

UNESCO - IOC
Consulting - Mission
for Program GLOSS

WEST - AFRICA

REPORT

BOR Scharringhausen
Wasser- und Schiffahrtsdirektion Nord
Waterway Authority
Ministry of Traffic

Hindenburgufer 247
2300 Kiel 1
-West Germany-

Consulting - Mission
for Program GLOSS

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(Ministry of Traffic)
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Timetable for Preparatory Mission of Mr. Scharringhausen

Country	Dates	Contact Points/Address
	29.11.88	
Senegal (Dakar)	29.12. 02.12.	Mr. Diafara Toure Co-ordinateur du Programme Environnement Centre de Recherches Oceanographiques de Dakar Thiaroye (CRODT) DAKAR B.P. 224 Tel.: 340534
Nigeria (Lagos)	02.12. 07.12.	Dr. A.C. Ibe Nigerian Institute for Oceanography and Marine Research (NIOMR) PMB 12729, Victoria Island LAGOS Tel.: 6195 17 Tlg.OCEANOGRAF
Ghana (Accra)	07.12. 10.12.	E.A. QUAYE Survey Department P.O. 191, Cantons Accra Tel.: 777731 Tlg.SURVEY DEPT.ACRA
Sierra Leone (Freetown)	10.12. 14.12.	DR.Ivan W.O.Findlay Institute of Marine Biology & Oceanography Furah Bay College, University of Sierra Leone FREETOWN Tlx. 3210 BOOTH SL Tel.: 50775
Mauritania (Nouadhibou)	14.12. 17.12.	Mr. MOCTAR BA Centre National des Recherches Oceanographiques et des Peches B.P. 22 Nouadhibou Tel.: 45124 Tlx. 415 CNROP

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1.

G E N E R A L

1.1

Mission

During my 3-week trip to West-Afrika

I managed it to visit all institution indicated in my travel schedule and I met everywhere a responsible person. The whole mission was better than expected.

One reason für this was, that in nearly all countries Unesco or UNDP was involved und very helpful (concerning: meeting at airport or making reservation at hotels).

Their offices are well organised for meeting visitors.

It is therefore better to involve always UNDP or Unesco when traveling.

Especially I have to thank Mr. Camara from Unesco Dakar für his help. (Dakar was my first stop; there I had to get Visa for Nigeria and kontakt Nouadhibou and Lagos).

Some important facts were:

- For all flights you have to make reconfirmations (once or several times) at the local airline agencies.
- Telephon-connection between the countries are often bad.
- concerning arrival and departure you have to count several hours for check in/out with all formalities and hoteltransfers.
So mostly every flight is a one-day-trip.
- For transport on land UNDP or Unesco was very helpful.

1.2 Institutes/Offices and Gauges

All institutes/offices are mainly engaged in biological science.

To handle gauges maintenance and observation is not their field of interest. They are only interested in tide-data.

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Only in Ghana gauges are fully integrated in survey departm. (building; maintenance and data management)

Therefore, for permanent observations and maintenance other responsible personnel/offices must be found. These can be e.g. Port Authorities.

Only good connections between all the offices guarantee that a gauge will run without problems for years.

Everybody was interested to install gauges. The interest was corresponding to the given information/plans and the activities in their own countries.

1.3 Some Important Facts for

Gauge + Construction and Installation

- Detailed plans of construction works and exakt data of e.g. quay, mole, waterdepth were often not obtainable and have to be received.
- There is no money for expensive construction-works in the budgets of the countries.
In some countries there is no money at all. IOC may have to assist.
So construction-work must be as simple as possible.
- The diameter of the stilling well (tube)must be as small as possible. So the smallest float must be chosen.
I therefore recommand to install a gauge on a vertically wall such as quay or mole.
- A safe place well protected against robbery and destruction is important.

1.4 Environment

- max. tiderange is between 1,5 to 3,0 m
but exact data not existing.
- Wind and Storm is no big problem.
Duration of storms are short and not as high inspeed^{as} in Europe. (e.g. 2 h - thunder storm about 8 beauf ; so no big fetch and no long duration)

...

it seems that waves are not the big problem but there are no data.

- About Salinity changing in river mouth there exist no exact data.
- Growing of fauna is more important than in Europe.
- Watertemperature is between 15° and 30° C.
- There is more corrosion than in Europe.
- West-Afrika has a problem with coastal erosion, especially Nigeria and Ghana.

1.5 Existing Gauges

- one in Lagos, without staff
- one in Takorati (Ghana) with a vertikal standing drum
- one in Dakar used for international Program TOGA
Type: (swedish) Aanderaa with pressure adsorption and digital data-recorder

1.6 Leveling Network / Bench marks

All proposed site for gauges are involved in a leveling network, but I think, this should be checked.

note:

a lot of photos are lost with my bag in Nouakchott by UTA-French Airlines. It seems, that the bag has gone with the plane to Paris and there someone has take it as "present".

...

2.

M A U R I T A N I A

2.1 Responsible Institute and Personnel

Centre National des Recherches

Oceanographiques et des Peches (CNROP)

Nouadhibou

BP. 22 Tel.: 45124 Tlx: 415 CNROP

Mr. Moctar BA

Diop Mika (Vice-director / biologist)

Juri Loktionov (Oceanographer from UdSSR, for two years)

Mr. Moctar was out of country

responsible person was Mrs. Mika and Mr. Loktionov

2.2 Results of Conversation and Inspection

(ref. to letter IOC 5/6/TGP/15 fls and protocol of my visit to CNROP- see annexed copies)

Mauritania suggested two sites for gauges

1. Nouakchott (port)

2. Nouadhibou (port)

The site of Nouadhibou was visited (photos were not allowed)

Both suggested points are in a port on a quay. So construction work is easy: for the stilling well they have to fix a tube at the wall, and for shelter they suggested a little hut, built in bricks or something else.

2.3 Environmental Important Facts

- tiderange about 2 m
- in wintertime sandstorms
- in Nouakchott there are waves from the open sea (swell)

...

2.4 Condition for Installing Gauges

- construction and manpower should be paid by IOC
 - constructions-plans have to be made by IOC-consulting
 - a plan (quay-etc), section plans with data of tide range, mean water-level data etc. will be sent by CNROP
 - estimate of cost of construction work and manpower will be done by CNROP and sent to IOC
 - persons/institutes, who will do maintenance, observation etc will be determined by CNROP
 - Tide data handling will be done by CNROP; for digitising etc. they need software.

2.5 Other Points of Interest for CNROP

CNROP wants to get data for: temperature
salinity
oxygen

they ask, if IOC or Unesco can give them instruments.
(May be e.g. Aanderaa datalogger)
(So it is hard- and software)
(see annexed letter and protocol).

3.

S E N E G A L

3.1 Responsible Institutes and Personnel

- Centre de Recherches Oceanographques
de Dakar Thioroye (CRODT)
B.P. 224 Tel.: 34 05 34
Dakar

Mr. Diafara Toure
Coordinateur du Programme Environment

Claude Roy (Oceanographie)
CRODT
Dakar Institut Francais
de Recherche Scientifique
por de Developinenten
Cooperation

- Port Autonome de Dakar (PAD)
(Port Anthority)
Mr. F. Dione Cief-direktor of Exploration
Mr. E. Sarr Portmaster

Mr. Toure from CRODT was at Paris.
So responsible person for my IOC-mission was Mr. Roy
and
for the Port Anthority Mr. Sarr.

3.2 Results of Conversation and Inspection:

The main-field of CRODT oktivities is biology.
Construction works, maintenance, observations of
tidegauges are not possible, only handling and computing
data of the tides (digitising traces etc).
Therefore an appointment with the port-authority was
made.

...

Persons of the meeting were:

Mr. Dione; Mr. Sarr; a respons. person of the pilots;
Mr. Roy; Mr. Scharringhausen

results: - The port authority is interested in a tide gauge; they will do the Construction-work and maintenance

- pilot will do observation and control (change chartpaper etc.)
- CRODT will compute the trace of chart-paper etc.
- IOC-consultant will send constructionplans

IOC has to find out the responsible person/office for the tide gauge.

Place of tide-gauge is inside of the entrance of port at a mole (see maps).

3.3 Environmental Important Facts

- Tide range about 2 m
- water temperature from 15° C (Febr) to 30° C (Aug.)
- growing of fauna is more than in Europe
- rain in summer; wind with dust from the desert in winter
- the mole protect against waves

3.4 Other Important Information

- CRODT is well equipped with computing systems (IBM)
- CRODT is involved in TOGA (Intern.Tropical Ocean Global Atmosphare Program)

For this purpose a tide gauge is installed at Madeleines Island (Dakar) (see map) by pressure-absorbing (type: Aanderaa datalogger) since 1983.

...

4.

SIERRA LEONE

4.1 Responsible Institutes and Personnel

- Institutes of Marine Biology and Oceanography

Furah Bay College, University of SL Freetown

Tel.: 50775 Tlx: 3210 BOOTH SL

Dr. Ivan W.O. Findlay

Dr. Johnson (Oceanograph) (Dr. J. studied in UdSSR)

Mr. Mustafa (Mr. M. trained at Bridston and Helgoland)

- Port Authority

Mr. Kamokei (habour-master)

4.2 Results of Conversation and Inspection

(Reference to letter to IOC from Dr. Findlay of
14th June 1988)

The suggested site for the gauge is at the seaside at a lighthouse (see plan and pictures - annexed).

At this site a heavy construktion must be built cause there is no protection against waves, only the offshore reef will smooth the big waves (wave breaking).

At Freetown we have the greatest tide range of about 2 m; maximum tide range is about 3 m.

Observation will be done by the Port-Authority (Lighthouse personnel)

An appointment at the lighthouse was made, but Port Authority (Mr. Kamokei) did'nt come. He had another offical important date.

So it has to be cleared, who will do the construktion work and the maintenance later.

Money for all the construction work and for manpower should come from IOC.

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4.3 Other Sites for Gauges

Some other sites for gauges, where more simple construction could be chosen because there is more protection against waves, is at the Aqua-Club and at the fisheries port. But there are no data about changing salinity during tides and seasons. Fisheries is very near to the Institut.

4.4 Data Handling

Till now they are not able to compute some data (see letter from 14.7.88 - annexed).

Some other Institutes of University have computing systems (PC's)

4.5 Old Tide-Gauge

Until few years ago they had run a tide gauge by pressure adsorbing with a round chart paper type: FOX BORO (Italy)

Diaphragen Box II DR

This instrument is out of order and cannot be repaired.

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5.

G H A N A

5.1 Responsible Institute and Personnel

Surrey Department

Accra

P.O. 191 Cantoments

Tel.: 777731

Telg. Survey Dep. Accra

Mr. E.A. Quaye

Mr. Odamety

Headman of S.D.

1. Mr. Iddirisu Abu

2. Mr. Brimah (vice-direct.)

5.2 Result of Conversation and Inspection

The Surrey Dep. will install a whole network of gauges at the seaside (see map - annexed), i.c. from west to east at:

Half Assini; Esiamo; Prince's Town; Takoradi; Elmina; Cap Coast; Tegu; Senya; Beraku; Tema; Ada.

One gauge with instrument (drum + float) is still running at Takoradi (port); it is an 60 year old English instrument (chart paper, see annex.)

Visiting Sites were:

Takoradi, Elima, Cap Coast, Tema

Takoradi (port)

For GLOSS S.D. want to replace the old instrument by a new one from IOC. The gauge is a construction with shelter (hut) and stilling well (tube) (see annexed section-plan).

At present all data (chart papers) are send to England:
Prondman Oceanographie

Laboratory

Bridstone

Liverpool

Mr. Odamety has had some training at this institute.

Elmina (port access)

Elmina is an small fishery port. Here they intend to build a tide gauge of a simular shape like Takoradi one (see annexed plan and photos).

The port is lying in a lagoon, so it is possible that during rainy season the salinity is mixed up and changing with the tide. There are no information and data. Also for this chosen site are no data about the waterdepth during low-tide, because inlet should be 1 m over ground and about 2 m under watersurface. (May be a little less, cause there are no waves)

Cap Coast

This gauge shall be built directly at the seaside on the rock in front of an old castle.

Here strong construction works are nessessary depending on the waves.

For a gauge at this place there is now no money in the budget.

Tema (port)

This is an old gauge with shelter, the same as Takoradi. The instrument is out of order; only the staff is still there.

For a new instrument they only had to change the tube (stilling well) with the inlet. This work is easy and not expensive and could be done without delay.

So for Ghana 3 gauges could be installed easily and it seems that construction work, maintenance observation can be well organised.

If more instruments are avaialble they will install more gauges.

Digitising and computing data and traces is still now not possible.

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6.

N I G E R I A

6.1 Responsible Institutes and Personnel

- Nigerian Institute for Oceanography
and Marine Research (NIOMR)

Lagos

PMB 12729 Victoria Island

Tel.: **61 95 17** Tlg.: Oceanograf

Dr. A.C. Ibe

- Nigerian Navy

Hydrogr. Dept. P.O.Box 2452

5 Point Road Festac P.O.

Apapa Lagos Lagos

Tel.: 87 57 15

87 63 25

Capt. Joe O. Abulu

(Hydrographer, Oceanographer)

- Nigerian Port Authority (N.P.A.)

N.P.A. Headquarter

26/28 Marina Lagos

Tel.: 63 62 30 / 60 06 20/2172

Idongesit M. Udoffa

Asst.-Direktor (Hydrographer)

6.2 Result of Conversation and Inspection

In Lagos institutes/offices which are interested in tidal data work close together; they have constituted a group for tide gauges.

...

These are:

- Institute for Oceanography
- Navy (Hydrogr. Dept.)
- Port Authority

In computing and digitising
tidal data NIOMR is working
with the University

"Headman" of this group is Dr. Ibe

This group suggested 3 points for installing tide-
gauges (see letter from 7.7.88 NIOMR - and map - annexed).

These are:

Lagos (port access)	see
Oua Ibo River (mouth)	annexed
Brass River (mouth)	map

The site of Lagos gauge was visited.

Dr. Ibe was 1 month abroad and arrived at the same day as I. So he could not manage it to collect all information, plans etc. He will send those documents shortly.

At Ibo R and Brass R. the gauges should be installed on solid platforms of Oil-Companies.

- Nigeria will do the construction work and maintenance for the gauges
- the IOC - consultant will send constructionplans.

Lagos Platform

This platform (about 2 x 9 m in size) is situated in the access area to the port at the big mole. It is a landing platform for small vessels, built in concrete on stilts. In one corner beside the access a gauge of the Port Authority is fixed. The stillung well is a tube

...

with about 10 cm in diameter. It was not very well fixed, so you can move it. A staff could not be seen. The shape of the gauge looked like our gauges for small creeks. To look into the inside there are no key available. The whole construction looked untidy.

6.3 Environmental Important Facts

- Tide range - maximum about 2 m,
normal 1 m
- summertime is rainy season
- high humidity
- no wind fetch, only thunder storms of about 2 h
- waves: no exact data
(at Lagos-platform there are no waves depending
on protection of the mole)

7. RESULTS OF MISSION

Ten (10) sites for tidegauges for GLOSS are proposed

- 2 in Mauritania
- 1 in Senegal
- 1 in Sierra Leone
- 3 in Ghana
- 3 in Nigeria

Nigeria, Ghana and Senegal will do the construction works with their own means. Only contruktion plans must be send and the installations of the instruments (type OTT)be done by the IOC consultant.

In Sierra Leone and Mauritania all construction-work has to be paid by outside sources (IOC). Plans must be send by IOC-consultant. He will also installing instruments.

In Mauritania construction work is not expensive, because the gauges are situated on quays.

In Sierra Leona a very solid and strong construction must be built.

To all countries constructionplan must be send. I have to get for this reason from nearly all countries some more data and plans.

8. Points for Clearance

- All instrument must mailed to Unesco adress in the countries and must be declared as gifts.
- size of the instruments
- size of float a counter-wights
- max. length of wire for counter-wights
- footrool for the well (with whistle)
- staff
- size of tube
- manuel to be provide by IOC, a lot must be send to Africa
- data-handling - statistiks, computing
- salinity changes important?
- detailed description of instruments (Ott)
with all dimensions
- chartpaper: who will pay!
- description for obersavation chartpaperhandling statistik

...

9. Cost-Estimate for Gauge-Construction
(without manpower)

Material cost at W.Germany in DM

- Gauges in Mauritania:

Cost with tube and shelter(house)
about 5.000,-- DM

same gauge with small shelter (steelbox)
costs: about 3.000,-- DM

- Gauge Freetown at seaside

a) in steel-construction

cost: about (steel) 6.000,-- to 10.000,-- DM
(concrete) 2.000,-- DM

plus: costs for a swimming-crane

plus: some costs for way construction to the access

b) cost for a construction with rocks and stones:

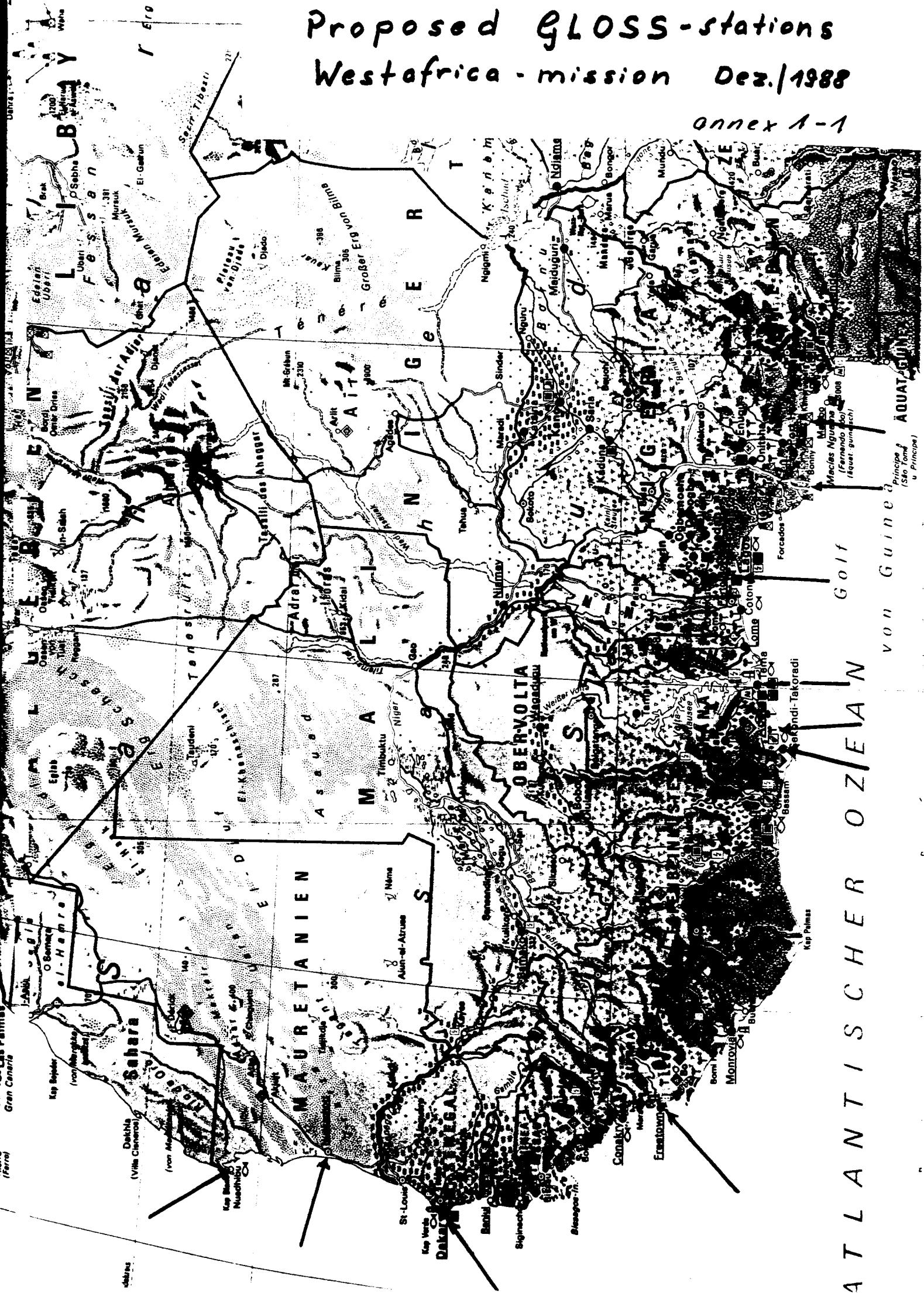
I can't estimate. For this reason I need plans
with the waterdepth, distance from where I get
stones (or rocks) ^{and} costs for concrete in Sierra Leone.

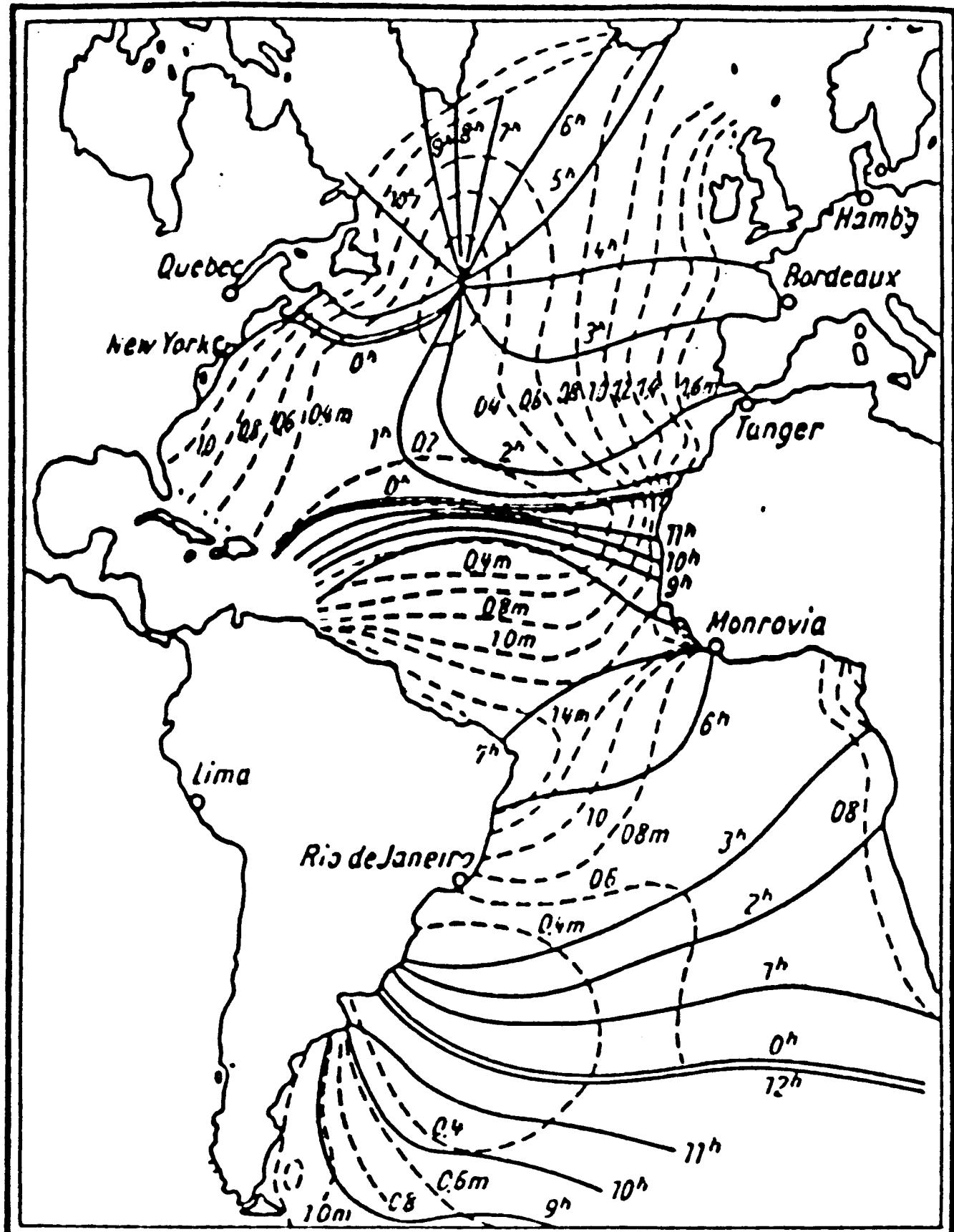
Annex I

General

Proposed GLOSS-stations Westafrica - mission Dez./1988

Annex A-1





Flutstundenlinien und Linien gleichen Tidenhubes
der Hauptmondtide M_2 im Atlantischen Ozean nach Hansen
- - - Line of tiderange

Hafen	Land	Koordinaten	Gezeiten- grundwerte aus ATT2 1988 SpHN NpHW SpNW	Gezeiten- grundwerte aus ATT2 1988 SpHN NpHW SpNW	Seekarte Nr.
Dakar	Senegal	14° 40' N 17° 25' W	1,6 1,3 0,7 0,3	VB ATT2 3535 GW " " K " "	798 1:50 000 (Plan 1:12 500)
Freetown (Aberdeen Point)	Sierra Leone	8° 30' N 13° 14' W	3,0 2,3 1,0 0,4	VB ATT2 3580 GW " " K " "	E34 1:300 000 (984 Plan A 1:100 000)
Tema	Ghana	5° 37' N 0° 00'	1,6 1,3 0,7 0,3	GW ATT2 3627 K " "	635 1:300 000 (637 Plan B 1:10 000)
Lagos Town	Nigeria	6° 28' N 3° 22' W	0,8 0,7 0,3 0,2	VB Nigeria GW ATT2 3636 K " "	634 1:300 000 (636 1:12 500)

VB = Vorausberechnungen

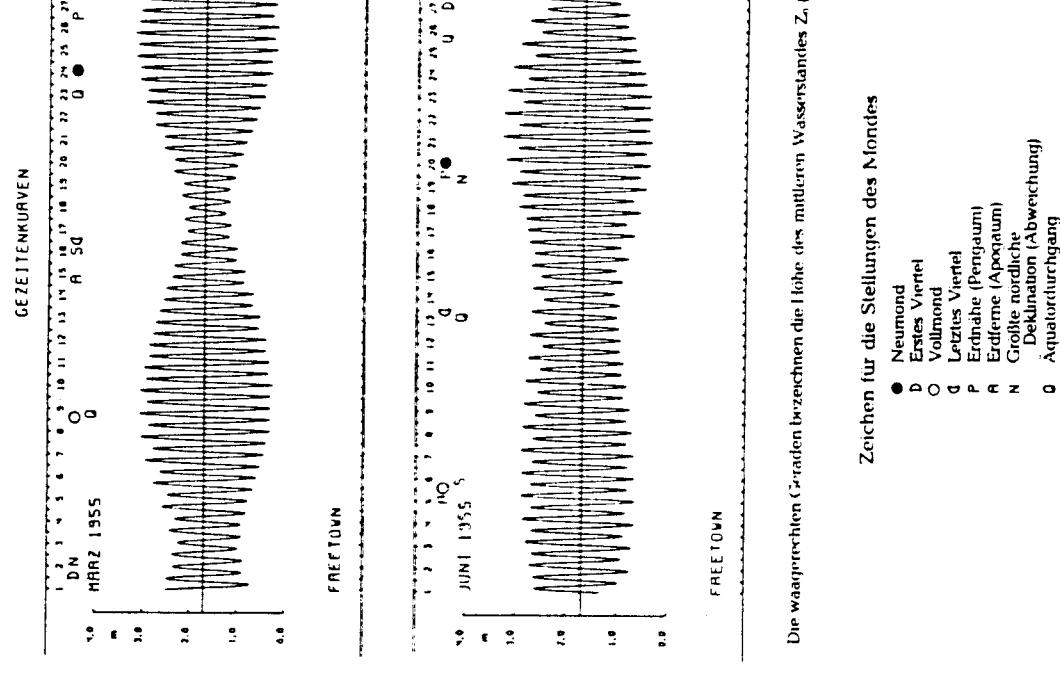
GW = Gezeitengrundwerte

K = Harmonische Konstanten

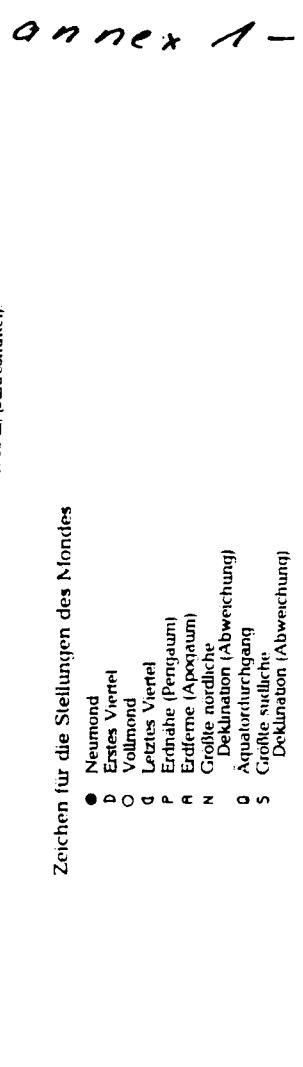
ATT2 = Admiralty Tide Tables Vol. 2

Freetown 1958
Brise A 30 Metre 11 14° W

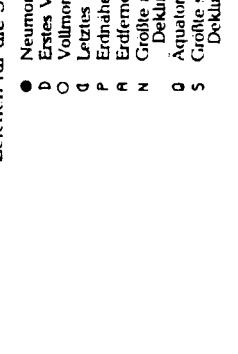
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13	1958 12 13	10 083	10 083	10 083	10 083	10 083	10 083
14	1958 12 14	10 084	10 084	10 084	10 084	10 084	10 084
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1	1958 12 31	10 101	10 101	10 101	10 101	10 101	10 101



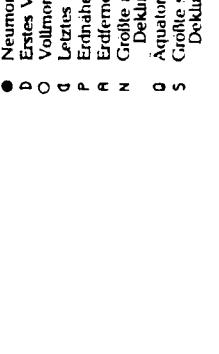
Die waagerechten Graden beschränken die Höhe des mittleren Wasserstandes Z. (Jahresmittel)



Zeichen für die Stellungen des Mondes



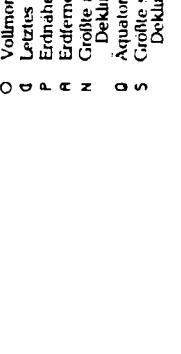
Neumond



D Erstes Viertel



Vollmond



Letztes Viertel



Erdnahe (Perigäum)



Große nordliche Dekination (Abweichung)



N Kleine südliche Dekination (Abweichung)



S Große südliche Dekination (Abweichung)



Größe südliche Dekination (Abweichung)



D Dekination (Abweichung)



O Dekination (Abweichung)



P Dekination (Abweichung)



S Dekination (Abweichung

MANUAL ON SEA LEVEL MEASUREMENT AND INTERPRETATION

3 TIDE GAUGES

3.1 CHOOSING A TIDE GAUGE SITE

Before any attempt is made to choose a site for a tide gauge installation the following information should be considered :-

- 1) The type of tide gauge to be installed. In the case of float operated gauges, the size of the stilling well and support structure necessary.
- 2) The area for which the tidal information is required and the use to which this information is to be put.

Within the limits of the coast dictated by the above requirements, the site will then be chosen. In some instances the choice of site is quite clear, since the requirement is to monitor tidal levels at a specific point, such as a sewage outflow point, or a lock gate. In most instances however, the choice of site will not be so clear and can only be made by judging which of the following constraints are more significant and which can be more or less ignored.

- a) The installation when completed must be capable of withstanding the worst storm conditions likely to be encountered. Therefore, positions known to be subject to storm damage because of their exposure should, if possible, be avoided. If this is not possible, then this situation must be borne in mind when designing the installation. Where large waves or tsunami are possible, raising the level of the building may be necessary to prevent swamping or destruction.
- b) The ground on which the installation is to be built must be stable, not being liable to subsidence because of underground workings, or because it is recently made up land (example: reclaimed by tipping). It must also not be liable to slippage in the event of heavy prolonged rain storms (i.e. must be adequately drained) or being eroded by river or sea action. Building direct on to solid rock is the ideal.
- c) The water depth must extend at least two metres beneath the lowest astronomical tide for successful operation of a stilling well. The outlet of the stilling well should be clear of the sea bed and be set deep enough to allow the float to operate about one metre below Lowest Astronomical Tide (LAT).

d) River estuaries should, if possible, be avoided. Water flowing down the river mixes with sea water resulting in varying water density in the area and because of layering water drawn into the stilling well may be of different density than the surrounding water. Currents due to the river flow can cause draw-down in the stilling well and following heavy rainstorms debris floating down the river can become entangled with the stilling well causing blockage or may even cause impact damage.

e) Areas where impounding (becoming cut-off from the sea) can occur at extreme low levels should be avoided. Similarly, sandbars slightly below the surface between the site and the open sea can result in uncharacteristic levels being measured. Monitoring across long shallow sloping beaches should also be avoided for the same reasons.

f) Sharp headlands and sounds should be avoided since these are places where high currents occur.

g) Proximity to outfalls can result in turbulence, currents, dilution and deposits, and should be avoided.

h) A study should be made of shipping passing or mooring close to the proposed site, since there will be a risk of collision and propeller turbulence causing silt movement.

i) Investigations should be made to determine if there is a possibility of construction work occurring in the area at some future time, which may affect the tidal regime at the site e.g. construction of new quays, breakwaters, locks or large factories having sluices or outfalls.

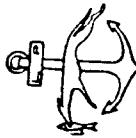
j) Where an appreciable amount of continuous power is required it will be necessary to lay in a mains electrical supply to the site. If this is not possible an alternative supply may be obtained from storage batteries and a generator. If power is required only for recording or telemetry purposes then batteries may suffice.

k) There must be adequate access to the site in the first instance to get materials on site during construction, and later for observation and maintenance visits.

Annex 2

Mauritania

Centre National des Recherches
céanographique et des Pêches



B.P. 22 — 161.45.124

/ CNROP / SRH/AS

Nouadhibou, Mauritania
أولاد بوب في

Il faut remarquer qu'aucune donnée sur les mesures du niveau de la mer n'existe en Mauritanie, et qu'aucun contact préalable n'a été fait avec d'autres centres de données.

Veuillez trouver dans cette note une réponse complète à votre lettre, et croire en mes sincères sentiments.

Ses Directeurs

// -)
Monsieur A. Tolkachev
Secrétaire Technique Supérieur
Unité Services Océan.

Monsieur,

Suite à votre lettre IOC/5/6/TGP/15/fils, je tiens à vous signaler tout d'abord que le CNROP accorde une très grande importance à l'installation du Système Global d'Observation du Niveau de la Mer (GLOSS).

D'autre part, vue l'importance des processus hydrologiques dans la région, y compris la variabilité, dans la région, de l'Upwelling et des courants et l'alternance des masses d'eau à caractéristiques nettement différents; et vue l'importance de telles conditions sur les ressources marines, nous souhaiterions que le matériel nécessaire au GLOSS puisse permettre, au delà des mesures de marées et niveau de mer, d'autres mesures de paramètres essentiels tels que température, salinité et oxygène.

Aussi souhaiterions nous que la mise en place de l'installation réceptrice(Steelring well and gauge shelter) soit prise en charge par la Suède car ici au CNROP nous ne disposons d'aucun moyen pour subvenir financièrement à cette tâche.

Concernant la localisation, le site préféré pour recevoir le système GLOSS est le port de l'Amitié de Nouakchott.

L'institution responsable du GLOSS est le CNROP qui est, du reste chargé de toutes les questions du matériel à expédier en Mauritanie. C'est aussi l'organisme qui s'occupera du suivi du système (stockage, traitement et exploitation des données).

Les traitements des données du système GLOSS peuvent s'envisager au CNROP qui dispose déjà de quelques ordinateurs pour d'autres travaux de recherches (le CNROP ne dispose cependant pas de logiciels propres à l'hydrologie).

...../....
...../....

1
2
1

KRIESEL von
CENTRE NATIONAL DES RECHERCHES OCEANOGRAPHIQUE ET DE PECHE
Mauritanien (CNROP) vom ?

Die für GLOSS zuständige Organisation wäre CNROP, die sich übrigens auch mit allen Fragen der Materialbeschaffung in Mauretanien befaßt. Sie ist auch die Organisation, die für die Unterhaltung des Systems zuständig ist (Lagerung, Bearbeitung und Auswertung der Daten).

Monsieur A. Tolkachev
Secrétaire Technique Supérieur
Unité Services Océan (IOC)

Es muß hinzugefügt werden, daß in Mauretanien bisher noch keine Daten über Messungen des Meeresniveaus existieren und daß bisher kein Kontakt zu anderen Datenzentren aufgenommen wurde.

Unter Bezugnahme auf Ihr Schreiben IOC/5/6/TGP/15 f1s,
möchte ich Ihnen zu allerst sagen, daß CNROP der Ein-
richtung des weltweiten Systems zur Beobachtung des Meeres-
meins (GLOSS) eine große Bedeutung beimßt.
Sie finden hoffentlich in diesem Schreiben eine vollständige
Beantwortung Ihres Briefes.

Mit freundlichen Grüßen

hydrologischen Prozesse und der Veränderlichkeit in dem Gebiet, von Upwelling und Strömungen und dem Wechsel der Wassermassen mit plötzlich verschiedenen Charakteristiken sowie wegen der Bedeutung solcher Parameter für die

erforderliche Material - über die Messungen der Tiden und des Meeressniveaus hinaus - andere erforderliche Parametermessungen wie Temperatur, Salzgehalt und Sauerstoff erlauben würde.

Weiterhin würden wir es begrüßen, wenn die Durchführung der Empfangsinstallation (Steeling well and gauge shelter) von Schweden übernommen würde, daß wir hier im CNROP über die Mittel verfügen, diese Aufgabe finanziell zu lösen.

Als die Lage anbetrifft, so würde als Standort für das

PROCES - VERBAL DE LA MISSION EFFECTUÉE
PAR MR B.H.SCHARRINGHAUSEN
AU C.N.R.O.P.

- Qui entretiendra les stations et qui effectuera les relevés.

- Si possible, les plans de port de Nouadhibou et de Nouakchott ainsi que des coupes de ces plans.

Du 15 au 17 décembre 1988, Mr B.H.Scharringhausen expert de l'UNESCO pour le système GLOSS a séjourné au CNROP. Au cours de cette mission, l'expert a rencontré Mrs : Diop Mika (Chef service P.I de la recherche halieutique et hydrocontinentale) et Loktionov Youri (océanographe physicien).

Cette visite entre dans le cadre de l'installation de stations d'observation de niveau de la mer dans le système GLOSS.

Mr B.H.Scharringhausen était venu étudier sur place les modalités pratiques de la mise en place du projet d'installation des stations en question dans les eaux mauritanienes.

A travers les correspondances antérieures entre Mrs Tolkachev (secrétaire technique supérieur Unité Services Océan du COL) et Ba Moctar (Directeur du CNROP), le principe du projet avait été retenu. Le CNROP avait proposé l'installation d'une station à Nouakchott et avait souhaité que le système qui sera mis en place puisse permettre des mesures de température, d'oxygène et de salinité.

Ces propositions ont été rappelées à Mr B.H.Scharringhausen qui a pris bonne note de ces suggestions. En ce qui concerne les mesures de paramètres, l'expert a laissé entendre que cela ne relevait point de sa compétence, mais qu'il ne manquerait pas en discuter avec Mr Tolkachev.

Les représentants du CNROP ont demandé l'installation d'une deuxième station d'observation deniveau de la mer au port de Nouadhibou, si la station de Nouakchott ne pouvait pas couvrir l'ensemble du secteur mauritanien.

Le CNROP a réitéré sa demande pour que l'UNESCO prenne en charge la construction des stations. Mr Scharringhausen a signalé que si l'UNESCO devait se charger de la construction des stations, l'entretien de celles-ci revenait à la Mauritanie.

Il a ensuite demandé à ce que le CNROP lui fournisse par lettre les renseignements suivants :

- Hauteur des vagues aux ports de Nouadhibou et Nouakchott.
- Coût de construction d'une station (le plan sera transmis par l'expert au CNROP).
- La place la mieux indiquée pour les stations au niveau des ports .

Q11267 2-0

PROCES - VERBAL DE LA MISSION EFFECTUÉE
PAR MR B.H.SCHARRINGHAUSEN
AU C.N.R.O.P.

Fait à Nouadhibou le 17.12.1988

Pour l'UNESCO

MR B.H.SCHARRINGHAUSEN

B.H.Scharringhausen

Pour le CNROP

MR DIOP MIKA

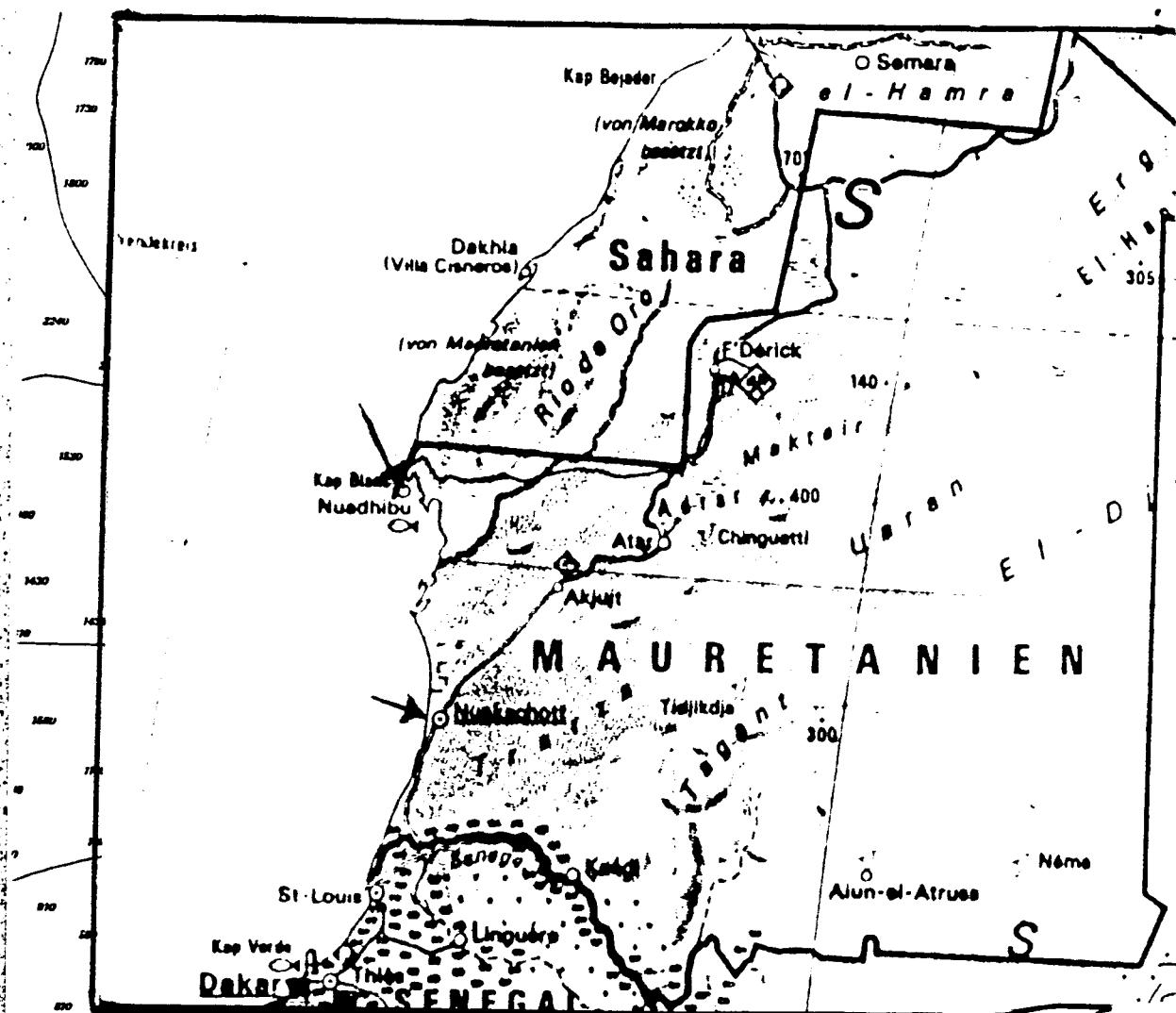
J. M. Diop Mika

Pour l'UNESCO

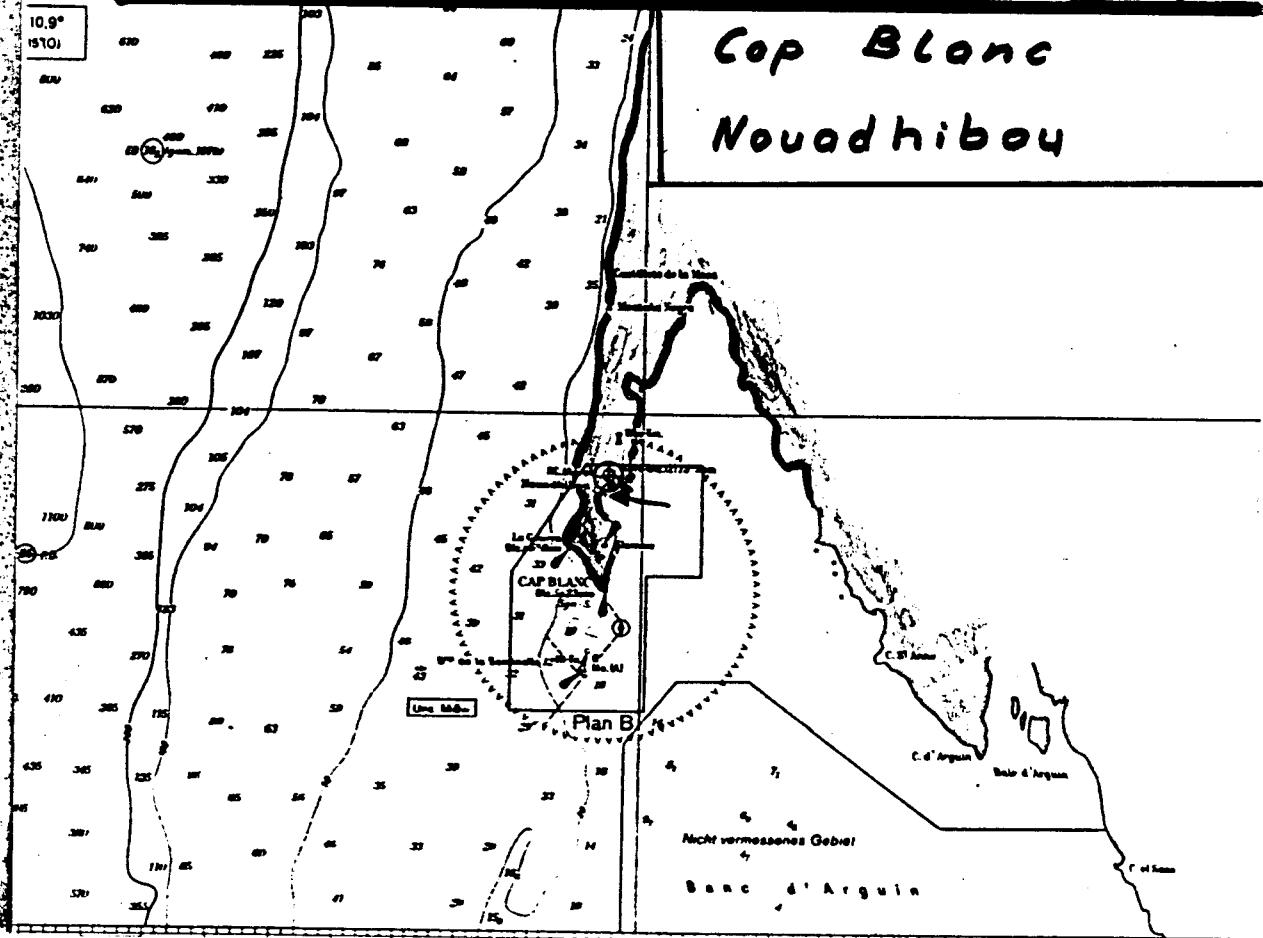
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(DU 15 AU 17 DECEMBRE 1988)

Mauritania

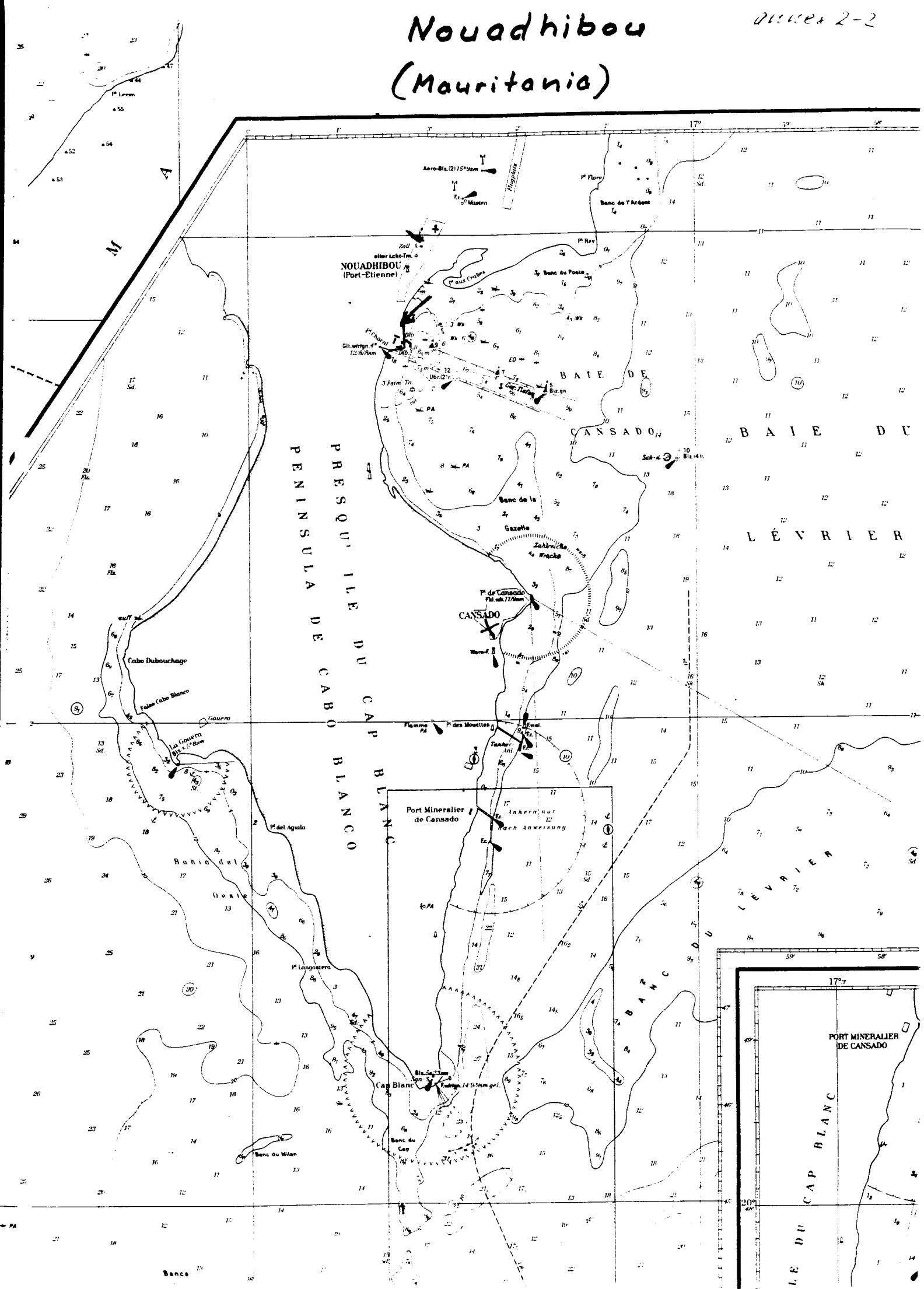


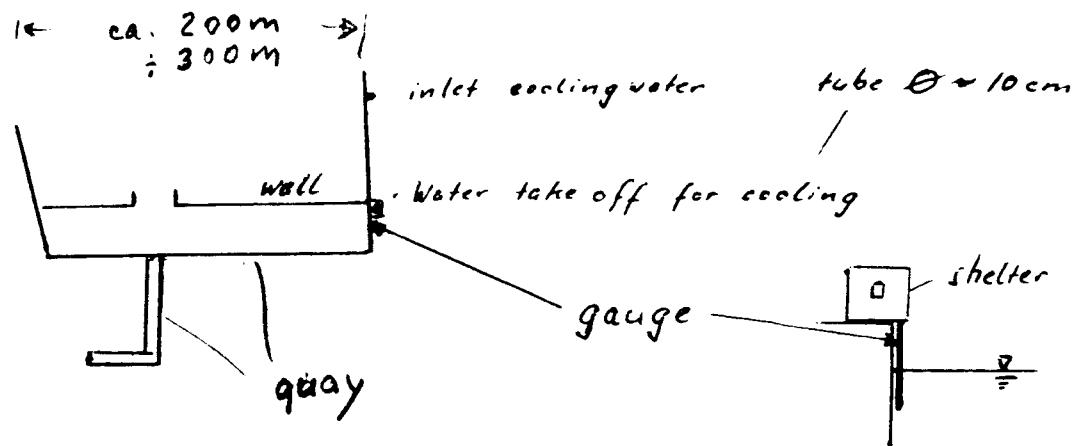
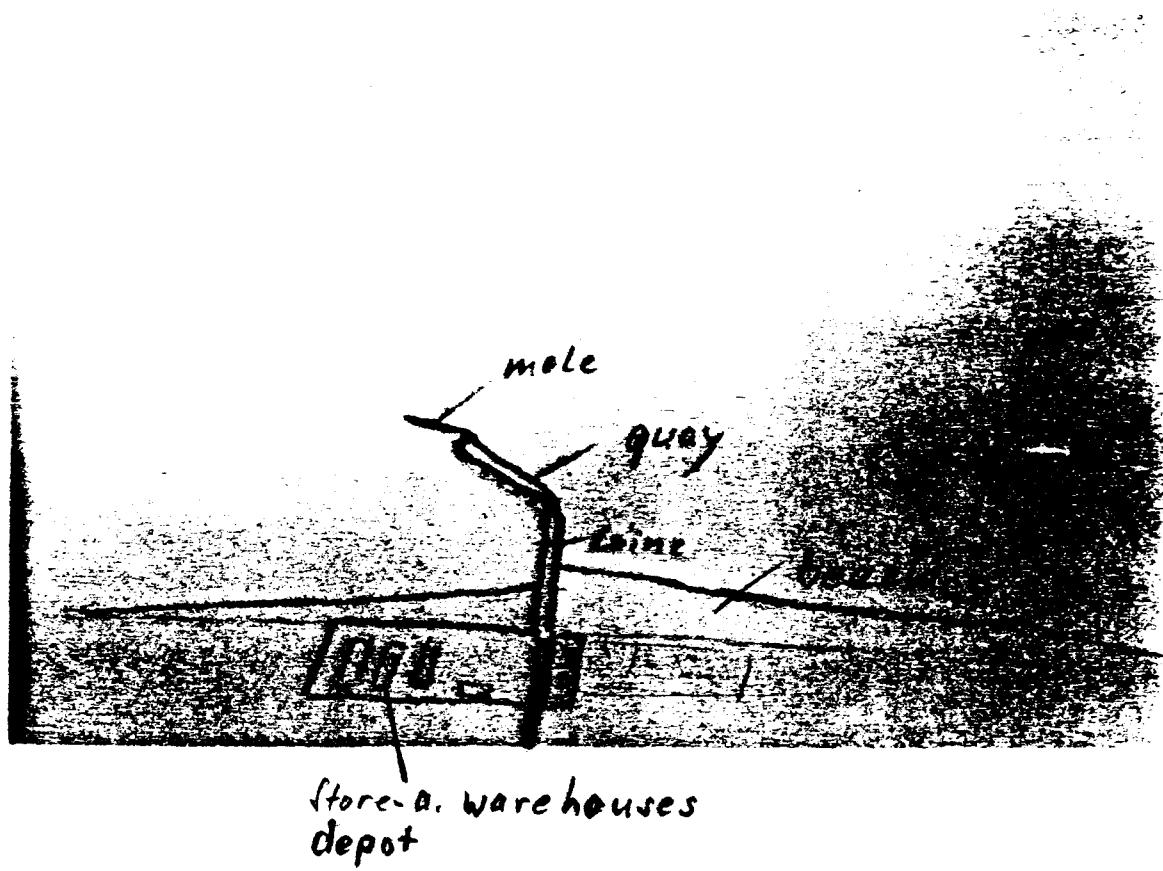
Cap Blanc
Nouadhibou



Nouadhibou (Mauritania)

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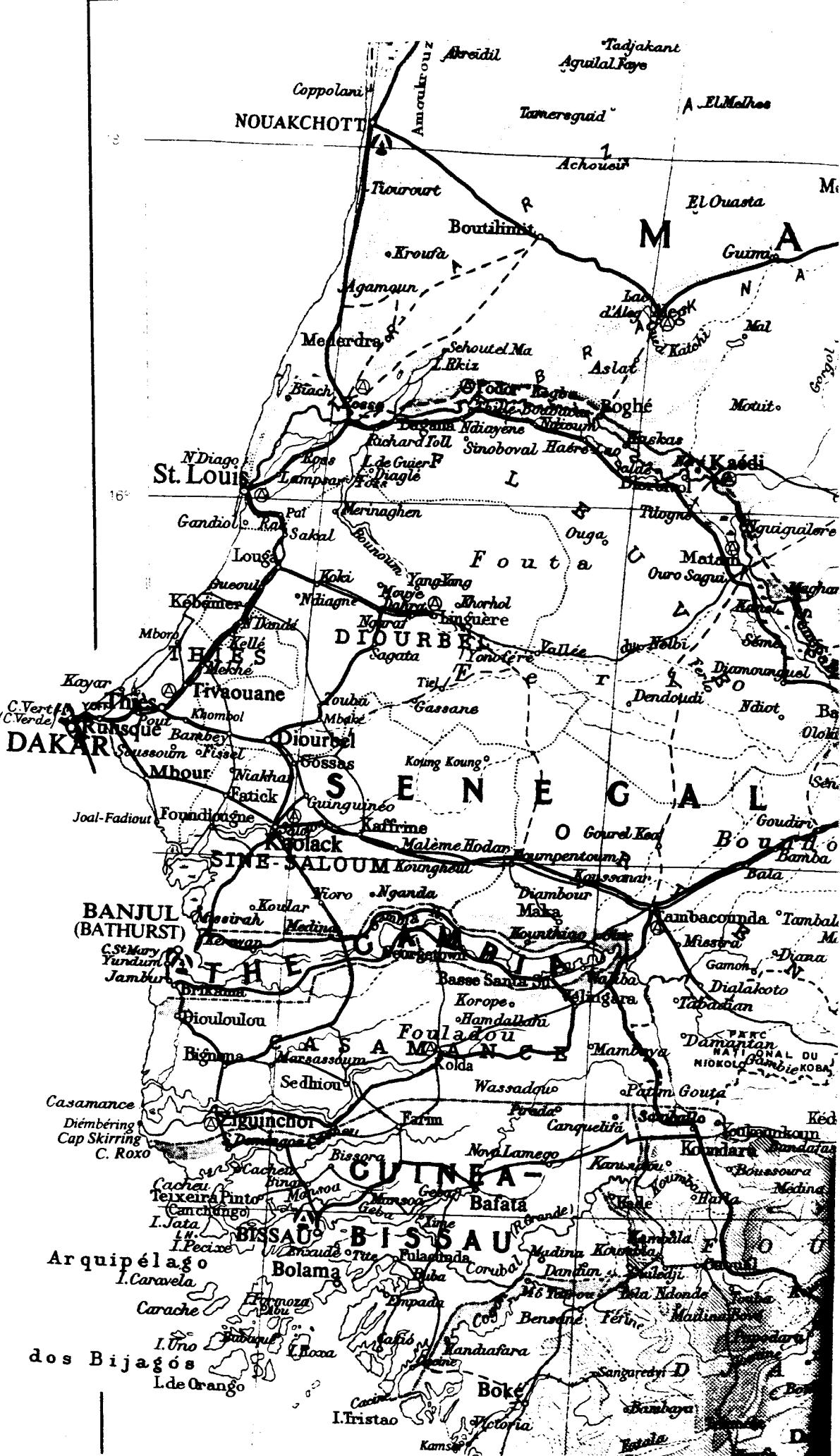


Nouadhibou portNouakchott port

Annex 3

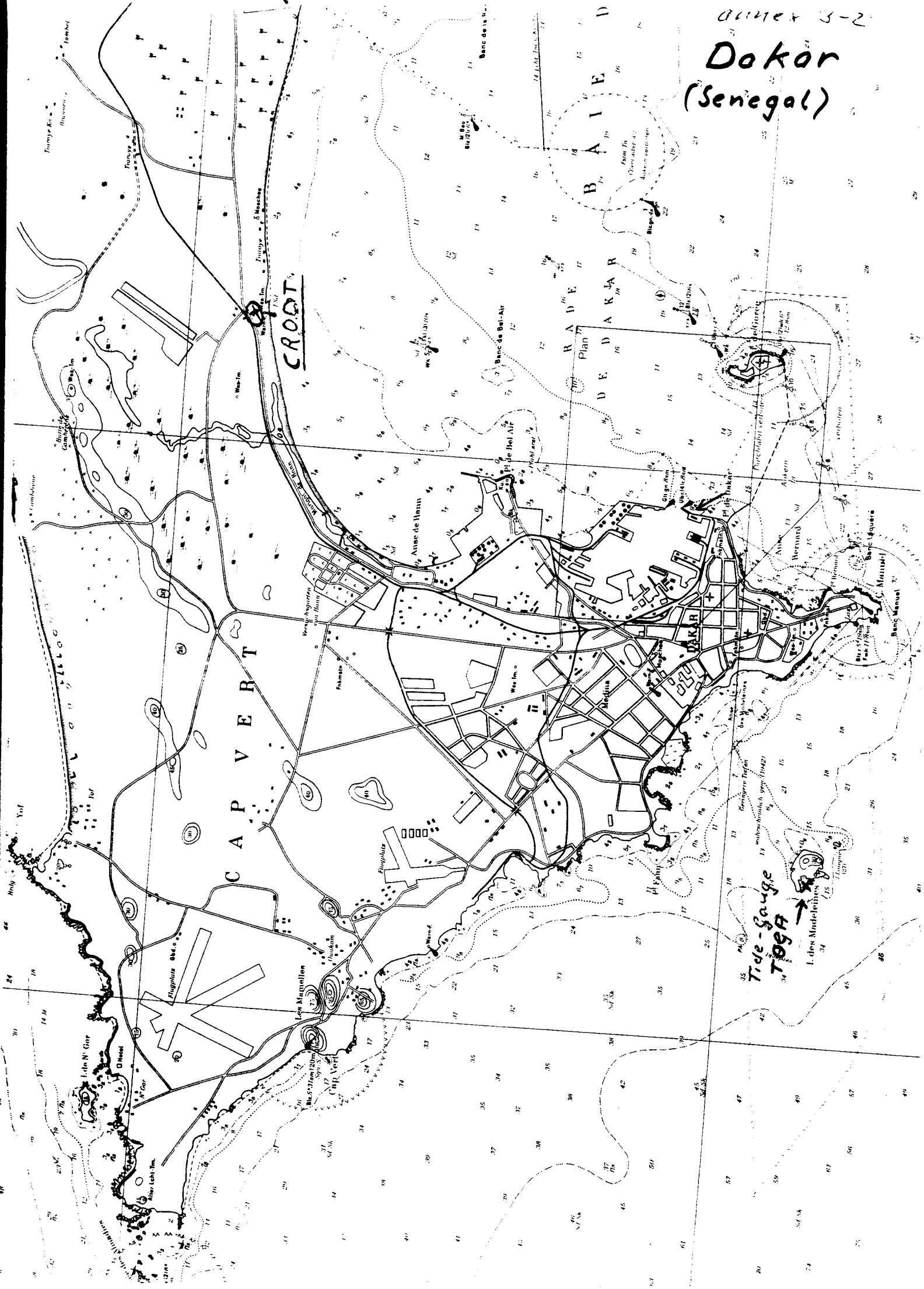
Senegal

SENEGAL



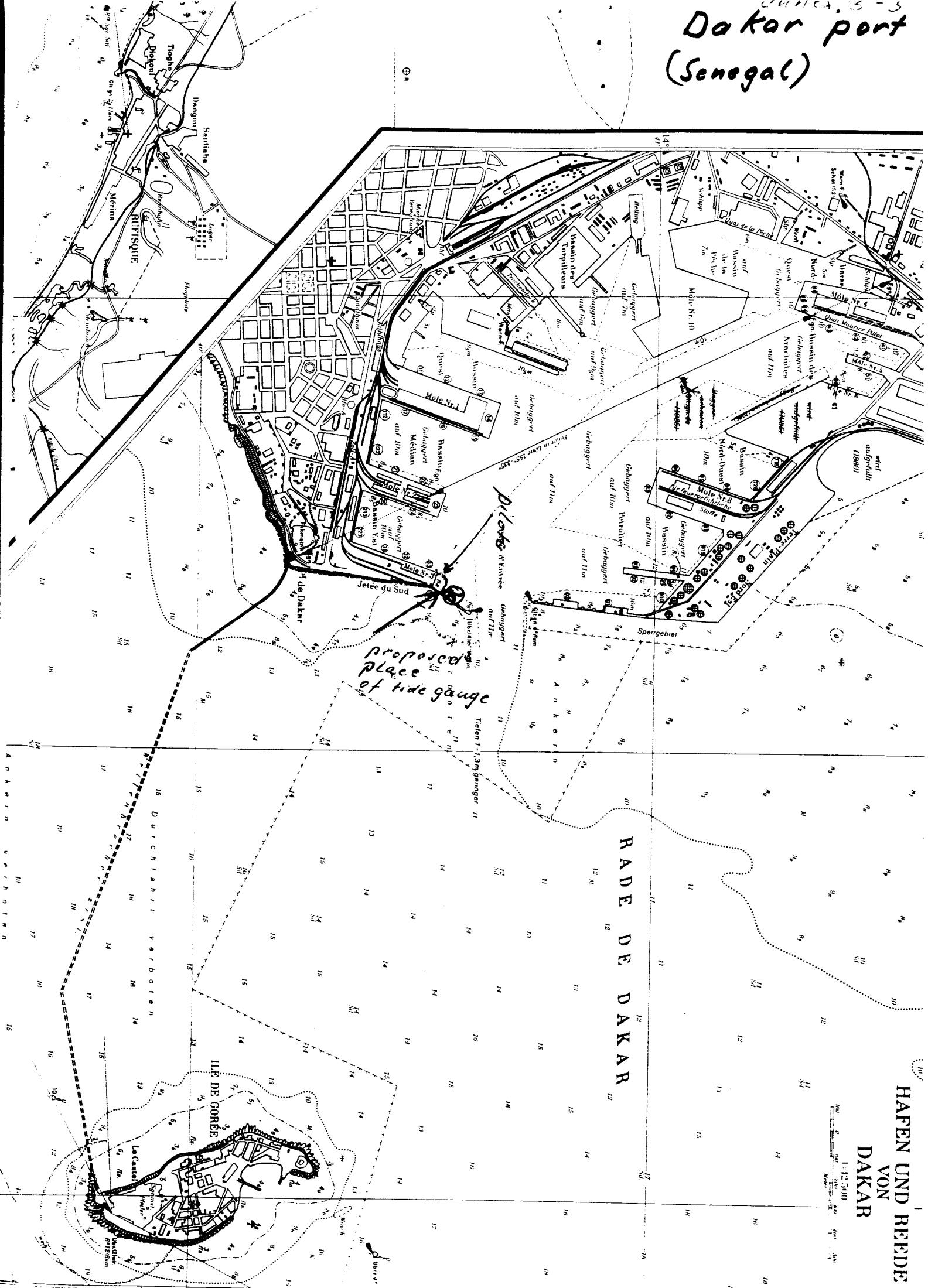
Dakar
(Senegal)

October 3-2



Dakar port
(Senegal)

HAFEN UND REEDE
VON
DAKAR





INSTITUT FRANÇAIS DE RECHERCHE SCIENTIFIQUE
POUR LE DEVELOPPEMENT EN COOPERATION
Direction Générale : 213, Rue La Fayette
75 480 Paris Cedex 10 - FRANCE - Tél. : 48.03.77.77

CLAUDE ROY

Océanographe

CRODT
B.P. 2241 — DAKAR - SENEGAL

Tél. : 34.05.34 - 34.05.36



PORT AUTONOME DE DAKAR

Edouard SARR
Capitaine au Long Cours
Chef de la Division Exploitation Maritime
Commandant du Port

Bd de la Libération
Tél. 22-14-70 - 22-29-70
21-74-21

B.P. 3195
Télex N° 406 SG
PORCOMER — DAKAR

Annex 4

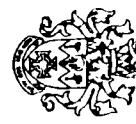
Sierra Leone

FOURAH BAY COLLEGE

UNIVERSITY OF SIERRA LEONE

INSTITUTE OF MARINE BIOLOGY & OCEANOGRAPHY

REFERENCE
 Dr. A. Tolkačev
 Senior Technical Secretary
 Ocean Services Unit
 Intergovernmental Oceanography Commission
 UNESCO
 7, Place de Fontenoy,
 75700 Paris.



FREETOWN
 SIERRA LEONE
 14th June, 1988.

Dr. A. Tolkačev
 IOC Senior Technical Secretary
 Intergovernmental Oceanographic Commission,
 UNESCO,
 7, Place de Fontenoy,
 75700 Paris,
 France.

Dear Dr. Tolkačev,

7, Place de Fontenoy,
 75700 Paris.

Dear Dr. Tolkačev,

Your letter IOC/5/6/TGP/15/RIS of 8th April, 1988 refers I am sorry about the delay in replying. I was out of station.

You will find enclosed the map of the exact location for installation of the tide guage. It is a new location and it was approved by Mr. J-M Verstraete (ORSTOM, France) who visited us in April, 1986. Unfortunately there are no existing facilities for the construction of the steeling well and tide guage shelter. However the visit of the FRG Consultant would be helpful.

The Institute of Marine Biology and Oceanography and myself - Dr. Ivan W.O. Findlay - will be the focal point for all questions related to the guage and the work of the consultant etc. Telephone - 50775 (Freetown) We will take charge of local transportation, customs etc.

i) Trained technician is available to work with tide guage. He attended the workshop at IOS, Bldston in June, 1986. However he will need computer training for data analysis and storage, etc.

v) Our tide-guage which was located in the Estuary of the Sierra Leone River is out of commission due to lack of spare parts. It was an Institute activity and we did not liaise with any international sea-level centre. I hope this information will be adequate to proceed on. If there are other questions not treated please let me know.

Yours sincerely,

Ivan W.O. Findlay (Dr.)

Ag. Director

IMB

Sierra Leone

West Africa

Europe

Africa

Asia

America

Oceania

Middle East

South America

North America

Europe

Asia

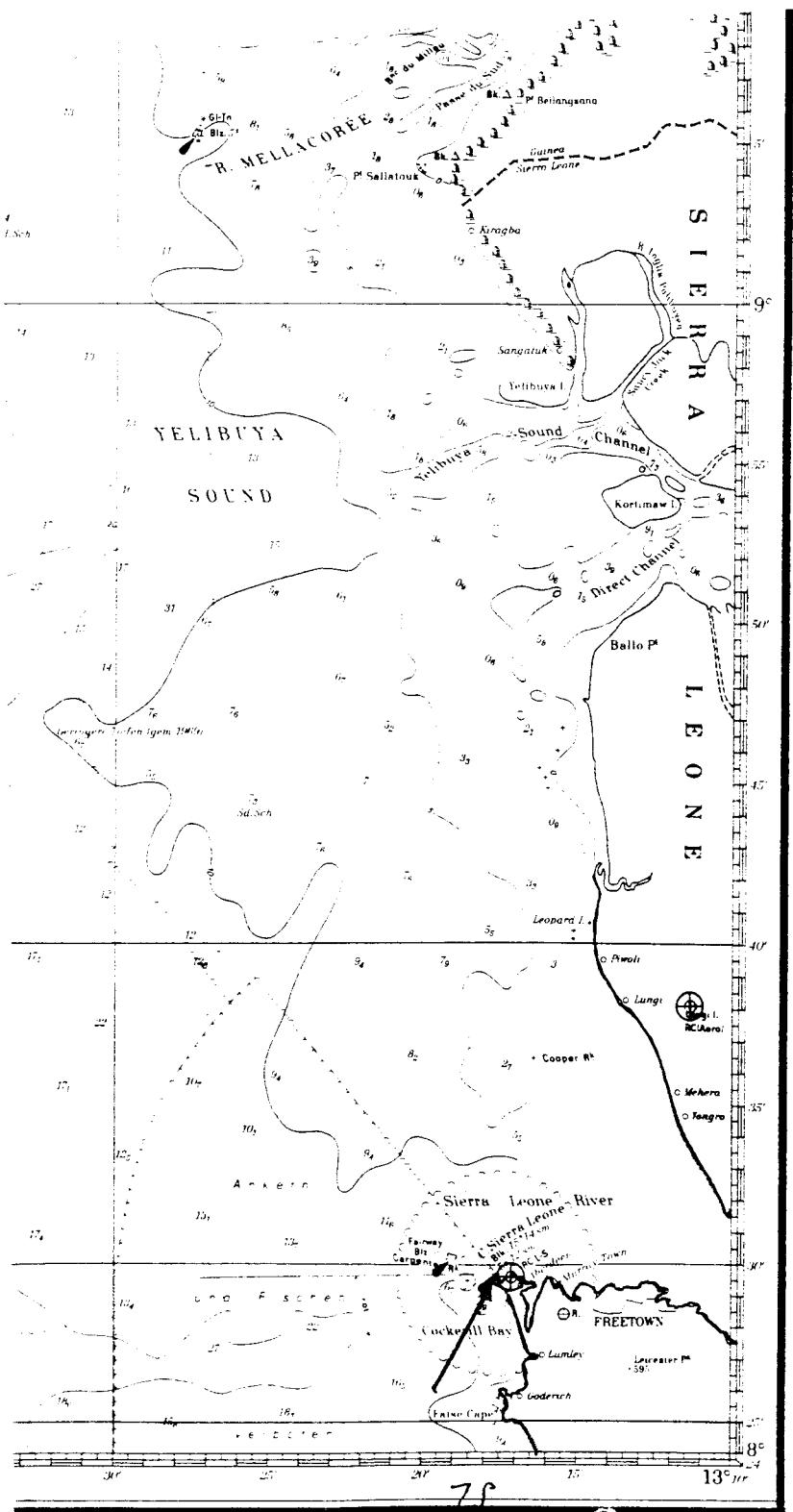
Africa

South America

SIERRA LEONE

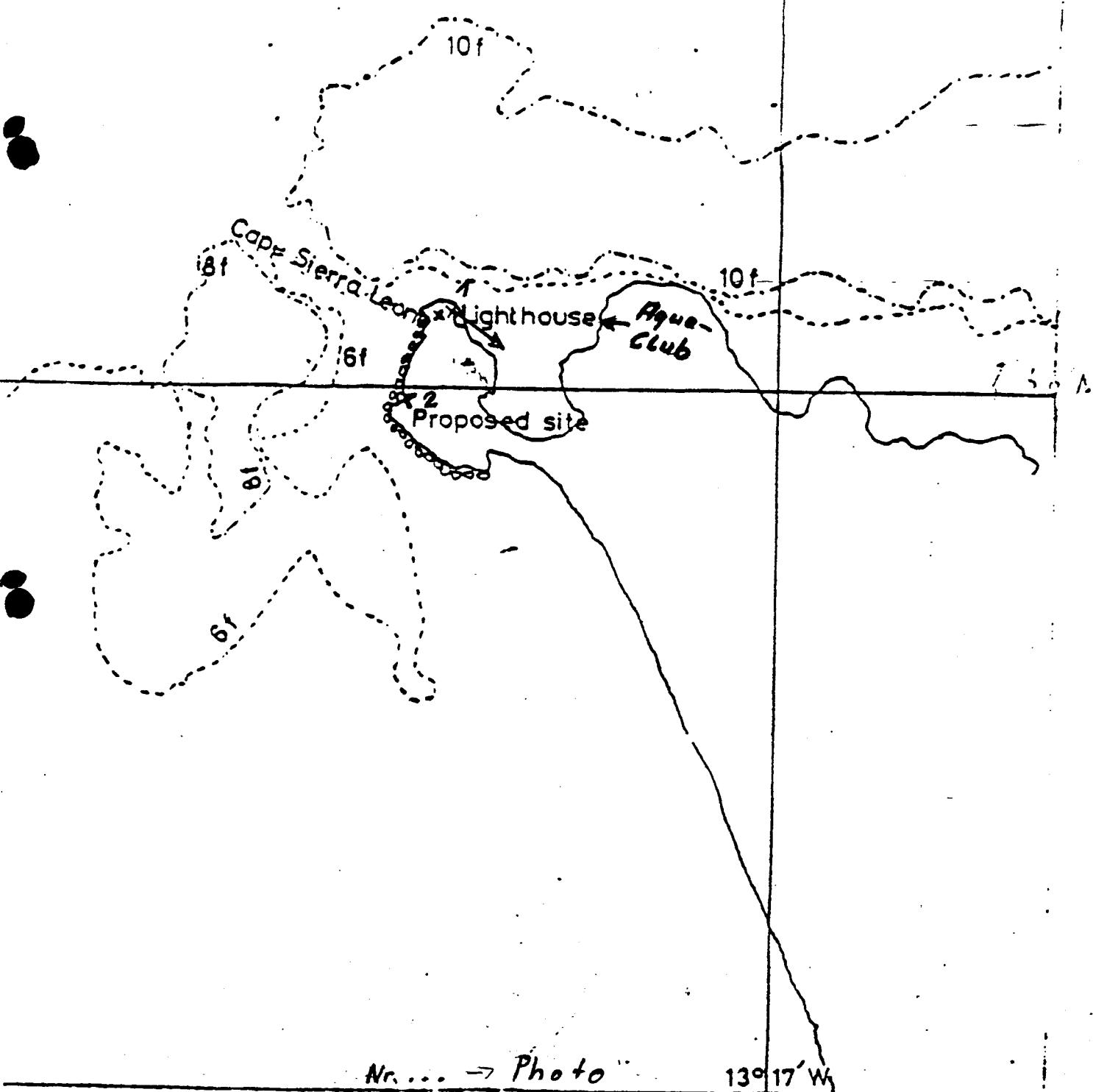


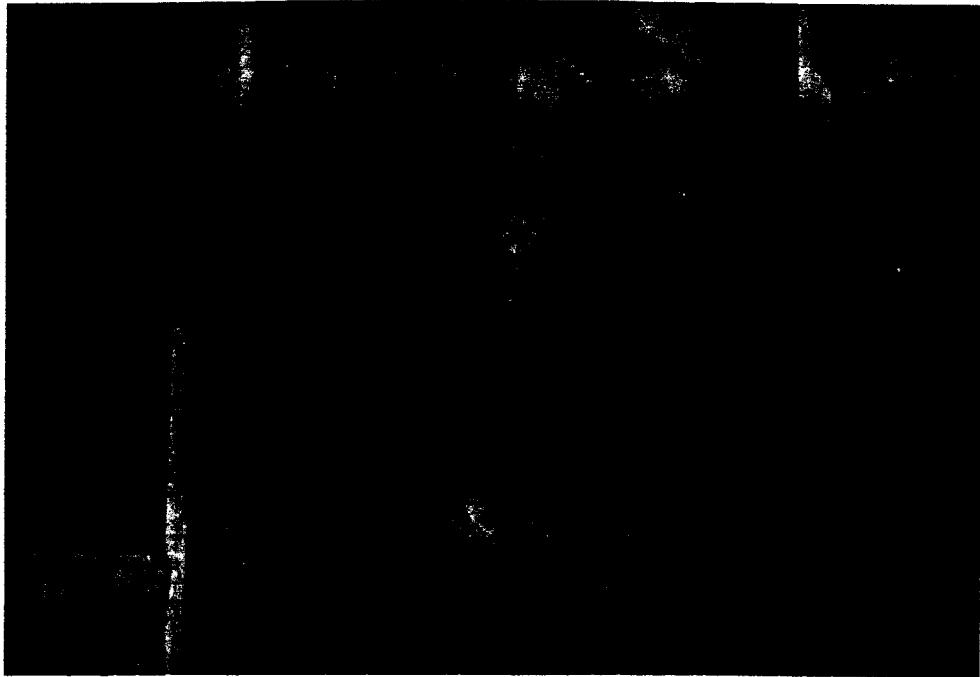
SIERRA Leone



SIERRA-LEONE

PROPOSED SITE FOR THE INSTALLATION OF THE NEW
TIDE GUAGE IN FREETOWN





map
of
Freetown
and
surround



1



2



place for a garage

view to the lighthouse



A. Findlay, Jr. Jackson, Mr. Hartman

Treecrown lighthouse

View in the opposite direction
(lighthouses)



Directions Lighthouses

Annex 5

Ghana

A05/10/Vol.2/T-

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION	
Received	29 May 1988
Report No:	

SURVEY DEPARTMENT,
P.O. BOX 191,
ACCRA.

20th May, 1988.

Dear Sir,

PROPOSED ASSISTANCE BY SWEDEN AND FRG TO
INSTALL GLOSS TIDE GAUGE.

Reference to your letter No.IOC/5/6TGP/15/fls dated 8th April, 1988, on the above subject, I forward herewith, the information required as follows:-

TAKORADI TIDE GAUGE

Installed in 1929 at the Takoradi Harbour on Latitude $04^{\circ} 53' 07.6''$ N and Longitude $01^{\circ} 44.34.3$ W.

Type of Gauge:- Baldwin Lathanis Recording Tide Gauge No.720.
 Manufacturers:- Cooke Throughton and Simons Ltd.

Mathematical and optical Instrument Messers Buckingham Works York. Ref. BM. for Gauge is PL.BM.GCS H4.

2. TEMA TIDE GAUGE

Installed in 1963 at Tema Harbour on Latitude $05^{\circ} 37' 20.7''$ N and Longitude $00^{\circ} 00' 23.0$ E

Type of Gauge: A Lege Float operated Recorder Type No.1 A Lege (Marine Engineers) Ltd. 361, Liverpool Road, London N.1.

3. Reference Bench Mark of Gauge is BM. PL.8/5 and is situated at North-Eastern Corner of the Tide Gauge Hut. Gauge Zero is 11.207ft. below Bench Mark. which is referred to National Level Datum of the country. A number of other precise level Bench Marks are available in the Harbour area for comprising unit height. Measurements in feet and mean values are referred to Gauge Zero.

4. All matters related to the Tide Gauge and the work of the consultant are to be referred to the Director of Surveys, Survey Department, P.O. Box 191, Accra, Ghana.

Telephone No.777331 Telex -

5. A technician is available to work with the tide gauge but some training will be necessary to brush up our technicians.

Data are filed. No Digitized, No Computer.

(a) Hourly Sea-level recording are sent to Mr. J.M. Verstraete, Botte Postile No.1386, Dakar, Republic du Senegal.

Monthly and annual Mean Sea-Levels are sent to permanent service for Mean Sea-Level Bidston Obscrutry, Birkenhead Mersey side L43 74^A United Kingdom.

The Takoradi and Tema Tide Gauges are already existing but need replacement. However, eight new ones are to be establish along the coast. Their exact locations with detail map will follow later.

Yours faithfully,

[Signature]
 for:AG. DIRECTOR OF SURVEYS
 (E. A. QUAYE)

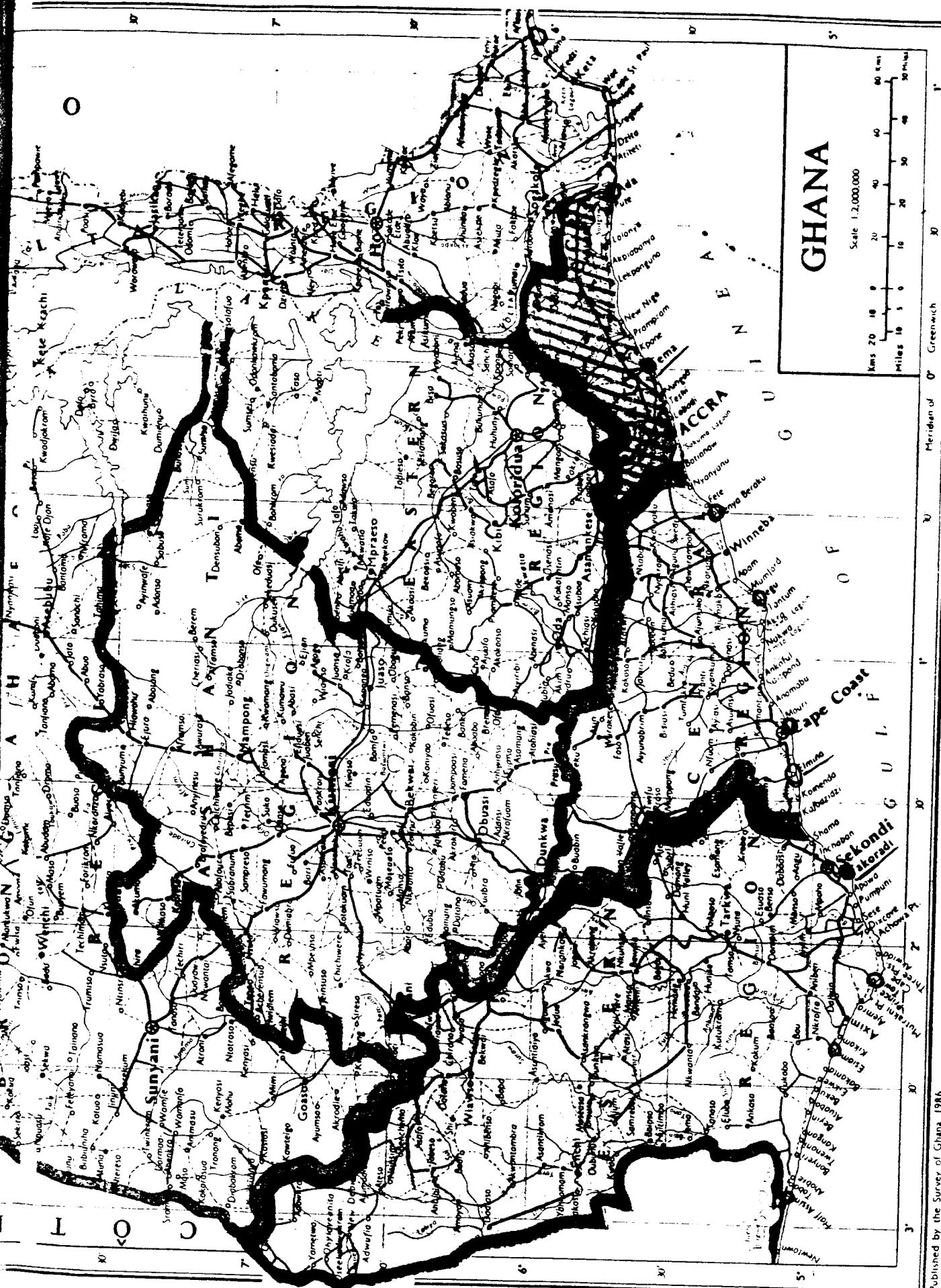
THE SECRETARY IOC,
 UNESCO,
 7, PLACE DE 75700 PARIS.

GHANA

BINGHOF OF BENVIN

Forcadus *Amassum*

Garrison 5-2



Published by the Survey of Ghana, 1986
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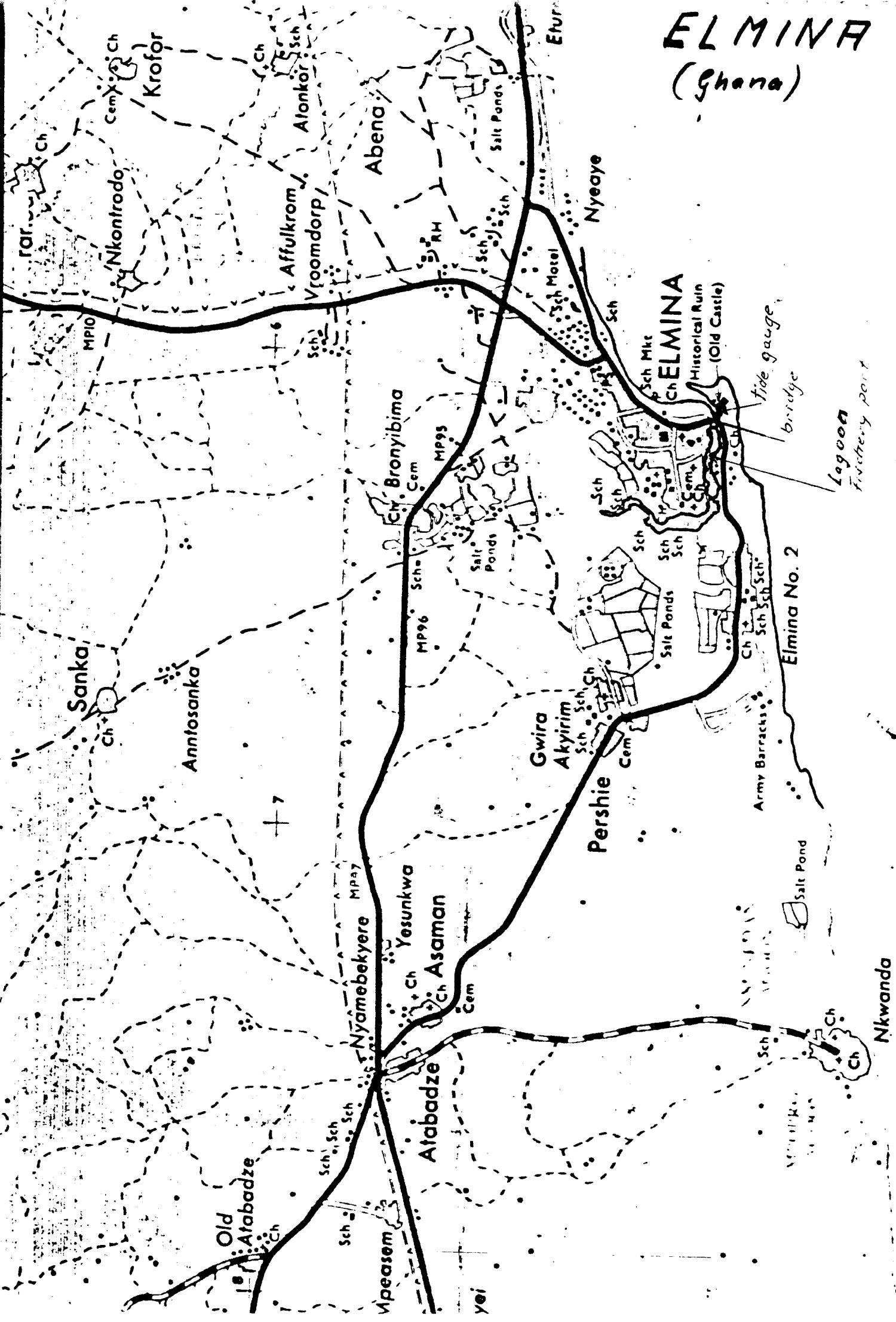
(Ghana)

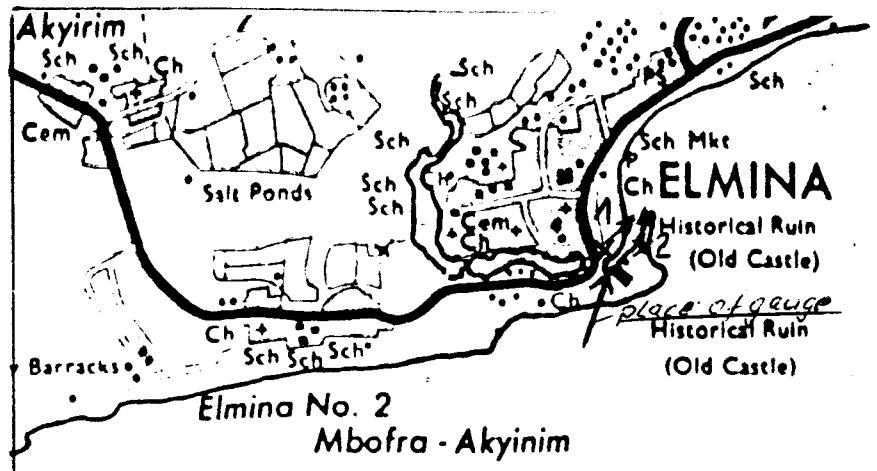
OCTOBER 5-3

TAKORADI



ELMINA (Ghana)





Picture Nr.
↑-View direction

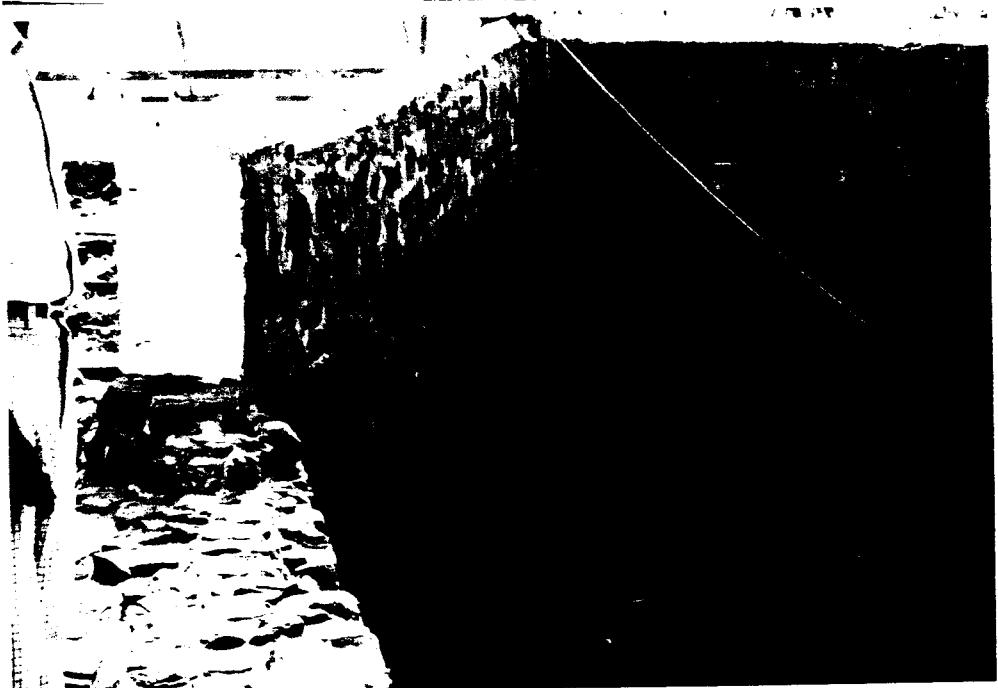
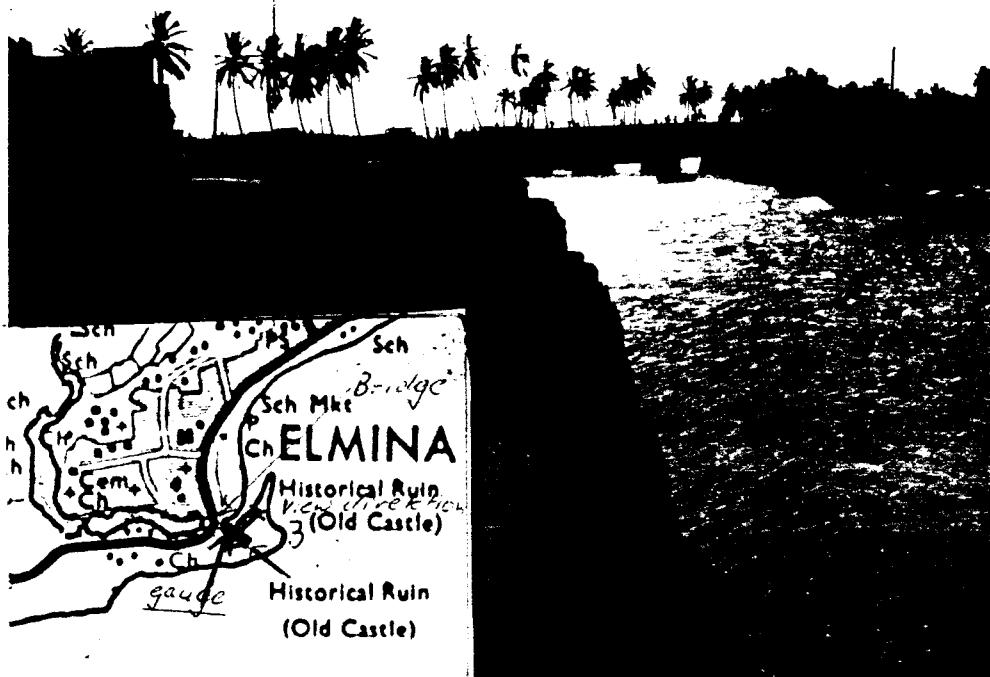


VIEW
from
bridge
(Pic. 3)



2

suggested place of gauge



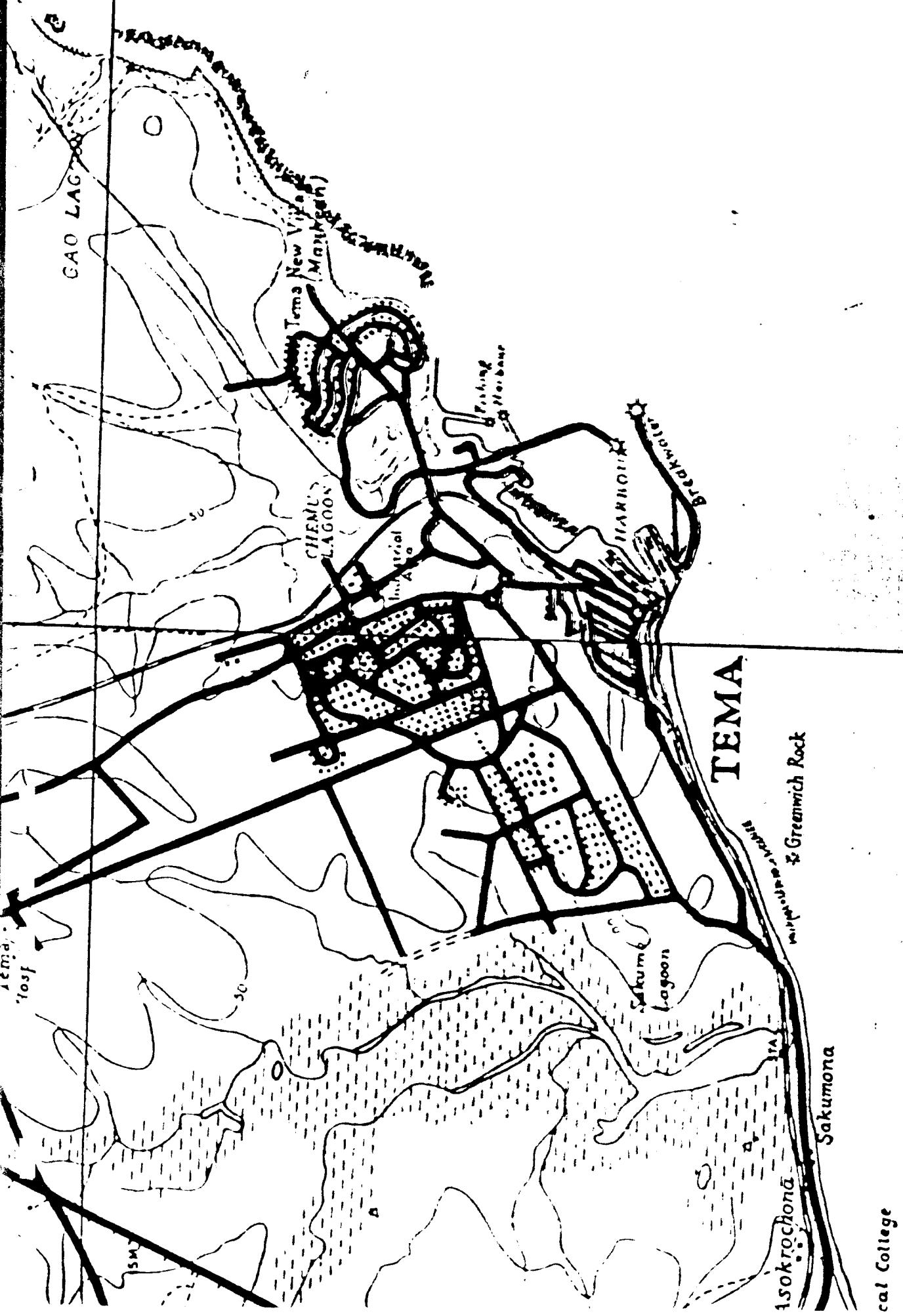
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5

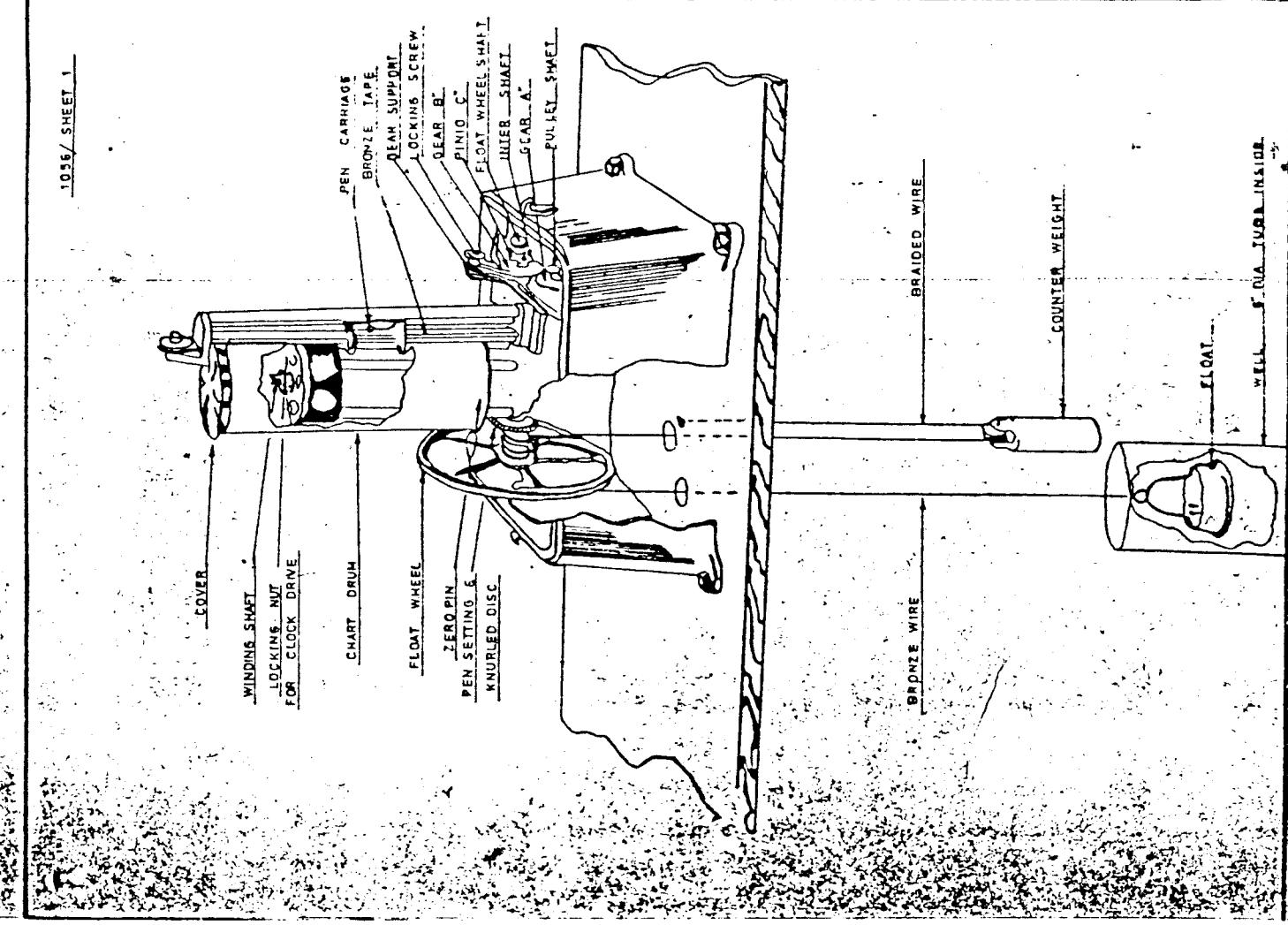
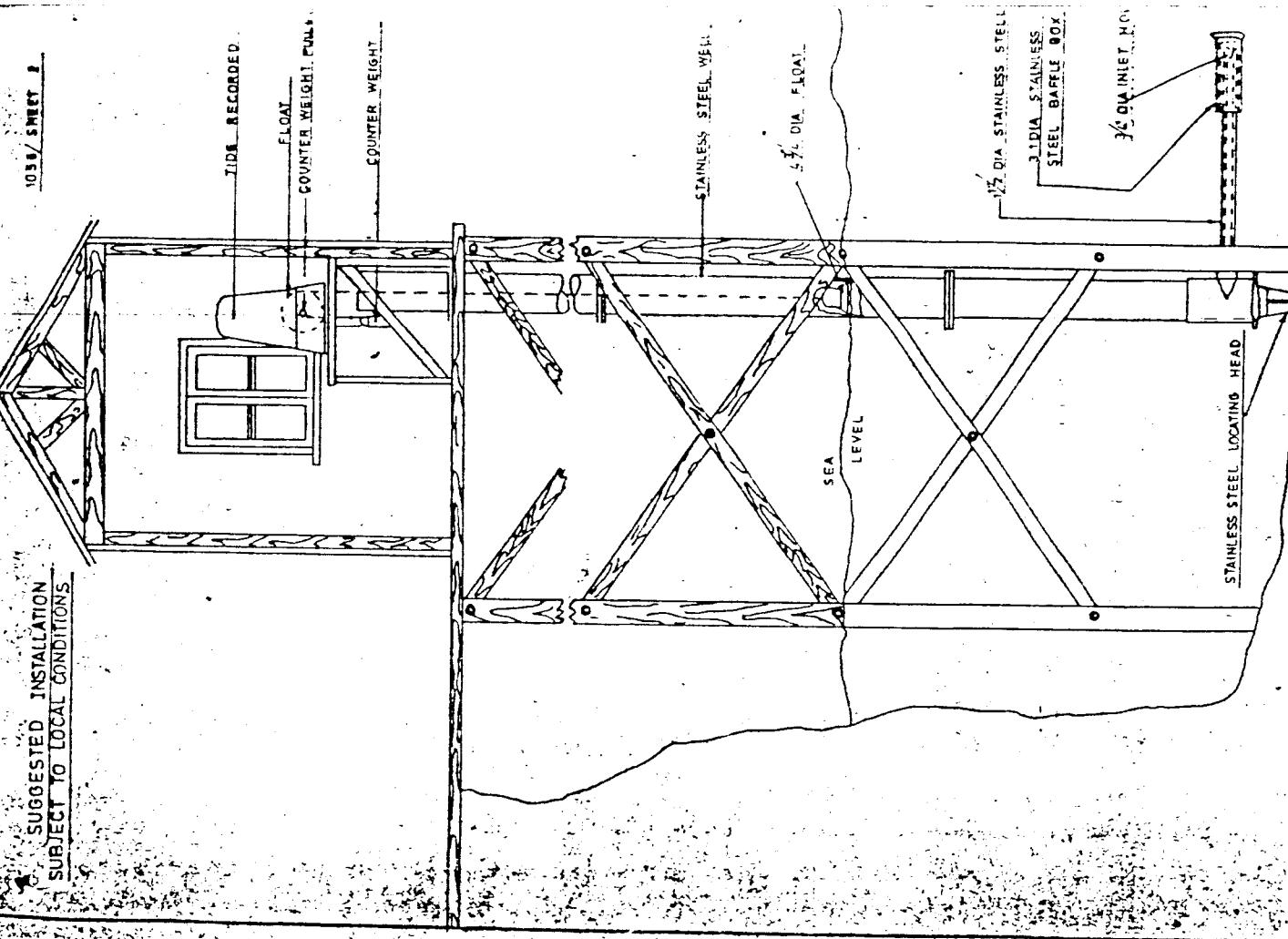
TEMA

(Ghana)



SUGGESTED INSTALLATION
SUBJECT TO LOCAL CONDITIONS

1056 / SHEET 1



March 5 - 8

Takoradi
Ghana

MONDAY

SUNDAY

FRIDAY

THURSDAY

WEDNESDAY

TUESDAY

MONDAY

chart paper
half - size

1 feet
↔

Annex 6

Nigeria

NIGERIAN INSTITUTE OF OCEANOGRAPHY AND MARINE RESEARCH

Annex 6-0



of the

FEDERAL MINISTRY OF SCIENCE AND TECHNOLOGY

TELEPHONE 617530, 617535, 617540, 617543, 617544

TELEGRAM OCEANOGRAPF

OUR REF: 8113/S.14/Vol.I/23

OUR REF:

P.M.B. 12729
VICTORIA ISLAND,
LAGOS, NIGERIA.

July,.....19.88

Dr. A. Volkachev,
Senior Technical Secretary,
Ocean Services Unit,
IOC/UNESCO,
7, Place de Fontenoy,
75700 Paris,
FRANCE.

Dear Dr. Volkachev,

INFORMATION ON PROPOSED GLOSS STATION

I refer to your letter Ref. No. IOC/5/6 TGP/15/fis of 8th April, 1988 on the above subject. Fig.1 attached herewith shows the proposed site for the Gloss station in Lagos while Fig.2 is a close-up view of the particular site shown for the installation of Tide Gauge. The accompanying write-up gives other necessary details about the proposed Gloss station.

We have, in addition, surveyed two other sites at Brass and Iboko-Eket in the Niger Delta area of Nigeria in anticipation of our expressed readiness to receive and install more than one tide gauge. I hope we are still on your list of potential recipient of additional tide gauges.

I wish to reiterate our earlier pledge to pay for all local expenses including construction work, local transportation and customs formalities to bring tide gauge to the country and to assist a consultant in his work. We can also absorb local expenses of the consultant.

With best regards.

Yours sincerely,

DR. A. C.IBE
HEAD, PHYSICAL & CHEMICAL OCEANOGRAPHY
FOR DIRECTOR.

	Capt Joe O. Abulu <i>B.Sc. (Hons) Ibadan</i> HYDROGRAPHER OCEANOGRAPHER NIGERIAN NAVY
Office	Nigerian Navy Hydro. Dept. 5 Point Road Anapa Lagos Tel: 875715 876325
Postal Address	P. O. Box 2452 Festac P. O. Lagos Tel:

IDONGESIT M. UDOPPA <i>B. Sc., M. Eng. M.N.I.S.</i> Asst. Director (Hydrographic)	
Office:	N.P.A. Headquarters, 26/28, Marina, Lagos.
Residence:	6, Hawkerworth Road, Ikorodu, Phone: 638230 600620/2172 Phone: 681188

The information on the proposed GLOSS Station are:

1. SITE

The Site is a tidal inlet leading into the Lagos Harbour. It is less than 1 km from the open sea and easily accessible being located on a jetty (Mole). There exists a platform on which an old tide gauge is mounted. This platform is very solid (made of concrete and steel) and is capable of withstanding the worst storm conditions likely to be encountered here. The platform is usually slightly flooded at very high tide, but this is no impediment to accessibility. The existing facilities are fairly okay for construction of steering well and tide gauge shelter.

Fig. 1 shows a sketch (not to scale) of the proposed site.

Fig. 2 shows a sketch (not to scale) of the platform.

2. BENCH MARK

A bench mark is about 60.0m from the site of the proposed GLOSS station (they are both inervisible).

Name of bench mark = LCS21811

Height of bench mark = 2.414m above MSL

Chart datum for Lagos Har = 0.500m

3. TIDAL INFORMATION

Tidal Reading on visual tidal staff at low tide = 1.40m

Tidal reading on visual tidal staff at High tide = 2.45m

∴ Tidal Range = 1.05m

But during extreme high Spring tide, the range could be as high as
= 1.50m

4. RESPONSIBLE INSTITUTION

Nigerian Institute for Oceanography and Marine Research, Victoria Island, P.M.B. 12729, Lagos.

Attention: Dr. A. C. Ibe
Head, Physical & Chemical Oceanography Division
Tel. No. 619517
Telegam: OCEANOGRAPH
Telex: Through UNDP/UNESCO office, Lagos.

5. TRAINING

Some trained technicians are availabe to work with the Tide Gauge but it is thought that an IOC Training programme of the type attended by Dr. Ibe in 1986 at Bidston, U.K. will be required for one or two more junior scientists from Nigerian Institute for Oceanography and Marine Research. Nominations have been sent to Dr. Tolkahev in an earlier letter Ref. No. 214/Vol.III/128 of 20th June 1988.

6. DATA HANDLING

The data from the old Tide Gauge installed by Nigerian Port Authority are being presently stored in graphical form by that organization. Attempts are currently on at digitizing and storing on computer such information as are available. This has been accomplished for tidal information at Lagos between 1960 and 1971 and since 1986 work has been in progress to digitize and store tidal information from 1985 to 1971. A parallel effort is going on to determine, in particular, all meteorological effects on the tidal records. The Nigerian Institute for Oceanography and Marine Research is the Institute responsible for data analyses and liaison with International Sea Level Centres.

NIGERIA

EQUAT

CIVIL ENGINEERING

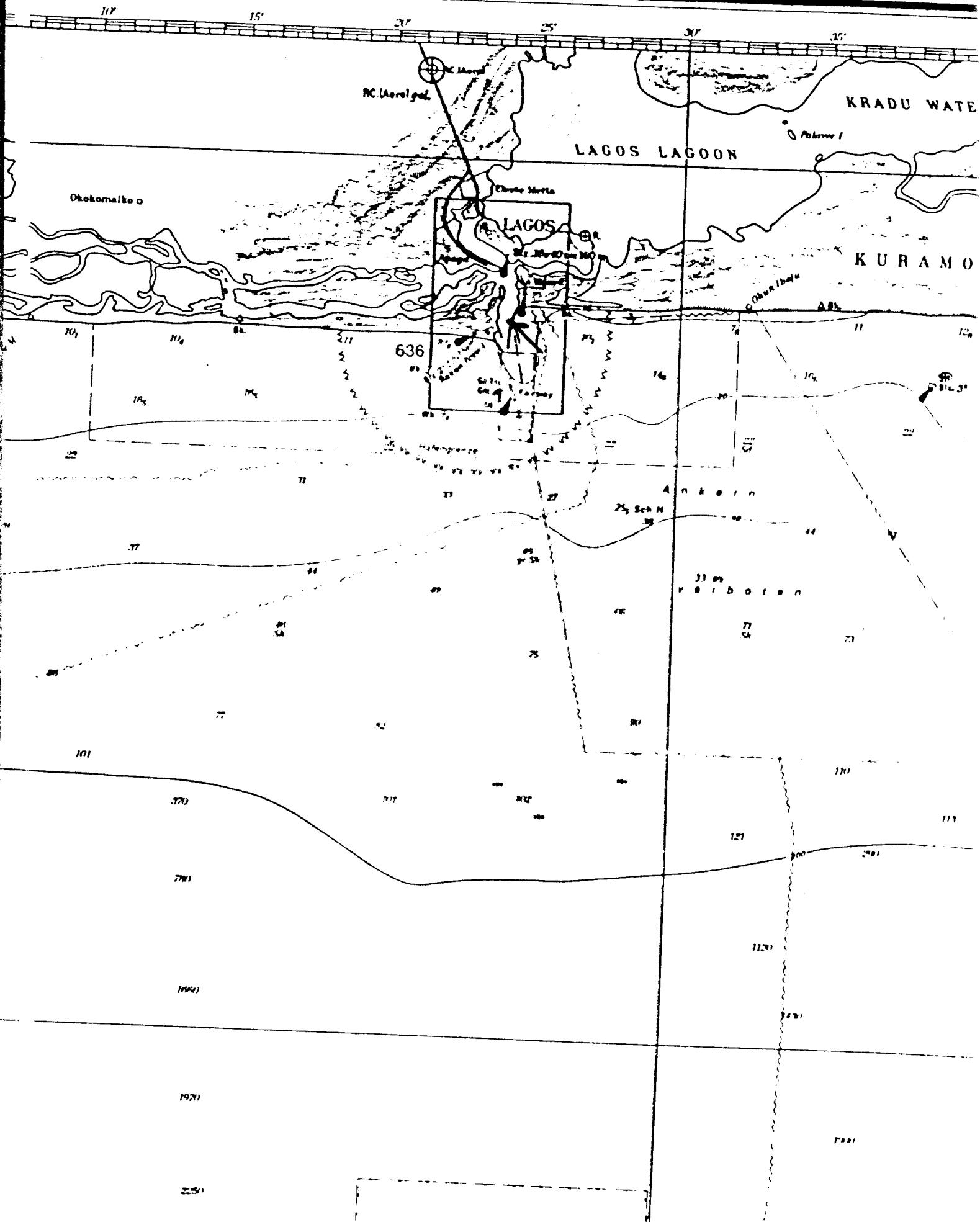
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Lagos.

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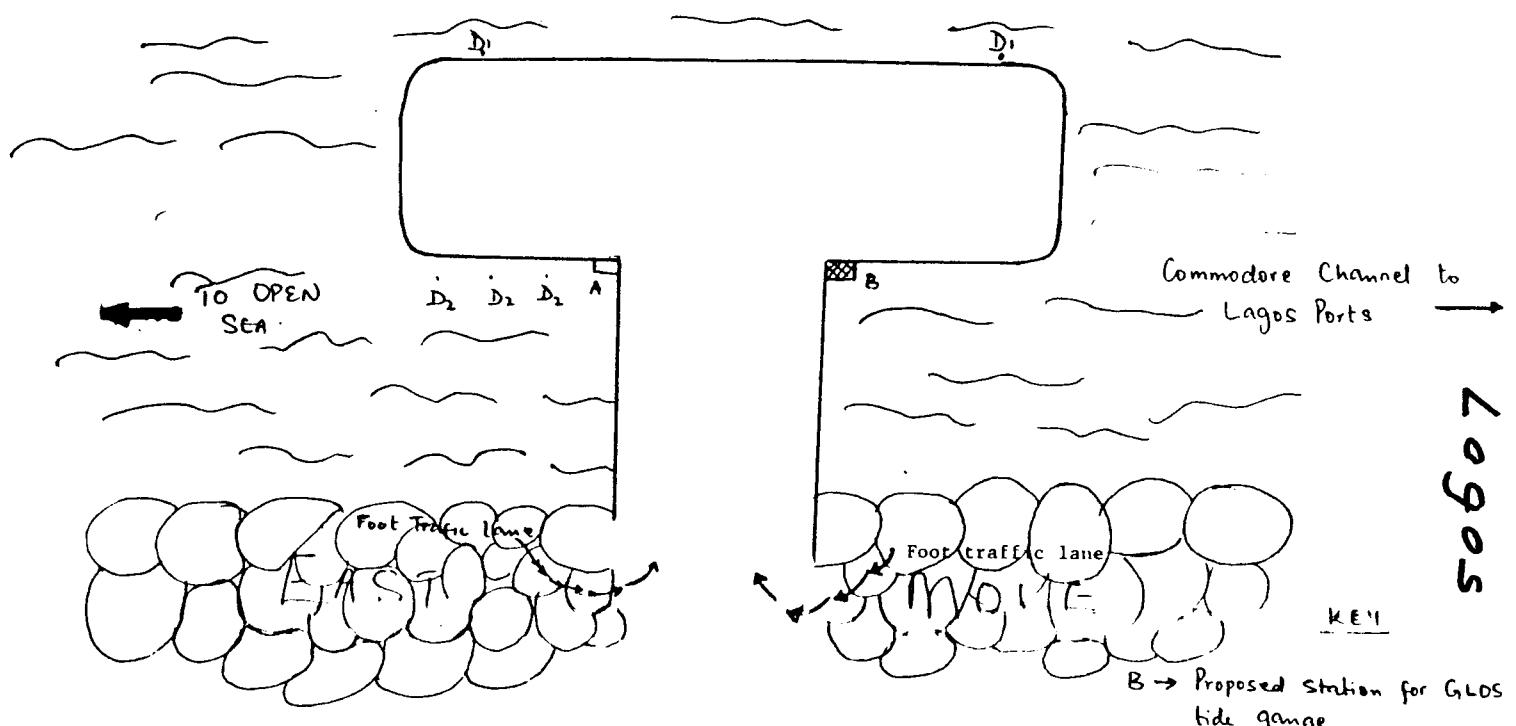
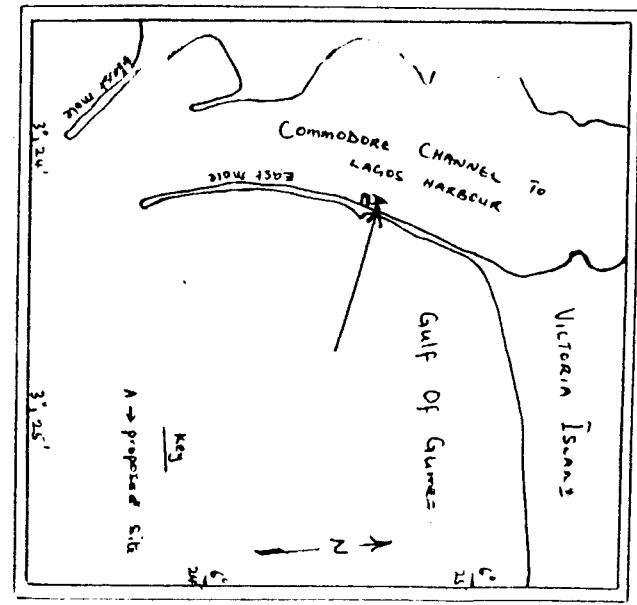


FIG 2 : Platform for Proposed GLOSS Tide Gauge.

A → Existing Old Tide Gauge
 D₂ → Depth at this position is
 $(2.46m) \pm 0.02$.

D₁ → Depth at this position is
 $3.7m + 0.09$.

Brass River

Nigeria



Nigeria

Ouaibo River

