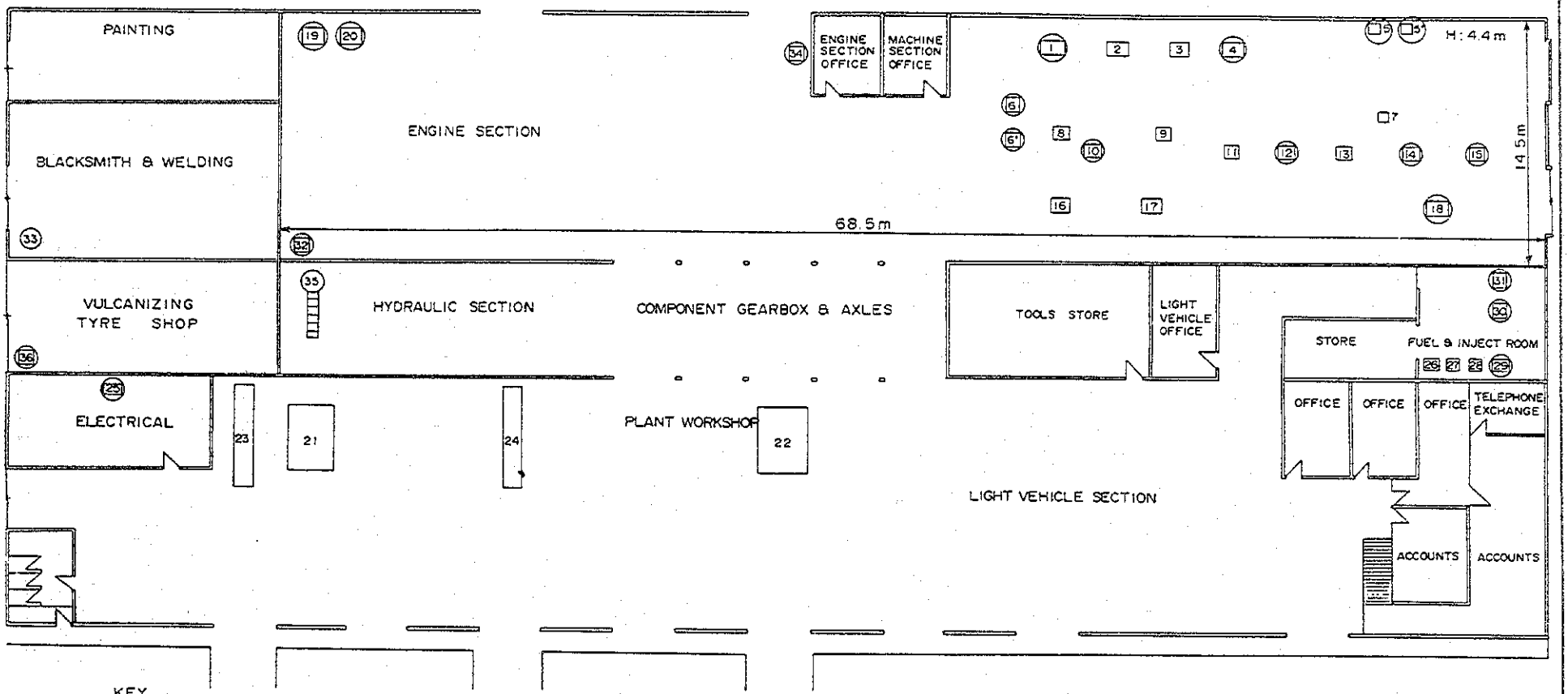
KEY

1 Lathe Machine
2 Lathe Machine
3 Lathe Machine
4 Grinding Machine
5 Valve Grinding Machine
6 Grinding Machine – (Brokendown on Longer in use)
7 Workshop Benches
8 Radial Drilling Machine
9 Pillar Drilling Machine
10 Shaping Machine
11 Lathe Machine
12 Threading Machine
13 Power Hacilsaw
14 Vehicle Lifiting Platform
15 Hydraulic Press
16 Blower – Hearth
17 Air Compressors


Gantry Crane 3t
1 Hydraulic Press
2 3 Bench Grinder
4 Parts Cleaner
5 Track Press
6 Air Compressor
Stationary store
Toilet
Office
Receiving bay
Office
parking
PARTS STORES
MECHANICAL WORKSHOPS
GARAGE
painting
engg. sect. office
mech. sect. office
machine section
black smith & welding
engine section
vulganizer brakes & clutches
hydraulic section
component gearbox & axles
tools store
store
office
RAMP
plant workshop
light vehicle section
blacksmith
wc
INSPECTION SECTION
SECURITY
ENTRANCE
HOSTEL
FUEL STORE
M.M.U store
welding
carpentry
hand tools store
HEAVY DUTY REPAIR WORKSHOP
L: 6.4m x 6
W: 13m
H: 5.1m
LP
HYDRANT
shower's /wc's
WIRE FENCE
concrete paved vehicle washing area
RAMP
open area for bridge components
scrap equipment for BOS
equipment & machinery parking before and after repairs
warehouse
obsolete store
trg.w /shop
trg.room
FILLING STATION
UNDERGROUND TANK
GHANA HIGHWAY AUTHORITY
ACCRA CENT'L MECH'L W/ SHOP
AFTER REHABILITATION
1991, 12.2

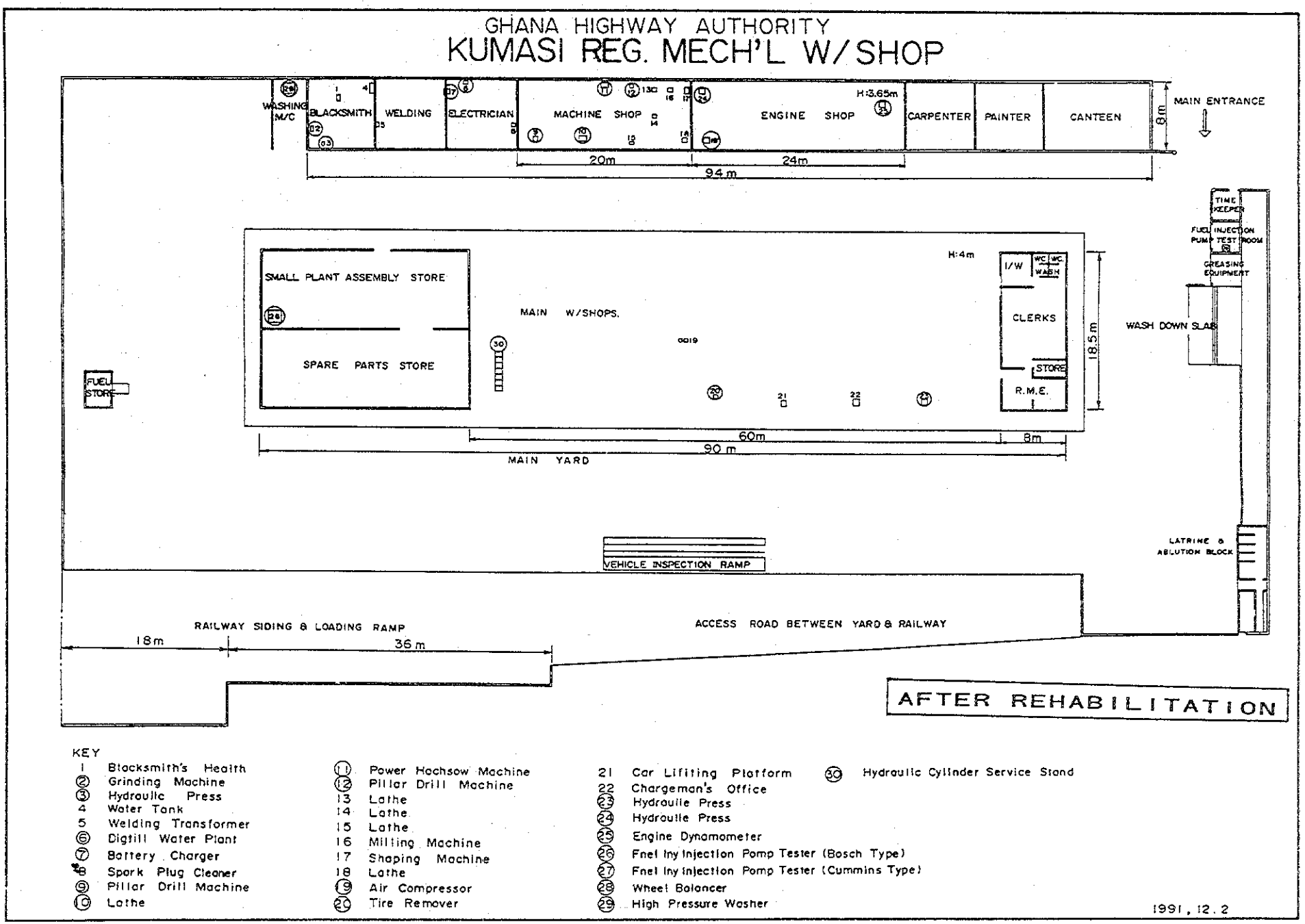
GHANA HIGHWAY AUTHORITY
ACCRA CENT'L MECH'L W/SHOP
MAIN WORKSHOP

AFTER REHABILITATION



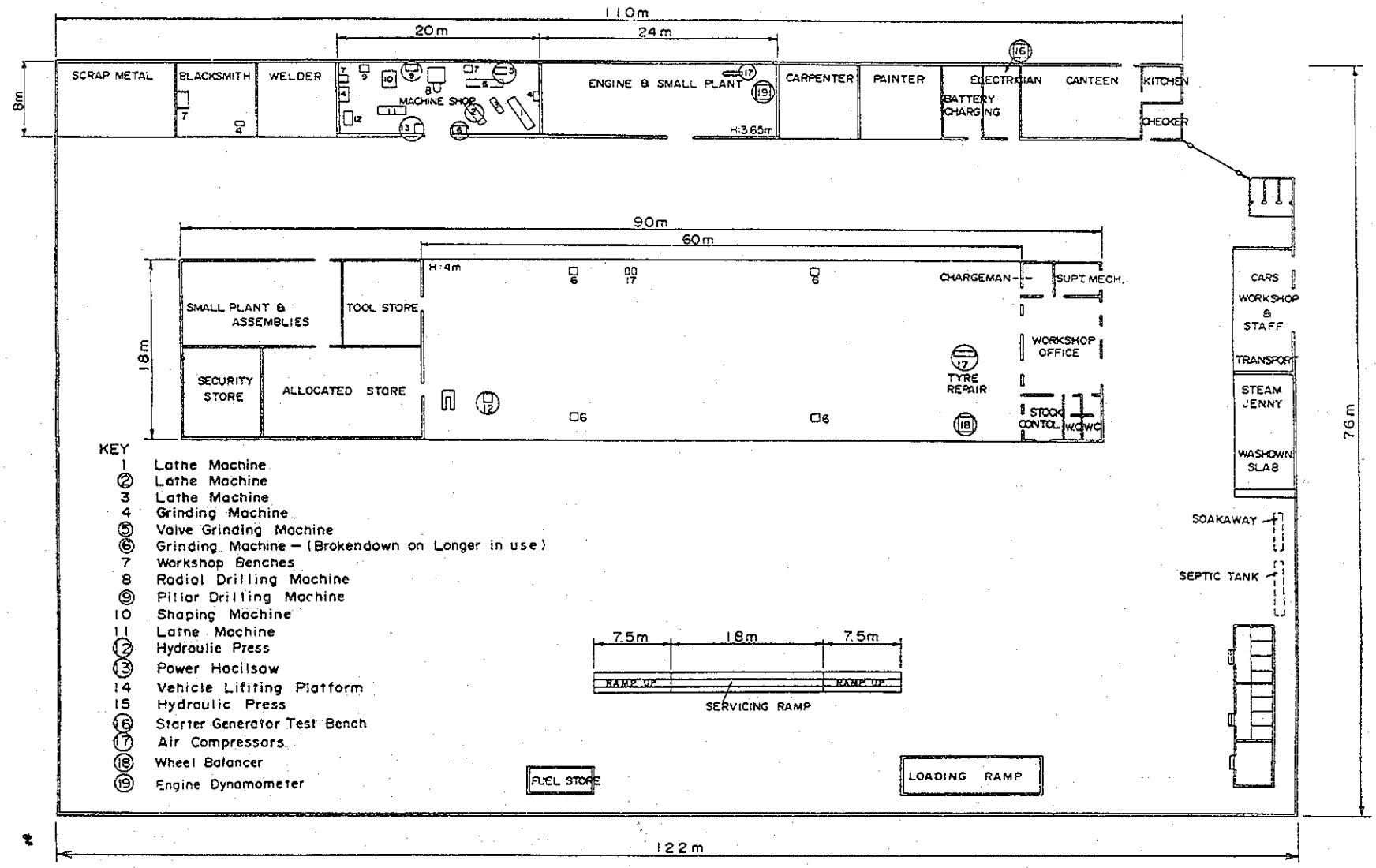
KEY

1. Crankshaft Grinder
2. Shaping Machine
3. Shaping Machine
4. Lathe Machine
5. Grinding Machine
5. Grinding Machine
6. Power Saw.
7. Grinding Machine
8. Brake Drum Lathe
9. Lathe Machine
10. Drilling Machine
11. Milling Machine
12. Milling Machine
13. Milling Machine
14. Drilling Machine "Pillar"
15. Drilling Machine "Radial"
16. Cylindrical Grinding Machine
17. Turret Lathe Machine
18. Lathe Machine
19. Cylinder Boring Machine
20. Honing Machine
21. Vehicle Lifter
22. Vehicle Lifter
23. Pit
24. Pit
25. Electrical Test Bench
26. Nozzle Reseating Machine
27. Lapping Machine
28. Lapping Machine
29. Nozzle Testing Machine
30. Universal Testing Stand
31. Fuel Inj Injection Pump Tester (Bosch)
32. Fuel Inj Injection Pump Tester (Cummins)
33. Hyohanlic Press
34. Engine Dynamometer
35. Hydraulic Cylinder Service Stand
36. Wheel Balancer


GHANA HIGHWAY AUTHORITY
KUMASI REG. MECH'L W/SHOP
WASHING M/C
BLACKSMITH
WELDING
ELECTRICIAN
MACHINE SHOP
ENGINE SHOP
H:3.65m
CARPENTER
PAINTER
CANTEEN
8m
MAIN ENTRANCE
20m
24m
94 m
TIME KEEPER
FUEL INJECTION PUMP TEST ROOM
GREASING EQUIPMENT
WASH DOWN SLAB
SMALL PLANT ASSEMBLY STORE
SPARE PARTS STORE
MAIN W/SHOPS.
H:4m
I/W
WC
WC
WASH
CLERKS
STORE
R.M.E.
18.5m
FUEL STORE
60m
8m
90 m
MAIN YARD
VEHICLE INSPECTION RAMP
LATRINE & ABLUTION BLOCK
RAILWAY SIDING & LOADING RAMP
18m
36 m
ACCESS ROAD BETWEEN YARD & RAILWAY
AFTER REHABILITATION
KEY
1 Blacksmith's Hearth
2 Grinding Machine
3 Hydraulic Press
4 Water Tank
5 Welding Transformer
6 Digfill Water Plant
7 Battery Charger
8 Spark Plug Cleaner
9 Pillar Drill Machine
10 Lathe
11 Power Hacksaw Machine
12 Pillar Drill Machine
13 Lathe
14 Lathe
15 Lathe
16 Milling Machine
17 Shaping Machine
18 Lathe
19 Air Compressor
20 Tire Remover
21 Car Lifting Platform
22 Chargeman's Office
23 Hydraulic Press
24 Hydraulic Press
25 Engine Dynamometer
26 Fuel Inj Injection Pump Tester (Bosch Type)
27 Fuel Inj injection Pump Tester (Cummins Type)
28 Wheel Balancer
29 High Pressure Washer
30 Hydraulic Cylinder Service Stand
1991, 12. 2

AFTER REHABILITATION

GHANA HIGHWAY AUTHORITY
TAMALE REG. MECH'L W/SHOP

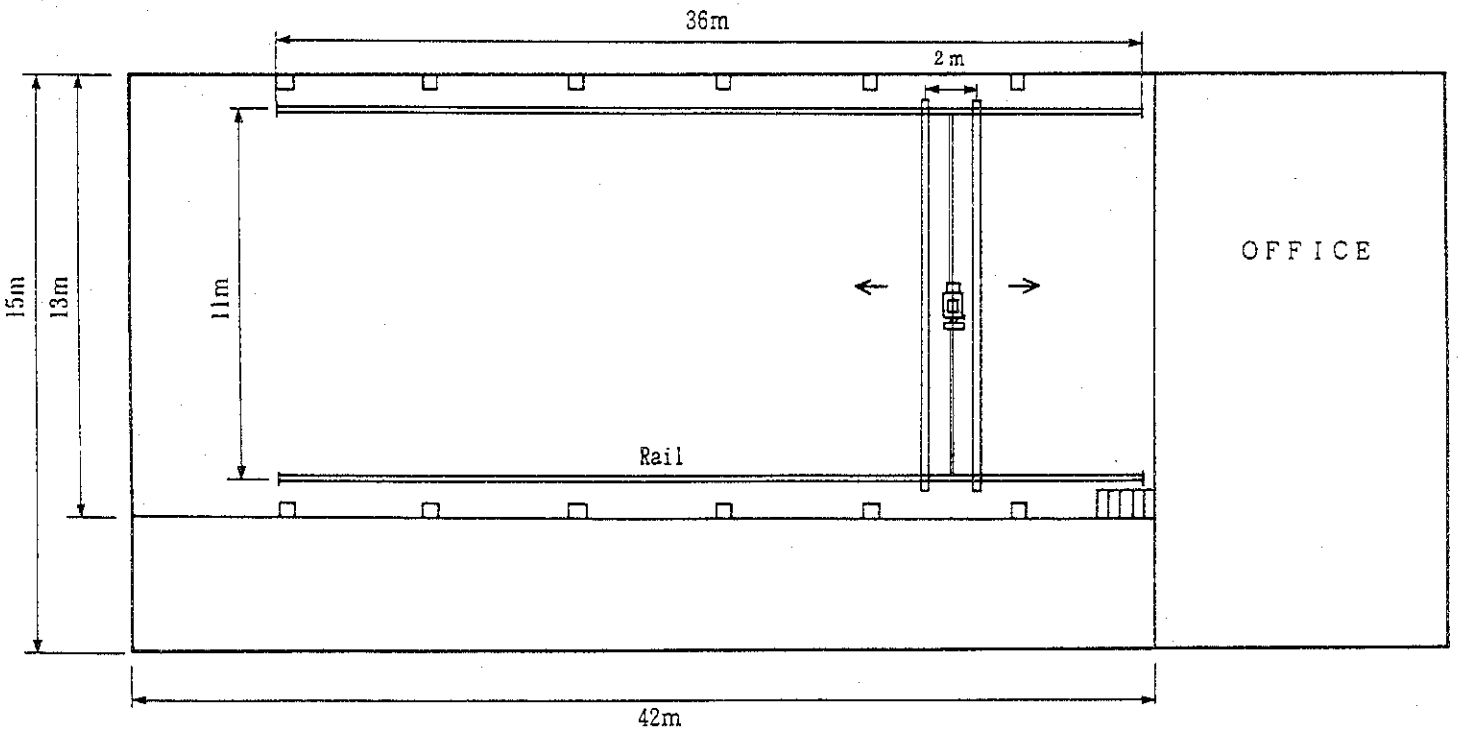


KEY

1 Lathe Machine
2 Lathe Machine
3 Lathe Machine
4 Grinding Machine
5 Valve Grinding Machine
6 Grinding Machine – (Brokendown on Longer in use)
7 Workshop Benches
8 Radial Drilling Machine
9 Pillar Drilling Machine
10 Shaping Machine
11 Lathe Machine
12 Hydraulic Press
13 Power Hacilsaw
14 Vehicle Lifiting Platform
15 Hydraulic Press
16 Starter Generator Test Bench
17 Air Compressors
18 Wheel Balancer
19 Engine Dynamometer

ACCRA HEAVY DUTY REPAIR WORKSHOP

(CRANE LOCATION)



PLAN

SIDE VIEW

FRONT VIEW

Appendix 5 Minutes of Discussion

MINUTES OF DISCUSSIONS
BASIC DESIGN STUDY ON
THE PROJECT FOR PROVIDING EQUIPMENT FOR
GHANA HIGHWAY AUTHORITY WORKSHOPS IN
THE REPUBLIC OF GHANA

In response to the request from the Government of the Republic of Ghana, the Government of Japan decided to conduct a basic design study on the Project for Providing Equipment for Ghana Highway Authority Workshops(hereinafter referred to as the "Project"), and entrusted the study to the Japan International Cooperation Agency(JICA).

JICA sent to Ghana a study team, which is headed by Mr. Ryo Yamana, Manager, Machinery Division, First Maintenance Department, Second Operation Bureau, Honshu-Shikoku Bridge Authority, and is scheduled to stay in the country from October 16 to November 5, 1991.

The team held discussions and conducted a field survey. Both parties have confirmed the main items described on attached sheets. The team will proceed to urther works and prepare the Basic Design Study report.

Accra, October 25, 1991

Ryo Yamana

Mr. Ryo Yamana
Leader
Basic Design Study Team
JICA

Mr. H.D. Pappoe
Acting Chief Executive
Ghana Highway Authority

ATTACHMENT

1. OBJECTIVE

The objective of the Project is to strengthen the workshops by providing necessary equipment for repairing road construction and maintenance machinery.

2. PROJECT SITES

(1) Accra Central Mechanical Workshop

(2) Kumasi Zonal Workshop

(3) Tamale Zonal Workshop

(Location map is attached as Annex-1)

3. RESPONSIBLE ORGANIZATION, EXECUTING ORGANIZATION

(1) Responsible organization: Ministry of Roads and Highways

(2) Executing organization : Ghana Highway Authority (GHA)

4. ITEMS REQUESTED BY THE GOVERNMENT OF GHANA

After discussions with the Basic Design Study Team, the list of major items requested by the Ghanaian side is shown in Annex-2.

However, the final components of the Project will be decided after further studies.

5. JAPAN'S GRANT AID SYSTEM

(1) The Government of Ghana has understood Japan's Grant Aid system explained by the team.

(2) The Goverment of Ghana will take necessary measures, described in Annex -3 for smooth implementation of the Project, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

P.L.

6. SCHEDULE OF THE STUDY

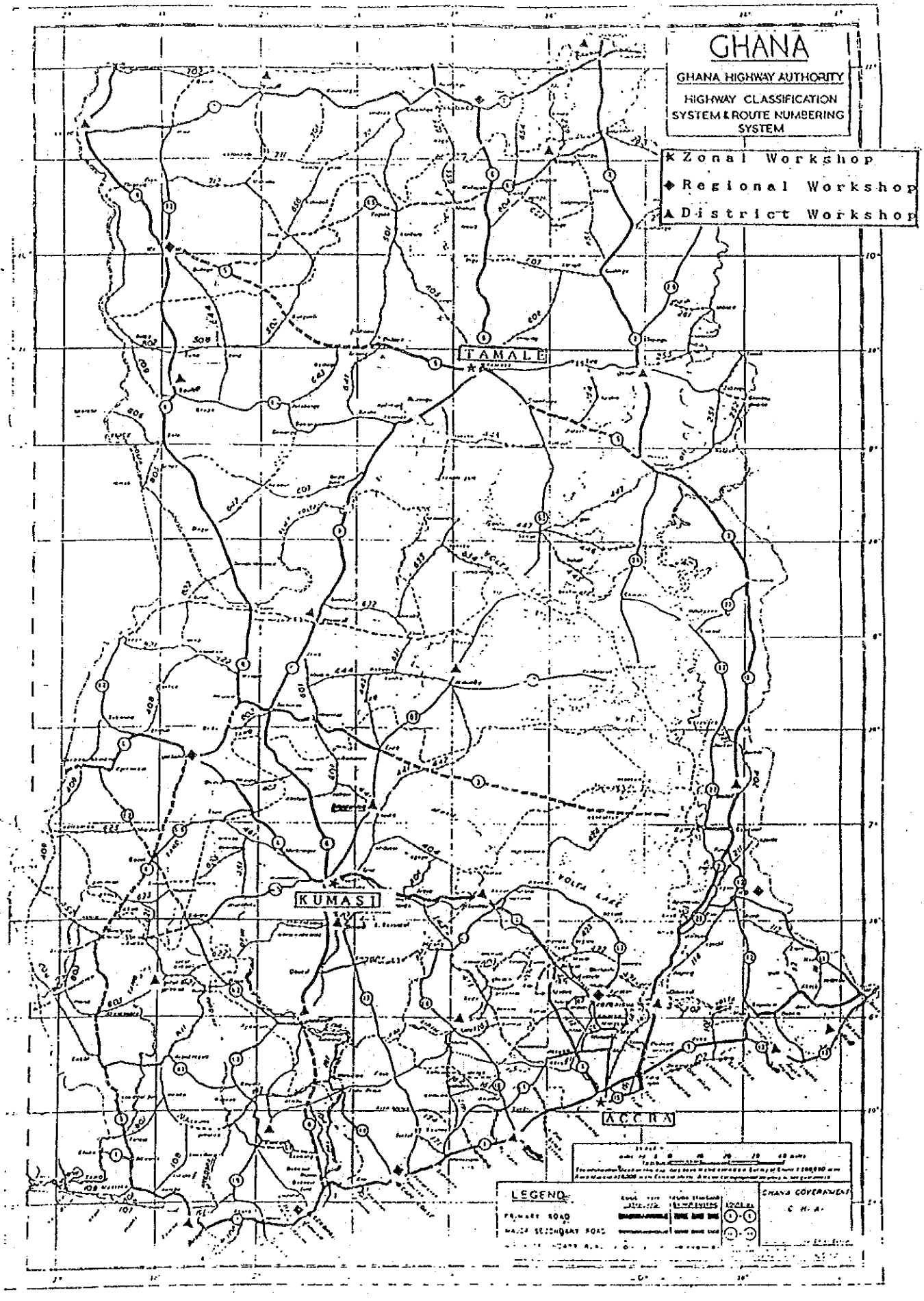
(1) The consultants will proceed to further studies in Ghana until November 5, 1991.

(2) JICA will prepare the draft report in English and dispatch a mission in order to explain its contents around January, 1992.

(3) Based on the Minutes of Discussions and technical examination of the study results, JICA will complete the final report and will send it to the Government of Ghana by the end of May, 1992.

R.Y. 4/28

ANNEX-1 LOCATION MAP



ANNEX-2 List of Equipment requested by the Government of Ghana

CHASSIS REPAIR SHOP

1. Gantry Crane 3 ton
2. Hydraulic Press 55 ton
3. Hydraulic Press 100 ton
4. Portable Hydraulic Jack 10 ton
5. Portable Hydraulic Jack 30 ton
6. Electric Bench Grinder
7. Parts Cleaner
8. Gas Welder Set
9. Tractor Support

UNDERCARRIAGE REPAIR SHOP

1. Jib Crane with Manual Chain
2. Lubrication Nozzle
3. Hand Truck 300 kg
4. Floating Seal Tester
5. Arc Welder

ENGINE REPAIR SHOP

1. Engine Stand 3 ton
2. Parts Cleaner
3. Hydraulic Press 15 ton
4. Electric Bench Grinder
5. Piston Heater (Bearing Heater)
6. Cylinder Head Hydraulic Test Stand
7. Cylinder Head Work Bench
8. Cylinder Honing Machine
9. Engine Hanger 3 ton

11. Valve Refacer
12. Eccentric Valve Seat Grinder

ENGINE DYNAMOMETER ROOM

1. Engine Dynamometer (Portable Type)

FUEL INJECTION PUMP REPAIR ROOM

1. Diesel Fuel Injection Pump Tester
2. Mobile Test Unit for Cummins PT Pumps
3. Nozzle Tester
4. Cummins Master Injecter

* Ghana side should secure necessary space for the installation of provided testers.

ELECTRIC SYSTEM REPAIR SHOP

1. Stater Generator Test Bench
2. Electricians Tool Set (Metric Size)
3. Alternator Scope

BATTERY SERVICE SHOP

1. Silicon Normal Charger
2. Silicon Normal Charger (Initial Boost Starting Engine)
3. Silicon Quick Charger
4. Water Purifier
5. Hand Truck

HYDRAULIC REPAIR SHOP

1. Hydraulic Cylinder Service Stand

2. Electric Grinder
3. Electric Drill

TIRE REPAIR SHOP

1. Air Compressor
2. Hydraulic Tire Removing Tool (10 ton)
3. Hot Patch for Tire Repair Set
4. Cold Patch for Tire Repair Set
5. Wheel Balancer
6. Tire Service Tool Set
7. Tube Vulcanaizer Set

MACHINE SHOP

1. Precision Engine Lathe
2. Upright Drilling Machine
3. Bench Drill Press
4. Bench Electric Grinder
5. Hack Sawing Machine
6. Hydraulic Press 100 ton
7. Milling Machine (Universal)
8. Cylinder Honing Machine
9. Radial Drilling Machine
10. Turret Lathe
11. Crankshaft Grinder
12. Surface Grinder

WELDING AND FABRICATION SHOP

1. Gas Welder Set
2. Hand Lever Shear
3. High Speed Abrasive Cut-Off
4. Soldering Iron Set
5. Electric Drier
6. Body Frame Repair System

२५.

7. Body and Fender Tool Set
8. Door Handle Tool Set

PAINTING AND CLEANING BAY

1. Hot Water High Pressure Washer
2. Steam Cleaner
3. Spray Gun, Suction Type
4. Suction Type Container, 1000 cc
5. Airless Spray Unit
6. Infrared Rays Stand
7. Infrared Rays Bulb

COMPRESSOR ROOM

1. Compressor 22 kw with Air Receiver

TOOL ROOM - MEASURING INSTRUMENT

1. Torque Multiplier
2. Torque Wrench
3. Surface Plate
4. Inside Micrometer Caliper Set
5. Outside Micrometer Caliper Set
6. Vernier Caliper
7. Dial Indicator
8. Standard Thickness Gauge
9. Cylinder Gauge (Bore Gauge)
10. Sound Scope
11. Diesel Engine Vacuum Tester
12. Diesel Timing Tachometer
13. Mechanic Tool Set (Metric & Inch Sizes)
14. Other General Tools
15. Special Tools
    1) Hand Operated Pump
    2) Cylinder 100 ton (Sprocket Removing Tool)

R.Y.

MINUTES OF DISCUSSION
ON
THE DRAFT FINAL REPORT OF THE BASIC DESIGN STUDY
FOR
THE PROJECT FOR PROVIDING EQUIPMENT
FOR GHANA HIGHWAY AUTHORITY WORKSHOPS
IN
THE REPUBLIC OF GHANA

In response to the request of the Government of the Republic of Ghana, the Government of Japan decided to conduct a Basic Design Study of the Project for Providing Equipment for Ghana Highway Authority Workshops (hereinafter referred to as "the Project"), and entrusted the Japan International Cooperation Agency (hereinafter referred to as "JICA") to carry out the Study. JICA sent Basic Design Study Team headed by Mr. Ryo Yamana, Manager, Machinery Division, First Maintenance Department, Second Operation Bureau, Honshu-Shikoku Bridge Authority, to Ghana from 16th October, 1991 to 5th November, 1991.

As a result of the Study, JICA prepared a Draft Final Report and dispatched a team headed by Mr. Ryo Yamana to explain and discuss it with GHA officials from 22nd January, 1992 to 29th January, 1992.

Both parties had a series of discussions on the report and agreed to recommend to their respective Governments that the major points of understanding reached between them on 29th January, 1992 attached herewith should be examined towards the realization of the Project.

Accra, 29th January, 1992.

Ryo Yamana
Leader,
Basic Design Study Team
Japan International
Cooperation Agency

Herbert O. A. Quaynor
Chief Executive,
Ghana Highway Authority

Witness:

George Cann
Director,
International Economic
Relation Division,
Ministry of Finance and
Economic Planning

DIRECTOR
INTERNATIONAL ECONOMIC
RELATIONS DIVISSION

ATTACHMENT

1. The Government of Ghana agreed in principle to the basic design proposed in the Draft Final Report.

2. The Government of Ghana assured that the following necessary activities for the execution of the Project will be undertaken:

   - Removal of the existing equipment which will be replaced by the Project
   - Repair of the roof of buildings to avoid leakages when it rains and
   - Expansion of the fuel injection pump test room in Kumasi workshop.

3. The Final Report (10 copies in English) will be submitted to the Government of Ghana in March, 1992.

R.Y.

APPENDIX 6 Country Data

1.	Official Name of Country	Republic of Ghana
2.	Capital City	Accra
3.	Independence	1957
4.	Official Language	English
5.	Currency	
	Currency	Cedi (¢)
	Exchange Rate	385 Cedi/Dollar (1992)
6.	Area and Population	
	Area	238,533 sq.km
	Population	12,296,000 (1984)
	Density of Population	52 persons per sq.km
	Growth rate of population	2.6 % (1970 - 1984)
7.	Gross National Product	
	GNP (1989)	1,417,214 (¢ Million)
	Per Capita National Income	100,512 (¢ Million)
	% change over previous year	+ 3.5 %
8.	Percentage Distribution of Economic Activity (At 1989 Price)	
	Agriculture	49.0 %
	Industry	16.6 %
	Transportation, Storage, Government Service	34.4 %
9.	Public Finance (1990 Preliminary Actual)	
	Revenue	267,347 (¢ Million)
	Expenditure	254,730 (¢ Million)
	Total budget deficit	12,617 (¢ Million)
10.	External Trade (1989 Provisional)	
	Import	346,983 (¢ Million)
	Export	275,290 (¢ Million)
	Balance of Trade	-71,693 (¢ Million)

Source : 'Quaetery Digest of Statistics' March, 1991. Statistics Services, Accra, Ghana