

No. 127

INFRASTRUCTURAL SURVEY REPORT
FOR THE DEVELOPMENT OF
THE WOLOGIS IRON MINING
IN THE REPUBLIC OF LIBERIA

PHASE II

MARCH 1979

JAPAN INTERNATIONAL COOPERATION AGENCY

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JICA LIBRARY



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JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

The Government of Japan decided to execute a series of surveys for the development of infrastructures related to the Wologisi Mine in the Republic of Liberia, and entrusted the Japan International Cooperation Agency (JICA) to act as executing agency for the surveys.

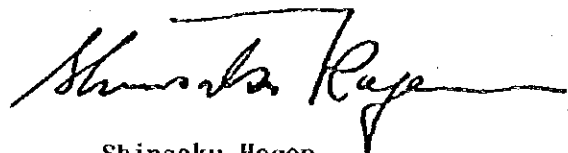
JICA organized a survey team of five experts headed by Mr. Seiji Hatano of Nippon Koei Co., Ltd., and sent them to Liberia for the period from Nov. 5 to Dec. 24, 1978 to carry out the field surveys. The results of the field surveys were further studied after the return of the survey team, and the report has been compiled and submitted herein.

The surveys and studies were carried out for establishing a new port facilities to export the iron ore of the Wologisi Mine. Appropriate plans for such port development have been formulated and studied technically and economically.

It would be our profound pleasure if the survey results could facilitate the development of the Wologisi Mine and contribute to the socio-economic development of Liberia, as well as to further promote the friendship between the Republic of Liberia and Japan.

I should like to take this opportunity to express our deepest gratitude to the personnel concerned in the Government of the Republic of Liberia who extended kind cooperation to the field survey team, and to the personnel concerned in the Embassy of Japan in Liberia, Ministry of Foreign Affairs, Ministry of International Trade and Industry of the Japanese Government, and all other authorities concerned in the surveys.

March 1979



Shinsaku Hogen
President

JAPAN INTERNATIONAL COOPERATION AGENCY

WOLOGISI IRON MINING PROJECT

PHASE II : PORT DEVELOPMENT STUDY

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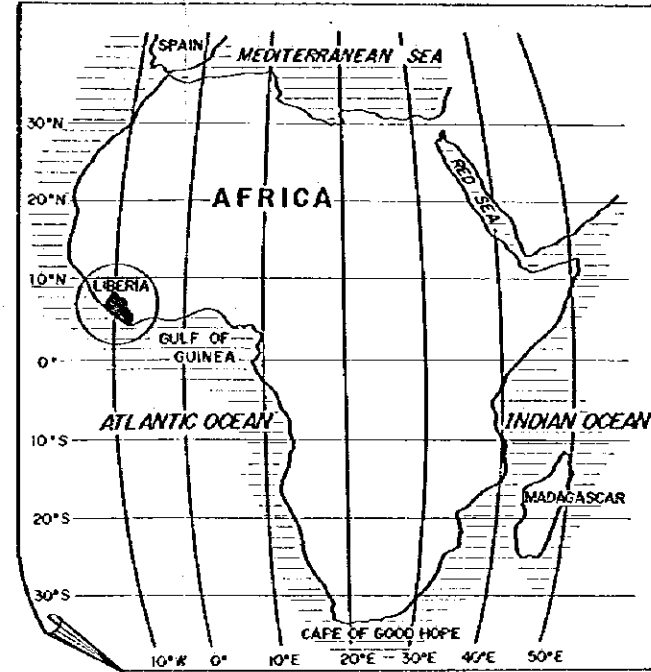
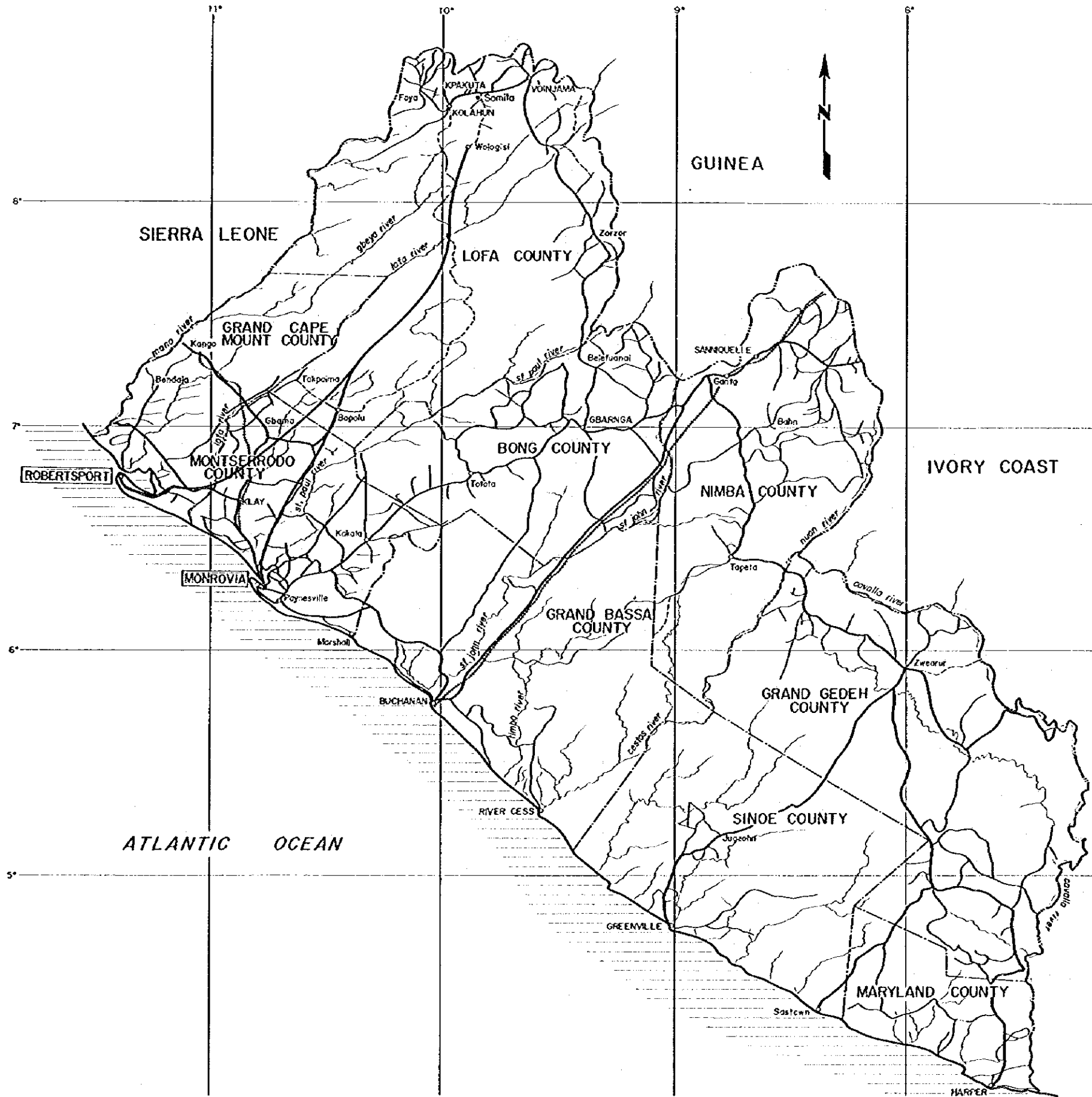
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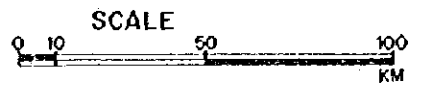
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Fig. 01 LOCATION. MAP



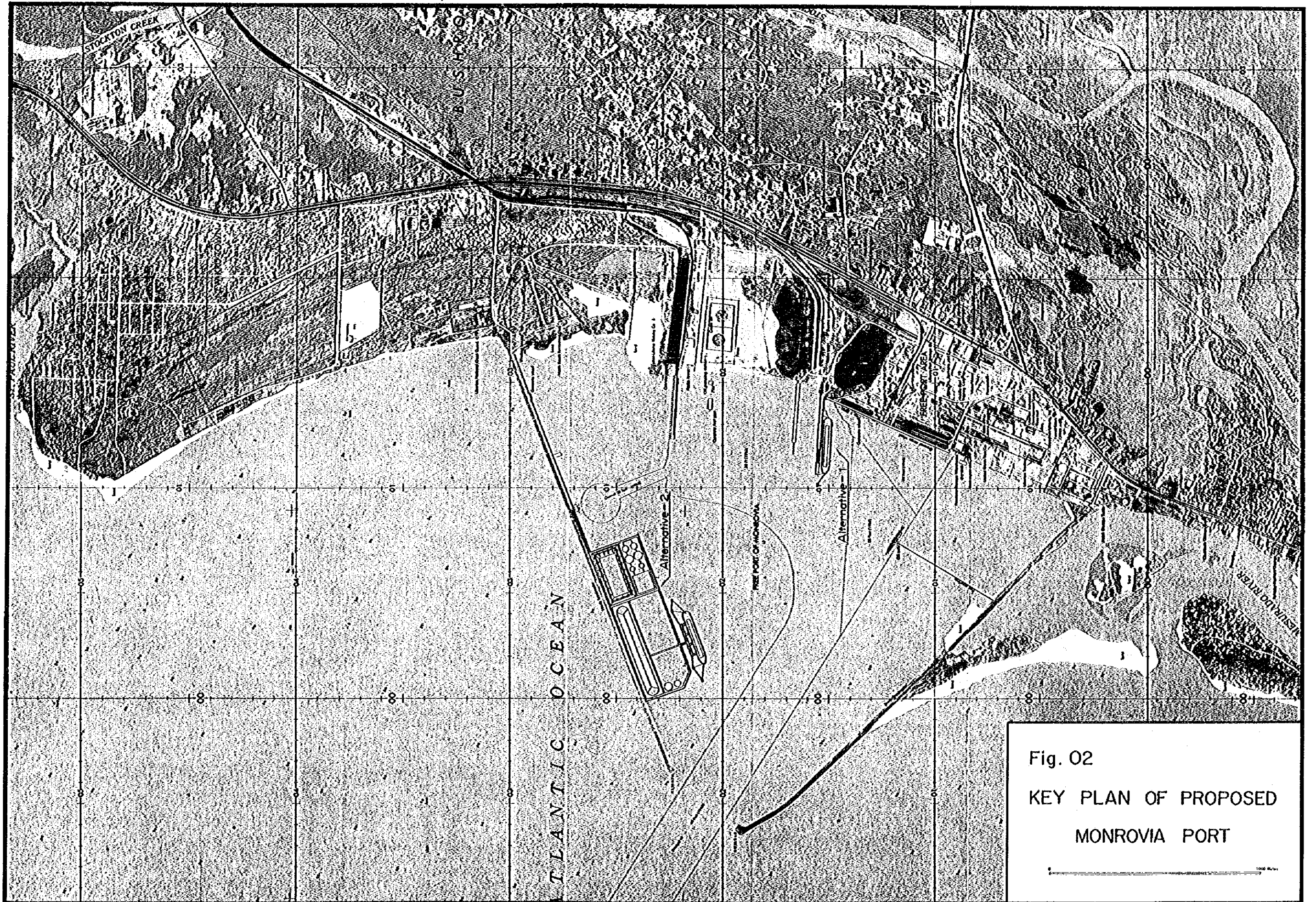
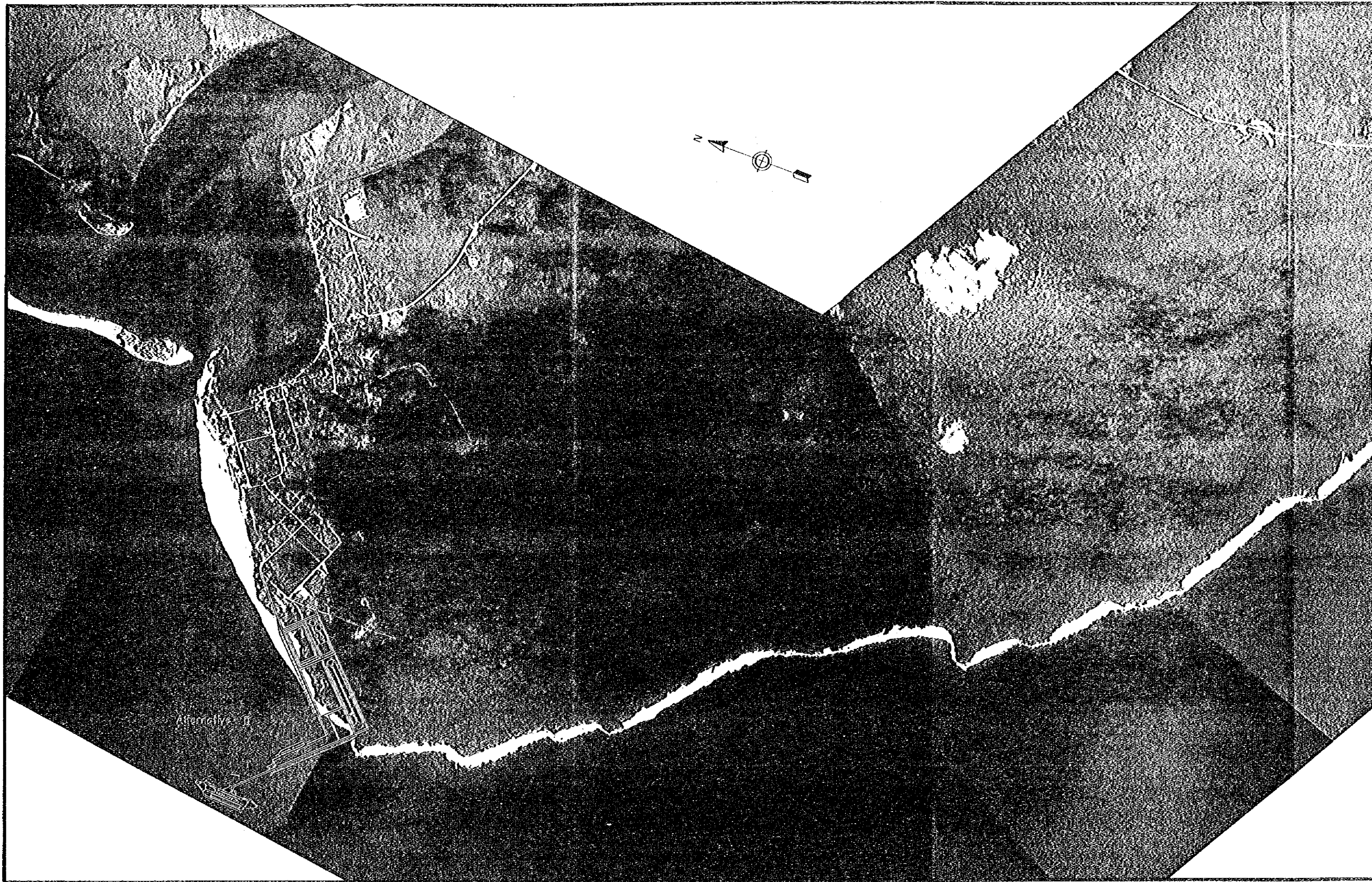
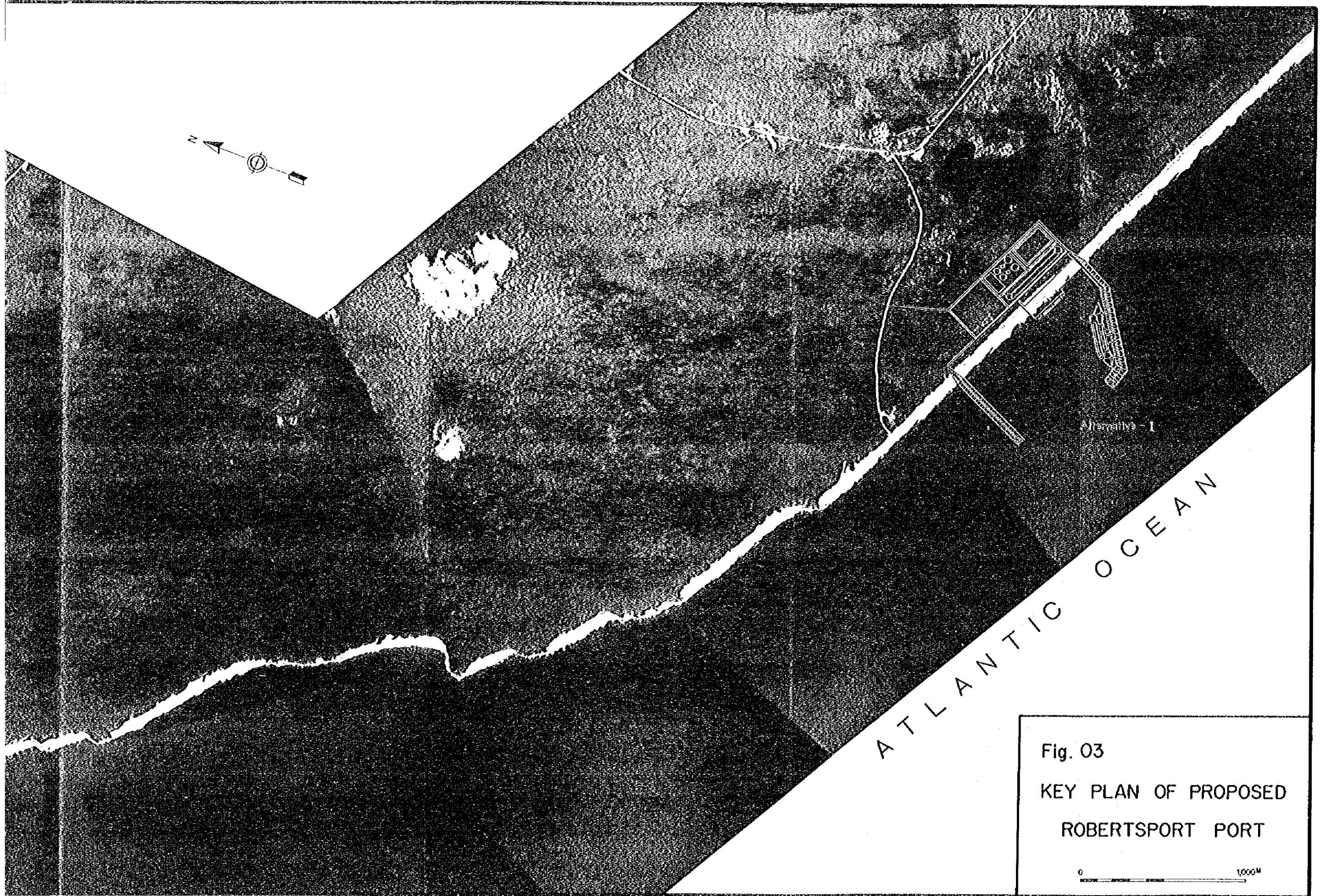


Fig. 02
KEY PLAN OF PROPOSED
MONROVIA PORT





SUMMARY AND RECOMMENDATION

SUMMARY AND RECOMMENDATION

1. As an associated component of the feasibility study for the Wologisi Iron Ore Development Project, this Phase II study covers preliminary study on port improvement. The major objectives of the study include the selection of a suitable port site and the comparative analysis of alternative plans of berths to handle the export of iron ore of 7 million tons per year at the ultimate stage and the import of related general commodities and fuel oil.

2. An iron ore export berth would be required to accommodate 120,000 DWT ore carriers and a general cargo berth for 20,000 DWT cargo vessels would also be required. Associated with the berth facilities, a stockyard complex of at least 20 ha is needed.

3. For detailed investigation and planning, two sites are selected: Monrovia site and Robertsport site. Of the existing four sea ports (Monrovia, Buchanan, Greenville, Harper), only the Monrovia Port is located within a reasonable distance from the Wologisi Mine. Robertsport site which is located about 30 km west of Monrovia, has no cargo port facilities at present but has good potential for future port development and hinterland development as well. (Refer to Fig. 01).

4. In the Monrovia site, the following two alternatives for iron ore berth were planned paying due consideration to avoidance of blocking the future port expansion program envisioned by the National Port Authority. (Fig. 02)

Monrovia/Alternative-I:

Taking-over and extension (120 m) of the existing Liberian Mining Company's pier (L.M.C. pier), which has terminated its operation since 1977, including dredging works (7.7 million m³) for upgrading of the existing turning basin and approach channel.

Monrovia/Alternative-II:

New berth construction just inside of the existing northern breakwater, including dredging (8.3 million m³), land reclamation (15 ha), revetment (1,250 m) and access road.

For the Monrovia Alternatives, no special plan of general cargo berth was prepared since it was judged the existing port facilities could handle the import of fuel oil and general commodities required for the Worogisi Project.

5. In the Robertsport site, constructions of an iron ore berth and a general cargo berth were planned in the following two alternative locations: (Fig. 03)

Robertsport/Alternative-I:

At the south coast of the Cape Mount, new port construction including works of an ore berth, a cargo berth, breakwater (1,400 m), dredging (17.8 x 10⁶ m³), etc.

Robertsport/Alternative-II:

At the west coast of the Cape Mount, new port construction including works of an ore berth, a cargo berth, land fill and cut, revetment, etc.

In the Robertsport Alternatives, the planned ore berth can accommodate ore carrier of up to 250,000 DWT and the cargo berth for 20,000 DWT can handle 200,000 to 300,000 ton/year, while the cargo requirement of the Wologisi Project is estimated at 100,000 ton/year.

6. Preliminary estimation of construction costs of berths and related works, excluding mechanical component, were made for each alternative and showed the Monrovia/Alternative-I was the least expensive, as follows:

Unit: Million US\$	
Alternatives	Construction Cost
Monrovia/Alt.- I	24.4
Monrovia/Alt.-II	42.0
Robertsport/Alt.- I	40.6
Robertsport/Alt.-II	30.3

7. Annual port costs, composed of ammortization cost and maintenance and repair costs, were calculated under the condition of 10 years of ammortization period and 10% of interest rate, as follows:

Unit: Million US\$	
Alternatives	Annual Port Cost
Monrovia/Alt.- I	3.25
Monrovia/Alt.-II	5.65
Robertsport/Alt.- I	6.15
Robertsport/Alt.-II.	4.29

8. Based on the above annual port costs, unit port charges were estimated dividing the annual port costs by annual throughput of iron ore of 7 million tons (ultimate stage), as follows:

Unit: US\$/ton	
Alternatives	Unit Port Charge
Monrovia/Alt.- I	0.46
Monrovia/Alt.-II	0.81
Robertsport/Alt.- I	0.88
Robertsport/Alt.-II	0.61

9. From a financial viewpoint, Monrovia/Alternative-I, i.e., taking over of L.M.C. pier, is the most realistic plan for the immediate solution. On the other hand, from a long range viewpoint taking regional development impacts into account, port development in Robertsport is worthy of considering for further studies with more comprehensive approaches, since the hinterland, including the Mano river basin area, of Robertsport has significant potentials for the future development. The proposed general cargo berth for 20,000 DWT class vessel, which will provide surplus capacity of about 150,000 ton/year besides the Worogisi related commodities, will be useful to the forestry and agricultural products in the hinterland. The other advantage of the Robertsport plan include the future possibility to accommodate larger ore carriers of up to 200,000 to 250,000 DWT class without excessive additional investment.

10. As a conclusion in this study, it is recommendable to further substantial discussions among people concerned on the implementation of the Monrovia/Alternative-I. At the same-time, it is also recommendable that the Government of Liberia will consider to proceed with a comprehensive study of the port and hinterland development of the Robertsport area.

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GLOSSARY & CONVERSION

GLOSSARY

B.M.C	:	Bong Mining Company
DELINCO	:	Deutschland-Liberia Mining Company
JICA	:	Japan International Cooperation Agency
IAMCO	:	Liberia, America, Sweden, Mining Company Joint Venture
LISCO	:	Liberia Iron and Steel Corporation
L.M.C.	:	Liberian Mining Company
N.I.O.C.	:	National Iron Ore Company
N.P.A.	:	National Port Authority
MIWN	:	Mean High Water Neaps
MHWS	:	Mean High Water Springs
MLW	:	Mean Low Water Level
MLWN	:	Mean Low Water Neaps
MLWS	:	Mean Low Water Springs
D.W.T.	:	Dead Weight Tonnage
MPH	:	Mile per Hour
TPH	:	Tons per Hour
TPY	:	Tons per Year

CONVERSION

1 km	=	0.62 mile	1 mile	=	1.6 km
1 m	=	3.28 feet	1 feet	=	0.3 m
1 km/hr	=	0.6 mile/hr	1 mph	=	1.6 km/hr
1 knot	=	0.5 m/sec	1 ha	=	10,000 m ²

CHAPTER I

INTRODUCTION

CHAPTER 1
INTRODUCTION

1.1 BACKGROUND

The republic of Liberia, with its population of about 1.6 million on the land of 112,000 square kilometers, has been developed under its own national guideline of self-reliance since the independence in 1847. The social and economic development, however, had been rather in retard until about a decade ago. To accelerate the development of the country, especially the development of economic and social infrastructures, the Government of Liberia took up in recent years policies to introduce foreign economic and technical aides on bilateral and multilateral basis.

One of the abundant natural resources of the country is mineral resources, especially iron ore. The mining sector accounted for one-third of GDP and made up for 74 percent of export value in 1975. The iron ore production by four major mining companies reached 25.3 million tons per year in 1974, though the production has been slightly decreased thereafter due to the closure of the Bomi mine of Liberian Mining Co. (LMC). Numbers of iron ore deposits remain undeveloped, including the Wologisi mine, Bie mine and Putu mine.

The Wologisi mine, located in the northwestern part of Liberia, has long been investigated by a Liberia-Japan joint enterprise, Liberia Iron and Steel Corporation (LISCO).

The mine is reported to have a deposit of more than 700 million tons of magnetite. The investment group contemplates to develop and export iron concentrate of 4 million tons per year at the first stage and 7 million tons per year at the ultimate stage.

For the development of the Wologisi mine, it is required to construct various facilities, including access road to the mine and ore transportation systems. In response to the request made by the Government of Liberia, the Japanese Government has decided to cooperate in the studies on such transportation facilities required for the Wologisi mine development, in view of the fact that the development of such facilities will not only facilitate the mine development but contribute to the social infrastructure development of the region as a whole.

The studies have been entrusted to the Japan International Corporation Agency (JICA), which has been acting as the executing agency of the Japanese Government for its technical cooperation programs. The JICA decided to carry out the studies stage-wise as follows:

1st phase : Study on an access to the Wologisi mine

2nd phase : Preliminary study on port improvement

3rd phase : Study on new road construction from the Wologisi mine to the ore loading port, along the pipeline to be constructed for ore transport

This report summarizes the results of the 2nd phase study on the port selection and improvement for the handling of iron ore.

1.2 OBJECTIVES OF STUDY

The objective of the 2nd phase study is to investigate the existing natural and physical conditions of the selected port sites, to make preliminary plans and to estimate associated costs to be incorporated into overall feasibility study of Wologisi project inclusive of mining and inland transportation system.

The field survey, which included marine investigation (hydrographical survey, tidal measurement and beach profile) in Robertsport and site reconnaissance in Monrovia port, was conducted by the JICA team from November 10, to December 20, 1978. The survey team was composed of the experts as follows:

Team Leader	:	Y. Hatano
Port Engineer	:	K. Ohkubo
Port Engineer	:	Y. Andoh
Marine Surveyor	:	T. Kaminoda
Marine Surveyor	:	S. Aramaki

CHAPTER II

ECONOMIC BACKGROUND

CHAPTER II
ECONOMIC BACKGROUND

2.1 GENERAL

To accelerate the foreign trade and the introduction of foreign capital, the Republic of Liberia has employed the Open Door Policy since her independence in 1847. Consequently, the foreign investment in the exploitation of iron ore and lumber, and in the operation of rubber plantation have been steadily growing, contributing to the national economy of the Republic of Liberia.

In terms of real GDP, production of iron ore accounts for over 30%, rubber and lumber about 10%, totaling nearly 40%. Financially, tax revenue from these sectors constitutes about 24% of domestic income.

The development of Wologisi Project not only deals with exploitation of iron ore, but also involves development of major infrastructure such as road and harbour. With the infrastructure being improved or constructed, the economic activities of agricultural field is expected to be greatly promoted further. This chapter briefly describes the recent achievements and future prospects of major sectors; iron ore, lumber and rubber.

2.2 IRON ORE EXPLOITATION

At present, four companies are engaged in exploitation of iron ore, namely Liberian Mining Company (L.M.C.), National Iron Ore Company (N.I.O.C.), Deutschland-Liberia Mining Company (DELIMCO) and Liberia, America, Sweden Mining Company Joint Venture (LAMCO). (Refer to Fig. 2.1) Annual throughput of iron ore over the past five years on each mine was in the order as shown below.

Table 2.1 Annual Throughput of Iron Ore

Mining Company	Mine Site	Annual Throughput
L.M.C.	Bomi Hills (Montserads)	1.0 - 3.0 MLT
N.I.O.C.	Mano River (Ground Cape Mount)	3.0 - 5.0 MLT
DELIMCO	Bong (Bong)	5.0 - 6.0 MLT
LAMCO	Nimba (Nimba)	5.0 - 12.0 MLT

Total annual throughput in 1970 and in 1975 are US\$21.1 million and US\$18.2 million, respectively. The future prospect of iron ore production is roughly projected in NEDECO Report, 1975. According to this report, in the next 5 years total output from three mines exclusive of L.M.C. which stopped operation in 1977, is expected in the order of 30 million tons/year. If the Wologisi project is completed within 5 years, total throughput will be 37 million tons per year and the share of Wologisi Mine will be around 20%. Besides the Wologisi mine, the Bie mountain near the Bomi Hills is expected to produce around 5 to 10 million tons/year in the near future. The production of Simando mine may also be envisaged in the order of 10 to 15 million tons/year. Accordingly, it can be said that the future prospect of iron ore export in Liberia is considerably promising.