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Environmental impact assessment: the marina in Paphos

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PREFACE AND ACKNOWLEDGEMENTS

Environmental impact assessments (EIA) have been extensively prepared and used over the last 15 years. Their wide application clearly indicates a need to ensure that environmental considerations are included in the decision-making process. However, particularly in developing countries, the procedures established for EIA in developed countries have met much criticism.

Realizing the shortcomings of these procedures and responding to frequent requests for a simple and practical, but still adequate approach to EIA, the Oceans and Coastal Areas Programme Activity Centre (OCA/PAC) of UNEP has attempted to formulate procedures, supplemented with guidelines, which could be used in preparing EIAs for typical development projects in the context of legal agreements supporting the UNEP Regional Seas Programme.

The procedures and guidelines advocated by UNEP 1/ were tested through a series of concrete case studies. One of the first case studies and the way it was prepared is described in this document.

The analysis of the case study and the description of the procedures used in the environmental impact assessment (Part I and II of the document) were prepared by the Priority Actions Programme Regional Activity Centre of the Mediterranean Action Plan, with assistance of consultants (Messrs. A. Baric and A. Jernelov). The guidelines for the preparation of the EIA document for the marina were originally prepared by Messrs. A. Jernelov and U. Marinov and modified for the specific situation in Paphos by Mr. Baric (Part III of this document). The EIA document (Part IV of the document) was prepared by Mr. C. Charalambides from the Department of Public Works, Ministry of Communications and Works, Mr. L. Loizides from Department of Fisheries, Ministry of Agriculture and Natural Resources, and Mr. A. Daveronas from the Department of Town Planning and Housing. In the preparation of the document they were assisted by Messrs Baric and Jernelov, consultants to the Priority Actions Programme Regional Activity Centre of the Mediterranean Action Plan.

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PART I: ANALYSIS OF THE CASE STUDY

In evaluating the process of preparation of EIA's in Cyprus, the general background has to be kept in mind. No EIA procedure had previously been practised on Cyprus. Evolving environmental groups were suspicious of the Government's attitude to environmental questions. Governmental bodies had no experience in collaboration over multidisciplinary environmental questions.

The first positive effect of the procedure of EIA preparation was that interagency governmental collaboration was established and functioned well.

Secondly, public participation was for the first time formally introduced in Cyrpus in connection with the presentation and evaluation of the EIA documents. A wide range of NGOs and concerned individuals participated in and were in agreement with the decisions reached.

Thirdly, a decision was reached not to build the marina at the location first considered north-west of Paphos, where it might interface with turtle nesting and bird migration. Instead, a location near the airport was chosen where the marina will cause considerably less environmental disturbance.

Naturally, some problems arose as existing information was not always in the format foreseen in the guidelines and as collected data were tailored for other needs than those of an EIA. However, these problems were considered to be of minor importance and not affecting the quality of the assessment as such but only the elegance of the presentation.

As the Paphos marina was still in a very preliminary planning stage when the EIA document was produced and no technical-economical feasibility study had yet been carried out, there are a number of shortcomings in the EIA related to the technical project description.

The most obvious omissions are:

- source of construction material;
- areas to be dredged; quality and quantity of dredged material to be discharged;
- proposed stages of construction with timetable;
- description of building structure in relation to the natural landscape.

PART II: PROCEDURES USED IN THE ENVIRONMENTAL IMPACT ASSESSMENT

1. Background

The fourth ordinary meeting of the Contracting Parties to the Barcelona Convention (Genoa, September 1985), when considering the workplan of the Priority Actions Programme Regional Activity Centre (PAP/RAC) of the Mediterranean Action Plan, "stressed the interest to develop suitable methodologies for environmental impact assessment, with a view to their introduction in coastal zone development planning" 2/. The same meeting adopted ten targets to be achieved as a matter of priority during the second decade (1986-1995) of the Mediterranean Action Plan (MAP). Among these targets was 3/:

- applying environmental impact assessment as an important tool to ensure proper development activities.

In response to similar requests from other meetings convened in the framework of the UNEP Regional Seas Programme, UNEP has developed a simple and practical approach to the environmental impact assessment (EIA) 1/ which might be applicable in the context of the legal agreements supporting that Programme.

In consultation between PAP/RAC and the National Focal Point of Cyprus for the Mediterranean Action Plan, the preparation of an EIA for the Paphos Marina was among the first case studies selected to test the new approach to EIAs.

2. Request for building of a marina in Paphos

Compared to other countries in the region Cyprus has only few marinas available for international boat tourists and the existing ones are on the south coast.

The Government of Cyprus therefore identified the area around Paphos as one suitable for development of a marina in order to diversify tourism. Based on infrastructure considerations, an area north-west of Paphos was identified as the first choice.

3. Decision on the need for an EIA document

According to a newly adopted governmental policy, an EIA is a requirement for any such development project.

4. Guidelines for the preparation of the EIA document

Building on the goals and principles for EIAs, adopted by the Governing Council of UNEP and endorsed by the United Nations General Assembly 4/, and on the procedures developed for a practical approach to EIAs 1/, the guidelines for the preparation of the EIA document for the marina in Paphos were prepared by PAP/RAC with assistance of consultants (Part III of this document). The guidelines list the issues which were expected to be addressed in preparation of the EIA document for the marina in Paphos.

5. The environmental impact assessment document

The preparation of the EIA was entrusted to the Department of Public Works, and the Department of Town Planning under the General Co-ordination of the Environmental Service of the Ministry of Agriculture and Natural Resources of the Republic of Cyprus. The study was carried out to test the methodology, and the selected area is only a test area for applying the guidelines and approach.

Several consultations were held between the staff of the Department and of PAP/RAC's consultants during the preparation of the EIA.

The information used for the preparation of the EIA consisted of:

- meteorological data available from the nearby airport;
- hydrographic, microbiological and sea-current data obtained through earlier measurements, as well as measurements during the preparation of the EIA, at the site of the proposed marina and in its vicinity;
- microbiological data available from the Limassol area; and
- biological data on benthos and detailed bathymetric measurements of the proposed site collected specifically for the EIA.

The EIA was prepared in a period of 8 months (from May to December 1988) and involved an estimated time of 2 m/m (man/months) of a scientist and of 1 m/m of a technical staff.

6. Evaluation of the EIA document

The draft of the EIA was presented, together with a draft of an EIA for a sea-outfall for the Larnaca Sewerage System 5/, to the Review Meeting on Environmental Impact Assessment Procedure, jointly organized in Nicosia, Cyprus, 24-27 October 1988, by PAP/RAC, OCA/PAC and the Co-ordinating Unit for MAP, in co-operation with the Environmental Conservation Service and the Fisheries Department of the Ministry of Agriculture and Natural Resources of Cyprus.

The meeting was hosted by the Agricultural Research Institute in Nicosia and was attended by 26 participants from seven Ministries and Departments of the Cyrpus Government, one participant of a non-governmental organization from Cyprus, four participants from the government departments of four countries other than Cyprus, two UNEP staff members and two consultants to UNEP (for a full list see Appendix of this document).

The meeting started by the participants' visit to the planned location of the marina in order to familiarize them with the physical setting and the technical details of the planned project.

The visit to the site was followed by the presentation of the approach used in the preparation of the EIA and by the detailed presentation and discussion of the EIA.

The main comments and suggestions offered at the meeting may be summarized as follows:

(a) the general approach proposed by UNEP for the preparation of EIAs was considered as suitable in principle, although some amendments were introduced into the proposed procedures*;

(b) the guidelines used for the preparation of the EIA were considered, with some amendments*, as sufficient general guidelines for the preparation of EIAs related to marinas, but they should have been supplemented with more specific guidelines tailored to the concrete case of the Paphos Marina.

(c) the presented draft for the EIA was considered, after some amendments, as adequate for the decision-making process; the comments included the following:

- information on the method for erosion control of the nearby sand beach was missing;
- no information was provided on areas to be dredged and reclaimed, and on the quantity and quality of the dredged material or its disposal;
- there was no information on the expected normal operation of the marina.
- the co-operation between the experts from various ministries was pointed out as being an exceptionally good example.

The EIA document was also considered by the government Technical Committee which was established to advise the municipality of Paphos on the project.

7. Decision by the Authorizing Authority

The conclusion of the EIA study was accepted and the procedure will be normative in the future evaluation of locations for marinas in Cyprus.

So far no decision has been taken to actually build a marina in Paphos.

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* The amendments suggested at the meeting are incorporated in the document listed under reference 1/.

8. Monitoring of the impact of the marina

Not yet applicable.

9. Re-evaluation of the environmental impact assessment

Not yet applicable.

PART III: GUIDELINES FOR THE PREPARATION OF AN ENVIRONMENTAL IMPACT ASSESSMENT DOCUMENT FOR THE MARINA IN PAPHOS

Building on the goals and principles for EIAs, adopted by the Governing Council of UNEP and endorsed by the United Nations General Assembly 4/, and on the procedures developed for a new approach to EIAs 1/, the following general guidelines for the preparation of EIAs for the Paphos Marina were prepared by PAP/RAC with assistance of consultants. The guidelines list the issues which were expected to be addressed in preparation of the EIA.

1. Description of the proposed project

The proposed plan of the marina should be described including the following:

- general description of the entire project including location and structure of main and lee breakwaters, depth of water at the entrance to the marina, the number and type of boats for which the marina is planned, water and power supply, roads, dry docks, boat maintenance and repair facilities, slipways, housing units, hotel accommodation, restaurants, commercial areas, parking, etc.;
- reasons for selecting the proposed site, including a short description of alternatives which have been considered;
- access for vehicles, boats and parking;
- breakwaters, jetties, bridges, causeways, reclaimed land, and dredged channels;
- sources of construction material for breakwaters;
- all areas to be dredged and the quantity and quality of the dredged material. The area where the dredged material is to be discharged;
- drainage and sewage systems, solid waste disposal system and fuel supply to boats;
- expected quantity of sanitary waste and the means for its disposal both on land and at sea;
- description of the proposed stages of construction with timetable;
- description of the expected normal operation of the marina such as its maintenance and measures to ensure the water quality :
- description of built structures in relation to natural landscape, and
- expected movement of population during construction and operating periods.

2. Description of the environment

A description of the environment of the site without the proposed marina in the form of maps and cross sections should include the following:

(a) Physical site characteristics

- An onshore topographic and offshore bathymetric map of the site and its surroundings at a scale

of 1:5000 covering at least 2 kilometres in each direction along the coast of the proposed site, and to an offshore water depth appropriate to the proposed project;
- details of any existing or proposed offshore structures within 5 kilometres of the proposed project;
- cross sections every 250 metres along the shore, showing offshore water depth and topography, and
- physiographic features such as cliffs, terraces, beach rocks, sand dunes, and a description of their level of stability and erosion.

(b) Hydrographic and meteorological information

- Wind velocity and intensity;
- the tidal conditions and the probability of extreme conditions;
- the wave, climate and currents at the proposed site, including the probability of extreme conditions;
- hydrographic conditions of natural or artificial water channels and outlets to the sea, and
- dissolved oxygen and nutrient concentrations, and other parameters.

(c) Sedimentological information

- Longshore sand movement at the area proposed for development;
- present onshore and offshore sand accumulation and sand loss, seasonal and over a period of time; and

(d) Biological conditions

- Identification on maps of onshore and offshore habitats;
- location of main components of the habitats, e.g. areas for feeding, refuge and reproduction, and areas important for migrating species;
- protected or rare species, and
- fishing areas and species important to commercial fishing.

(e) Present land uses on site and in surroundings

- Location and size of nearby settlements;
- location and description of cultural properties;
- road and patterns of vehicle access;
- existence of beaches used by swimmers in the immediate surroundings.

3. Identification of possible impacts

An assessment of anticipated or forecasted impacts, using accepted standards whenever possible, should include the following:

- Topographic and bathymetric changes, and the occurrence of the changes during and after construction until stable conditions are resumed.
- Sand movements and sites where increased sand accumulation and coastal erosion is likely to occur.
- Oceanographic changes likely to occur over a period of some 10 years, including the location and risk of wave reflection on adjacent shores and the concentration of wave energy and currents which could endanger swimming or disturb fisheries.
- Risk of sea pollution inside and outside the marina by uncontrolled sewage, polluted surface runoff, oil and gasoline, paints and anti-fouling materials resulting in adverse environmental impacts such as change of dissolved oxygen and nutrients concentration and/or microbial pollution due to pollution and/or changes in circulation patterns.
- Impacts on flora and fauna in the area likely to be affected by the proposed project, the risk of loss of a habitat, changes likely to occur in existing habitats and the possible creation of a new habitat, and the impact of barriers to movement on migrating species.

- Impacts on nearby present or proposed land use.
- Visual impacts of construction on landscape.
- Impacts on the quality of bathing water and on the cleanliness of beach sand, if any.

4. Proposed measures to prevent, reduce or mitigate the adverse effects of the proposed marina

This section should describe all measures - technical, legal, social, economic or others - to prevent, reduce or mitigate the negative effects of the proposed marina. In addition, it should propose the elements for monitoring the effects on a long term basis, including the collection of data, the analyses of data, as well as the available enforcement procedures to ensure implementation of the measures.

PART IV: ENVIRONMENTAL IMPACT ASSESSMENT DOCUMENT FOR THE MARINA IN PAPHOS

1. Introduction

PAPHOS: (Fig. 1). Paphos is a town on the western coast of Cyprus. It is mainly an agricultural area, but has recently developed a high potential for tourism.

Paphos is about 160 km from Nicosia, the capital of Cyprus (Fig. 2), and about 70 km from Limassol which is the second largest city in Cyprus. In its vicinity are a small International Airport and the small Old Harbour, now used as a boat shelter for fishing and pleasure boats.

2. Description of the proposed project

2.1 General

The choice of the site for the Paphos Marina was based on certain planning criteria. It was decided that the marina site should meet the following basic requirements:

(a) natural protection from waves and currents;
(b) adequate water depth;
(c) proper road access;
(d) relative proximity to the centre of Paphos and nearby commercial, recreational and accommodation facilities;
(e) available land bordering on the main marina basin for siting the structures necessary for the functioning of the marina;
(f) adequate screening of the marina site in order to achieve security and effective customs control with minimum environmental intrusion;
(g) compatibility with the other main activities of the proposed Paphos Local Plan;
(h) preference to sites with available government-owned land, nearby existing management and manpower; and
(i) improvement of coastal scenery and promotion of tourism development.

Several areas, including Melanoudhia, were examined and rejected, both because of their exposure to the open sea and because of their great depth.

Finally, a location called Vikla, near the villages of Timi and Mandria, was selected. Vikla is 12 km south-east of Paphos. The existing main highway which connects Paphos and Limassol is only 3 km away from the site, with access via the Paphos airport road, which passes 150 m from the marina site. The airport itself is only 2 km away.

While the marina site is presently 12 km from Paphos, the new coastal road connecting the airport and Paphos, proposed by the Paphos Local Plan, will almost halve the distance.

The proposed project consists of the marina, an adjacent nautical club and improvement of the beaches to the east and west of the marina complex as shown in Fig. 3 and 4.

2.2 Size of the marina

The marina is planned initially for about 400 boats of different sizes with a possible future quay extension for up to 600 boats. There will be both motor and sail boats. The depth of the water at the entrance to the marina as well as in the deep water part of the basin should be at least 5 m.

2.3 Water circulation and exchange

Although passage will not be possible between the marina basin and that of the nautical club, there will be provision for water circulation from one basin to the other.

Inlets and outlets will be constructed approximately at the mean sea level along the breakwaters and in selected places to improve water circulation and exchange. From previous experience these inlets/outlets should be about 1 m in diameter.

2.4 Breakwaters

The marina itself will be protected by two breakwaters detached from the coast and oriented so that the entrance to the marina is to the east. This will protect the basin of the marina from all major wave directions.

The third smaller breakwater, partly detached from the coast, will protect the nautical club basin. The entrance to the nautical club basin will require particular attention to ensure that the reflection off the main breakwater will be kept reasonably low.

Preliminary site investigation shows the sea bottom to be rocky. To minimize the dredging in rock, the breakwaters will be situated at the required depth. Consequently, the shallow water areas will be reclaimed to provide all the land needed for the various onshore facilities.

The breakwaters will be constructed using sand stone from a quarry a few kilometres away. The reclamation material will be obtained from the same quarry, as well as from other secondary quarries.

The possibility of using precast concrete interlocking units to armour the main breakwater cannot be excluded at this stage, because no geological survey reports are available on the largest size of rocks that can be quarried. No modelling of the breakwater has been carried out, either, to determine the actual size of rocks required for armouring.

2.5 Jetties and revetment

Nearly all the berthing system of the marina will be constructed as open finger jetties to allow water circulation and minimize oscillations within the berth basins.

A revetment of low reflection characteristics to dissipate waves will be erected along the interface between the basin and the land.

2.6 Facilities to be provided at and on the berths

The facilities and services which will be installed at each berth are:

(a) water supply;
(b) electricity and lighting;

(c) telephone points; and
(d) drainage and sewage pipes.

No fixed fuel supply station is envisaged, but a mobile supply system operated by the marina staff will be provided.

There will also be mobile garbage-bin collectors situated at convenient points along the jetties. Floating toilets will be located at several points close to the jetties, connected to the sewage pipeline system.

2.7 Land facilities and services

The land facilities within the marina provide an easy, comfortable and, to some extent, independent short sojourn for marina visitors.

These facilities which are shown also in Fig. 3 are described below:

Location No.	Description
8	Boat service yard with lift and all necessary buildings
9	Boat parking space
10	Car parking space
11	Marina main building which includes: (a) Administration section (b) Information, telecommunication and Post Office (c) Customs, Police and Health Section (d) Medical unit (e) Restaurant, toilets, shower and laundry places (f) Shops and duty free shops (g) Recreation and indoor sports (h) Quarantine and customs store (i) Fire brigade
12	Petrol station
13	Road network
14	Gate house
15	Tennis courts
16	Swimming pool
17	Security fencing
18	Sanitary treatment plant
19	Access road to marina
20	Nautical club area
21	Restaurant
22	Access road to nautical club and beach
23	Rent-a-car and taxi services

2.8 Stage of construction and maintenance

Nearly all items of work as shown in Fig. 3, including the three breakwaters for both the marina and the nautical club, must be constructed during the first stage because all are considered necessary. During the second stage, if necessary, the jetties may be extended to their full length.

Serious siltation problems are not expected because there is no serious littoral sand movement near the entrance to the marina.

2.9 Disposal of the sanitary waste of the boats and aeration of the water

Although it would be desirable to have a sewerage network around the marina basin, for direct connection to sanitary pipes of the boats, this is not possible due to the practical and legal difficulties of operating such a system in Cyprus, as in other Mediterranean countries. It is, therefore, suggested to install

a small sewerage network along the deeper pier of the marina, so that heavy displacement boats, at least, will be connected to it. This small network will be connected with the marina treatment plant, sited in area 18 (see Fig. 3).

For the remaining small boat jetties, a sewerage network will be connected directly to the floating toilets situated at convenient locations.

The smaller boats crews are expected to discharge their toilets in deep water before entering the marina and, once in the marina, to make use of the floating toilets.

Nevertheless, it is expected that some discharge will take place inside the marina; consequently a few air compressors could be installed at selected points to diffuse air in the marina basin.

In addition, it is expected that the layout of the three breakwaters together with the pipe inlets/outlets will make use of the existing currents to facilitate water circulation in the marina basin.

2.10 Expected quantity of sanitary waste and means for its disposal both on land and in the sea

It is expected that the mean daily flow of the sewage discharge of the marina will be around 80 cm per day and the maximum flow around 10 cm per hour.

The sewage will be treated at a biological treatment plant which will operate independently until the implementation of the Central Sewerage Scheme of Paphos.

The treated water will be used:

(a) for irrigation purposes on the nearby agricultural land, mainly for fodder and industrial crops;
(b) for watering the green areas of the marina; and
(c) for cleaning the roads and paved areas of the marina.

It is expected that the treatment plant will need an area of approximately 20 by 40 metres. This area is located close to the main entrance to the marina (see number 18 in Fig. 3).

Special arrangements will be made to ensure that the treatment plant will not be visible from the nearby roads. The base of the plant will be approximately 2 metres below ground and its top, 3 metres above ground. In addition, the area surrounding the plant will be planted with medium height trees.

Fig. 5 and 6 show two main treatment processes which can be used for the Paphos marina. The processes are the "Extended Aeration System" and the "Contact Stabilisation System". The axonometric projection shows the Extended Aeration System in greater detail.

2.11 Expected movements of population during construction and operating periods

The only movement of population expected during the construction period is that of the manpower working on the marina building. Other large projects, like hospitals and hotel complexes, have already been constructed in the Paphos area. Therefore, it is expected that the local construction industry will face no problems of adequate manpower.

It is expected that during the operation period, the marina staff will come from Paphos and the nearby village be shared to some extent with the nearby airport terminal complex.

3. Description of the environment

The entire onshore area around the marina site is a plateau sloping slightly inland, see Fig. 7, 8, 9 and 10. There are a few very small hills and the remaining land is intensively cultivated, due to its fertile soil,

and irrigated by the Great Irrigation Scheme of Paphos.

Between the marina site and the airport (Fig. 11) there is a small forest of approximately 40 hectares, a part of which is periodically used by scouts for camping.

Apart from the airport buildings, there are several small buildings, a restaurant and a house east of the marina. The restaurant is open all year round, but is busy only during the summer.

3.1. Physical site characteristics

3.1.1 Western and south-western coast

West of the marina site there is a small bay about 400 m long, (Fig. 3). The land bordering this bay is low-lying and flat with soft soil. The wide beach is covered by coarse sand and medium-sized gravel.

The sea bottom is not sandy but gravelly with boulders, rock outcrops and pockets of sand. The sea bottom slopes gradually for 200 m becoming abruptly very steep thereafter. The bay is heavily used for bathing during summer.

Further to the south-west the coastline forms a small cape with practically no beach where heavy erosion has left a concentration of rock outcrops which extend considerably offshore.

3.1.2 Marina site

The land behind the coastline rises to about 2-4 m above mean sea level.

Rock outcrops form the western part of the coast, while to the east the coastline gradually changes to softer formations with gravel on the beach. The nearshore sea bottom is rocky with gravel and pockets of sand. The sea bed is not uniform, as shown in Fig. 13 and 14. It slopes to 5 m depth at a distance of about 450 m offshore. The area, except for the eastern part, is not suitable for bathing.

3.1.3 East and south-east of the marina

East of the marina the coastline is composed of soft formations and the beach becomes sandy while the sea bed is partly sandy and partly gravelly with rock outcrops.

The area is heavily used for bathing only during the summer. Further to the south-east of the marina the situation is more or less the same.

The beach widens with more gravel than sand, especially at the mouth of the small river.

3.1.4 Onshore structures

There are no onshore structures near the shore on either side of the proposed marina. A possible reason for this is that the area has not been developed extensively for tourism.

For the same reason there are no hotels or other accommodation except for a café/restaurant east of the marina.

3.2. Hydrographic and hydrologic information

Tidal range as elsewhere around Cyprus is very small, varying almost about $\pm$35 cm from the mean sea level.

The coastline of Paphos is exposed to the prevailing waves and winds coming from the north-west sector as shown in Fig. 15, 16 and 17.

The effective fetch length is more than 500 m. The marina site is located within the bay of Mandria

which is protected from the north-west sector but is open to the less exposed sector from west to south-east via south. The site is considered to be one of the best protected areas of the Paphos coastline.

Wave directions based on ship observations are shown in Fig. 17. For preliminary studies a design wave height of about 5 m with a wave period of about 10 s is considered to be likely until more complete measurements are made.

The available data on currents are scarce but there are surface wind-generated currents and wave-induced currents whose direction depends on the wind and wave directions. A net easterly wave-induced current seems to prevail in the area.

The freshwater input is limited to winter rains only. There is a small river mouth to the south-east. In the past, this river was the source of the gravel deposits in this area. Recently, however, because of the increased utilization of the river water, the river runoff to the beach has decreased.

The oxygen concentration in the area ranges from 4.5 ml/l at the surface to 5.5 at a depth of 50 m, and the saturation is above 100% for all depths.

From existing measurements, as shown in Tables 1 and 2, the bacterial counts (F.C./100 ml) at two stations on the site of the proposed marina show no microbial pollution.

3.3 Sedimentary properties

The coastline of Paphos, as previously mentioned, is exposed to the prevailing waves and winds coming from the north-west sector which is in fact the least favourable. Nevertheless, the site is situated in a rather protected bay (see Fig. 10).

The westernmost to north-westernmost part of the coastline, near the small cape, has been considerably eroded due to strong wave activity. Even though permanently exposed to erosional processes, the coastline stability has not been affected since erosion has made rock outcrops prominent over the centuries.

Further eastward, towards the marina, although the wave activity is reduced, the easterly wave-induced currents have also eroded the coast, resulting in prominent rock outcrops which provide some protection to the area. The movement of littoral sand in this area is very small.

East and further south-east of the marina, there are considerable quantities of nearshore sand and gravel, especially near the river mouth. There are three possible explanations for the presence of sand and gravel in this area:

(a) river runoff;
(b) slowing down of the easterly longshore current which possibly transports some littoral material; and
(c) the erosion of soft depositing fine material on the beach where it remains since there are no strong longshore currents to take it away.

3.4 Biological conditions

3.4.1 State of benthic communities at different depths

The benthic flora and fauna from the proposed site of the marina were sampled at four stations, using a dredge sampler (orange peel) (See Table 3).

The stations are located at 1, 2, 3 and 4 fm depths offshore. The data are given in Table 11 (for each station-depth). Twenty grab samples of 5 litres were collected at each station.

The bottom consists of coarse sand as shown by hydrometer analysis (according to B.S. 1377 of 1975). The percentage of fineness decreases considerably at the depth of 4 fm where the bottom mainly

consists of coarse sand and shingle.

The samples showed the presence of marine phanerogams *Posidonia oceanica* and *Zostera nana* at the depth of 3 fm. *Posidonia oceanica* occurs in small patches.

The green marine alga *Caulerpa prolifera* and the brown marine alga *Padina pavonina* occur in shallower waters at 1 fm depth.

The ecological study shows a low diversity of fauna with 18 animal species represented in the samples and a high proportion of marine worms. Mainly single specimens were recorded from the samples so that the total biomass was very low.

3.4.2 Fish species

The fishes red mullet (*M. barbatus*), picarel (*M. smaris*) and bogue (*B. boops*) were most frequently found in the study area.

There are no fish or shellfish farms in the area and none are anticipated in the near future.

3.4.3 Notes on the terrestrial fauna and flora of the area

The land adjacent to the coast is agricultural and is used for growing cereals. A generally narrow belt of uncultivated land fringes the beach. The vegetation on this belt is typical of the Paphos area, with some grasses and *Limonium, Sinuatum, Malconia* sp. and some wild asparagus species.

There is, however, one patch which merits more attention. This is found on the beach, in the middle of the bay, where in the narrow uncultivated belt there is a small seepage, apparently natural, with a vegetation community characteristic of such seepages, *Rubus sanctus, Phragmites australis, Juncus* sp. etc.

Of the fauna, only one lizard was found (*Acanthodactilus schreiberi*) and some snails (*Helicella* sp.) on halophytes. Of the marine fauna that inhabits the beach, no ghost crabs were found. Two *Caretta* turtle nests were found, one on the beach east of the café and one on the western beach in June.

3.5 Present land use of the site and its surroundings

Two to three kilometres from the marina site, there are two villages, Timi and Mandria, of about 700 and 500 inhabitants respectively. The villages have not been developed in the modern sense. Fig. 18 shows the present land use and Fig. 19 the present town planning zones.

4. Identification of possible impacts

4.1 Coastal impacts

Although several detailed studies are not available (see section 4.3), an effort has been made, using all available data and visual observations and an examination of the present condition of the coastline, to foresee the possible coastal impacts, which are as follows:

(a) The net longshore currents have an easterly direction and the amount of littoral sand movement as previously explained is small. Therefore a possible small sand accretion may take place within the small bay west of the nautical club. This accretion, however, is not likely to be enough to improve the existing poor sea bed conditions of this bathing bay. So, any substantial and quick improvements in this area must be obtained through beach improvement works.

(b) Along the east side of the marina where at present there is a medium sandy beach, the following impacts are expected:

- The south-west storm waves, when diffracted off the main marina breakwater will create some wave concentration along the east side of the beach.
- The south to south-east storm waves, though of smaller intensity, when reflected off the lee marina breakwater, may cause some difficulties for bathers in that area.
- The marina breakwaters will intercept the small easterly littoral movement, if any, and as a result there may be some erosion along the east side beach.

Furthermore, the existing beach at number 29 will be very much in the lee of the secondary breakwater at number 2, and as a result the existing beach will be "buried" behind the breakwater (see Fig.3).

In order to improve the expected conditions, the area can be protected by constructing an offshore breakwater (No. 18) together with a groyne at the position No. 21 (see Fig. 3).

These beach improvement works will improve the wave dissipation characteristics of the bathing area and also provide suitable conditions for the realignment and stabilization of the beach to a more acceptable position as shown by the number 26 (see Fig. 3). The replenishment of the bathing area with sand could either be achieved by littoral sand movement from wave diffraction, (which may take a few years because of the small littoral movement) or by artificial supply of sand from other areas.

No other serious coastal or bathymetric changes are expected in the area.

Nevertheless, the beach east of the offshore breakwater should be well monitored to ensure that, in the case of any changes, there will be enough data to proceed with some protection works.

4.2 Risk of sea pollution

Only a few problems are foreseen from oil, paints and anti-fouling materials assuming that the proper prevention and control measures are taken in the marina. This judgement is based on the experience of the operation of the Larnaca Marina. Over the last ten years only five minor oil spills have occurred in this marina causing no serious pollution damage.

The operation of the marina should not result in any microbial pollution outside the marina, provided the control measures are enforced in the marina.

Table 2 shows bacterial counts at two stations situated at the east side of the SHERATON marina in Limassol. This marina can accommodate 290 boats plus 50 on the dock. It started operating in September 1986 at 90% of its capacity. From Table 2 it can be seen that there is no increase in bacterial counts in the area.

From the above observations, no serious problems for the nearby beaches or fishing areas are expected to occur.

4.3 Impacts on marine flora and fauna

From the marina operation no serious effects on the marine flora and fauna of the area are expected, apart from local disturbances in the vicinity of the marina.

Some disturbance can be expected to the limited turtle breeding on the beaches.

4.4 Visual impacts

It is expected that the various structures of the marina could adversely affect the landscape of the area.

To safeguard or minimize this problem the following measures will be taken:

- nearly all breakwaters will be detached from the coastline;
- the rock armouring for the breakwaters will be of a similar nature as the rock outcrops in the area;

and

- all buildings will be low, not exceeding two storeys.

4.5 Impacts on the nearby land use

At present nearly all land in the marina area is used for agricultural purposes. After the construction of the marina and especially if there are also some improvements to the nearby beaches, the adjacent area will gradually become a tourist resort demanding construction of new buildings and other developments.

4.6 Airport noise

A possible disadvantage of the proposed site is the aircraft noise which is expected to increase in the future. Fig. 20 shows the noise contours both in PNdB and NNI units, which are expected in the area. The estimation of the NNI units was based on the following formula:

$$NNI = LPN\ max + 15 \log. N - 80$$

where LPN max represents the mean maximum value of perceived noise level in PNdB units and NNI represents the number of flights (landings and take-offs) which are expected between 06.00 and 18.00 hours. Fig. 20 shows two sets of NNI values. The first calculation was based on the assumption that there are only 10 flights between 06.00 and 18.00 hours and the second that there are 50 flights. It must be mentioned here that according to 1987 data, the number of flights recorded during the summer of 1987 was 25 to 30, the total number of flights during the same year was 3341 and the total number of passengers which passed through Paphos airport was 268,700. These data suggest that it is very likely that, by the year 2000, Paphos airport will reach the number of 50 flights per day so that the estimate of the NNI values mentioned above is realistic.

Based on the above, it is assumed that the marina site is presently not affected by the aircraft noise, but by the year 2000, some protection measures, like the insulation of the marina buildings, should be provided (see Table 4).

In addition, it must be mentioned that the proximity of the chosen site to the Paphos Airport offers the opportunity for the marina to share the customs, immigration, police, taxi and other services already existing at the Paphos airport.

5. Proposed measures to prevent, reduce or mitigate the adverse effects of the proposed marina

5.1 Technical measures

The summary of the various measures, which have been recommended in this report to minimize the adverse effects of the marina, are listed below:

1. Shore protection and beach stabilization along the east side of the marina;
2. installation of floating toilets at various locations along the jetties;
3. installation of central sewerage and disposal systems for direct connection to large boats and to the floating toilets;
4. installation of inlet/outlet pipes along breakwaters;
5. interconnection of the basins of the marina and the nautical club;
6. installation of air compressors;
7. construction of suitable surface drainage, especially in the boat repair area, to drain away all unsuitable substances like paints, oils etc. from the basin;

8. installation of a mobile unit for fuel supply to boats;

9. construction of open type jetties to assist the water circulation; and

10. examine the possibility of planting tall trees around the land side of the marina to reduce aircraft noise.

5.2 Legal measures

1. Enforcement of practical regulations and penalties for fouling or polluting the marina and introduction of all the necessary legislation to this effect; and

2. Preparation of a study with proposals for the landscaping of the quarry after the completion of the works.

5.3 Elements for monitoring and research

In order to minimize various possible impacts as a result of the proposed construction, it is recommended to carry out the following detailed surveys.

5.3.1 Prior to the design of the project:

(a) Topographic and hydrographic surveys;
(b) offshore wave and current measurements; and
(c) littoral movement surveys.

5.3.2 During the design stages:

(a) Model studies of the stability of the breakwaters, using both rock and precast concrete interlocking units;
(b) model studies to examine the reflection characteristics of the breakwaters, at both the entrance to the marina and the nautical club;
(c) model studies to examine the capability of the marina basin to circulate and exchange its water through the nautical club basin and vice versa;
(d) model studies to examine the possible coastal effects especially along the eastern side; and
(e) geological and seismic studies for all major structures including breakwaters because of the earthquake risks in this area.

5.3.3 During the operation period:

(a) Hydrographic surveys along the eastern coastline up to the river mouth (twice a year);
(b) aerial photography just prior to and after construction which should be repeated every 2-3 years; and
(c) regular microbial pollution testing of the marina basin and of the bathing area No. 26 (see Fig. 3), twice per month during the summer season.

* * *

REFERENCES

1/ UNEP: An approach to environmental impact assessment for projects affecting the coastal and marine environment. UNEP Regional Seas Reports and Studies No. 122. UNEP, 1990.

2/ Report of the fourth ordinary meeting of the Contracting Parties to the Convention for the Protection of the Mediterranean Sea Against Pollution and its related Protocols. UNEP/IG.56/5, Part I, para. 89. UNEP, 1985.

3/ Ibid. Part II, para. 17 (b) and (c).

4/ Decision 14/25 of UNEP Governing Council; 17 June 1987. UNEP/GC/14/26, Annex I.

5/ UNEP: Environmental impact assessment: Sea-outfall for the Larnaca Sewerage System. UNEP Regional Seas Reports and Studies No. 131. UNEP, 1990.

ANNEX 1

LIST OF FIGURES

FIG. 1

ENVIRONMENTAL IMPACT
ASSESMENT OF THE PAPHOS MARINA

MAP OF MEDITERRANEAN

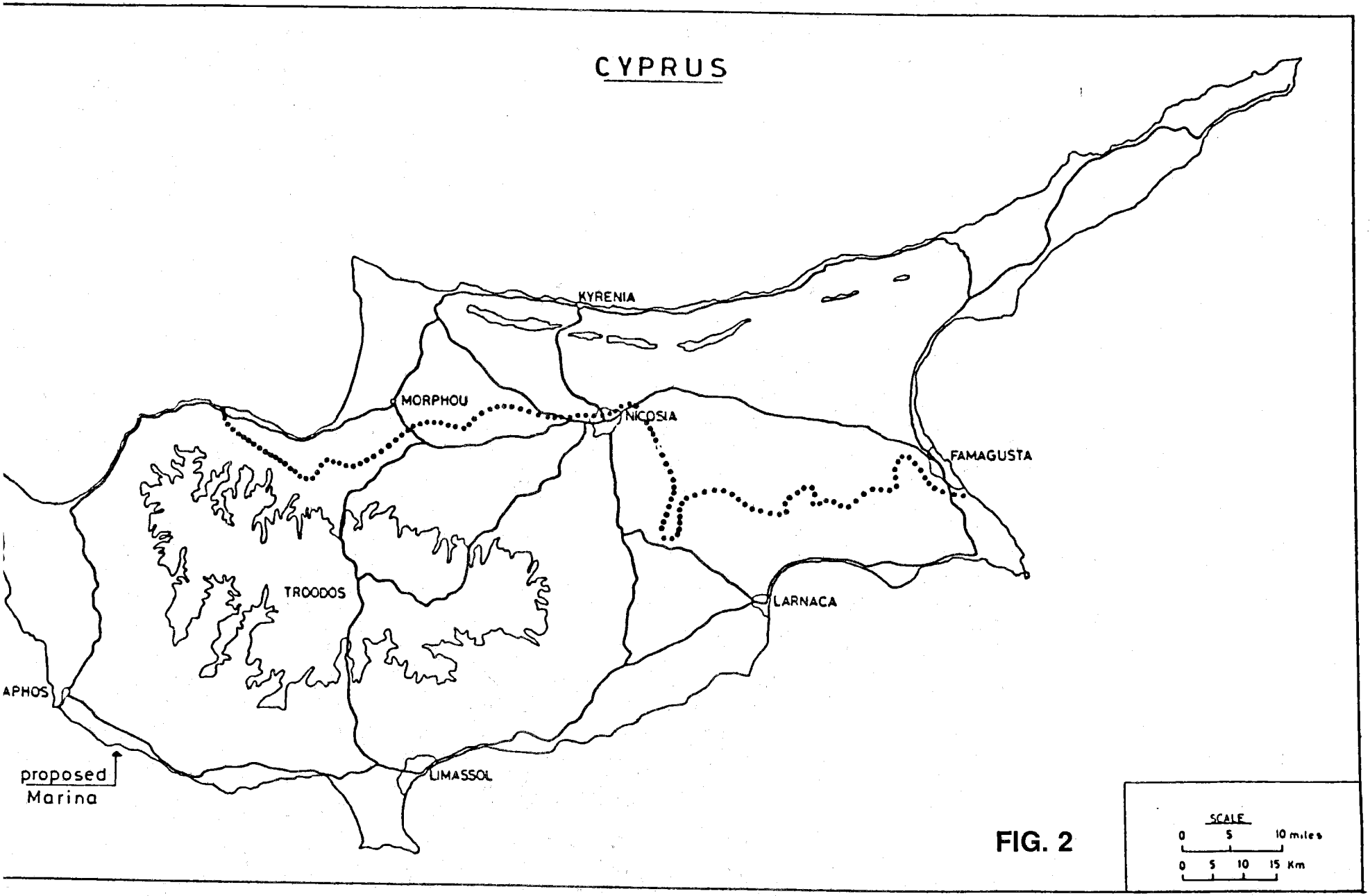

CYPRUS
KYRENIA
MORPHOU
NICOSIA
FAMAGUSTA
TROODOS
LARNACA
APHOS
proposed
Marina
LIMASSOL
SCALE
0 5 10 miles
0 5 10 15 Km

FIG. 2

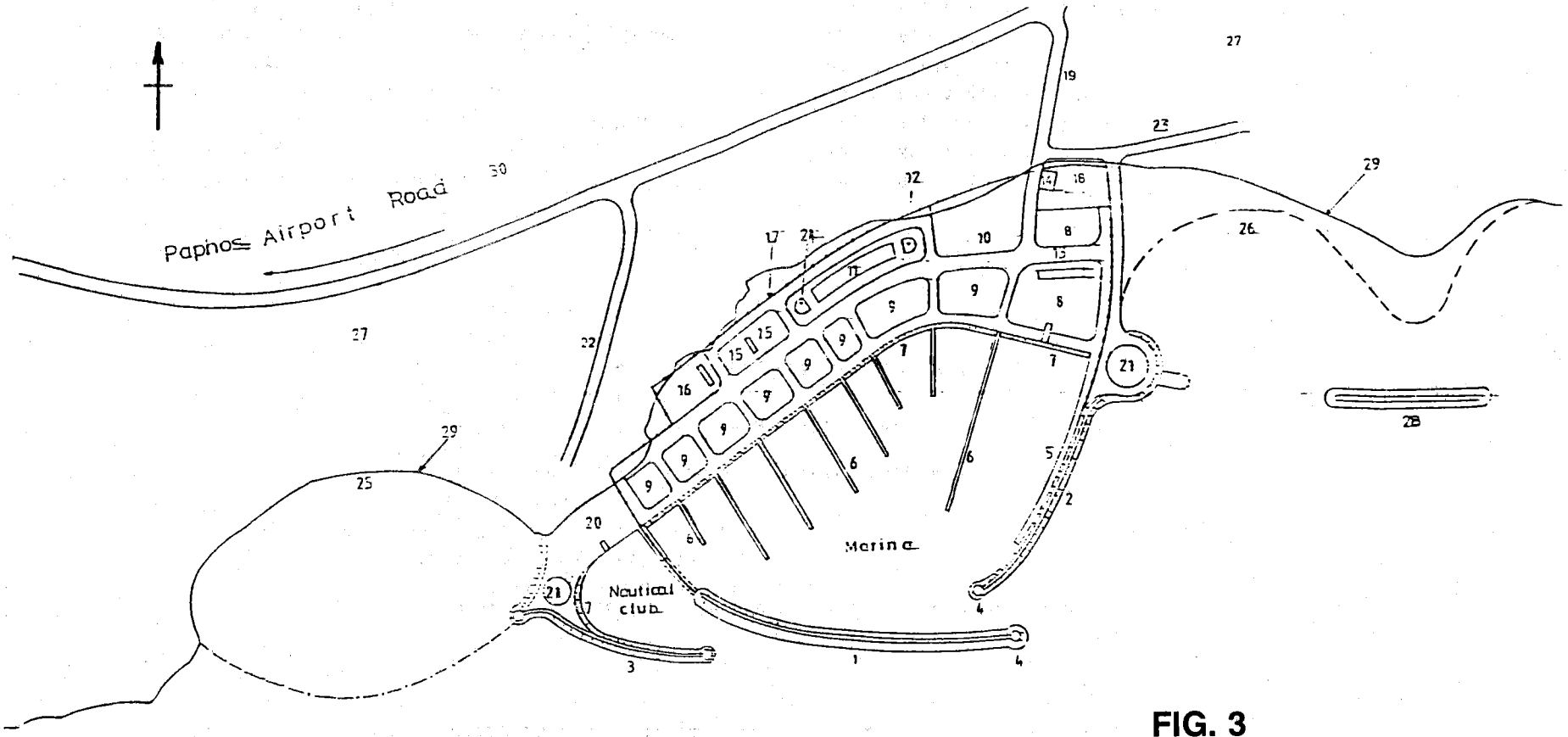


FIG. 3

ENVIRONMENTAL IMPACT
ASSESMENT OF THE PAPHOS MARINA

GENERAL LAY OUT OF THE MARINA

Scale 1:5000

PAPHOS MARINA PROJECT

DESCRIPTION OF THE PROPOSED WORKS

1. Marina main breakwater with low reflecting characteristics by the entrance to the nautical club
2. Marina secondary breakwater
3. Nautical club main breakwater
4. Navigation lights
5. Deep water quay, with telephone, electricity, water and sanitary services
6. Jetties of various depths with similar services
7. Low reflection revetment
8. Boat Service Yeard with lift and all necessary buildings
9. Boat parking space
10. Car parking space

11. Marina main building which includes:
    - i) Administration section
    - ii) Information, telecommunications & Post Office
    - iii) Customs, Police and Health Section
    - iv) Medical unit
    - v) Restaurant, toilets, showers and laundry places
    - vi) Shops & duty free shops
    - vii) Recreation and indoor sports
    - viii) Quarantine and customs store
12. Petrol station
13. Road network
14. Gate house
15. Tennies courts
16. Swimming pool
17. Security fencing
18. Sanitary treatment plant
19. Approach road to Marina
20. Nautical club area
21. Restaurant
22. Approach road to nautical club and beach
23. Approach road to restaurant and beach
24. Rental and taxi service
25. Beach improvement scheme
26. Beach stabilization and improvement scheme
27. General development area
28. Offshore breakwater
29. Existing beach
30. Existing road to Paphos airport

FIG. 4

ENVIRONMENTAL IMPACT
ASSESMENT OF THE PAPHOS MARINA

GENERAL LAYOUT OF THE MARINA

"DESCRIPTION"

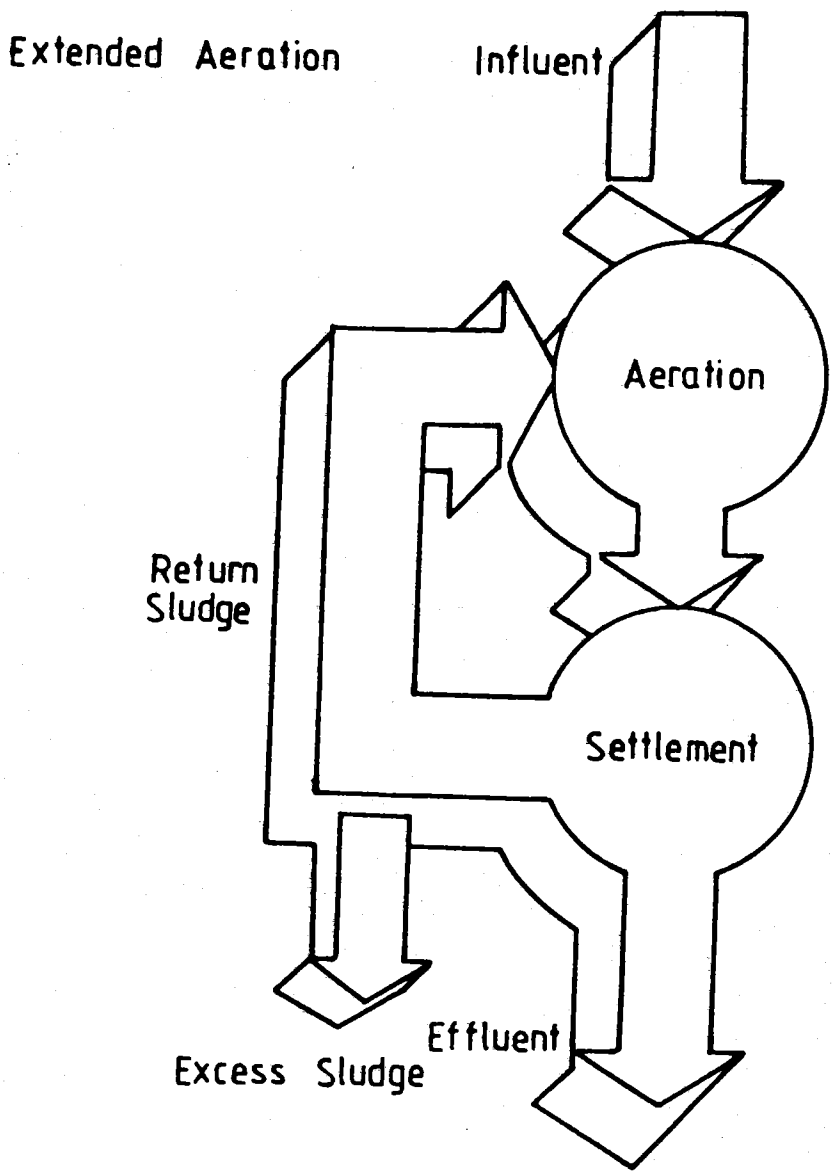

Extended Aeration
Influent
Aeration
Return Sludge
Settlement
Effluent
Excess Sludge

FIG. 5

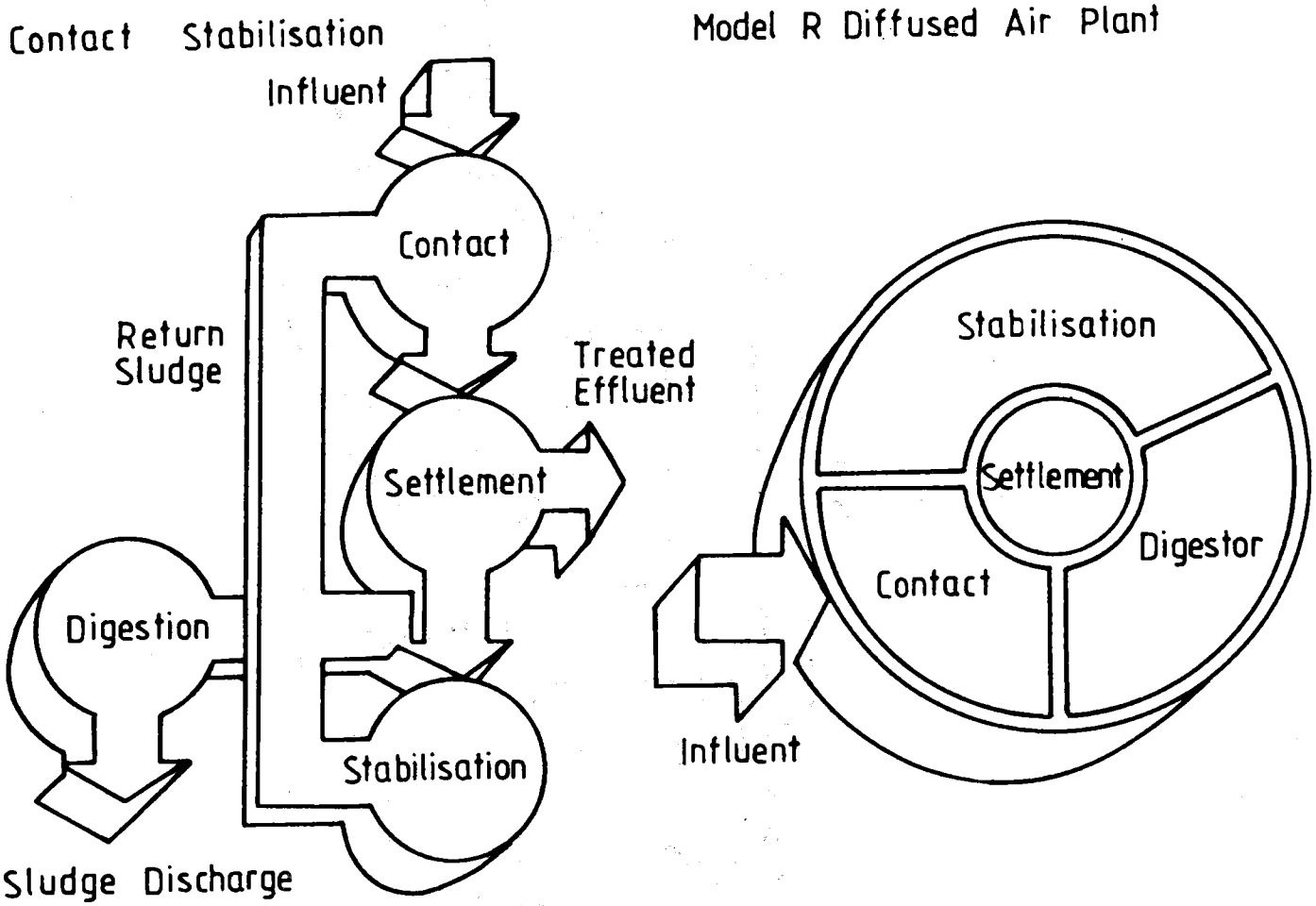

Contact Stabilisation
Influent
Contact
Return Sludge
Treated Effluent
Settlement
Digestion
Stabilisation
Sludge Discharge
Model R Diffused Air Plant
Stabilisation
Settlement
Digestor
Contact
Influent

FIG. 6

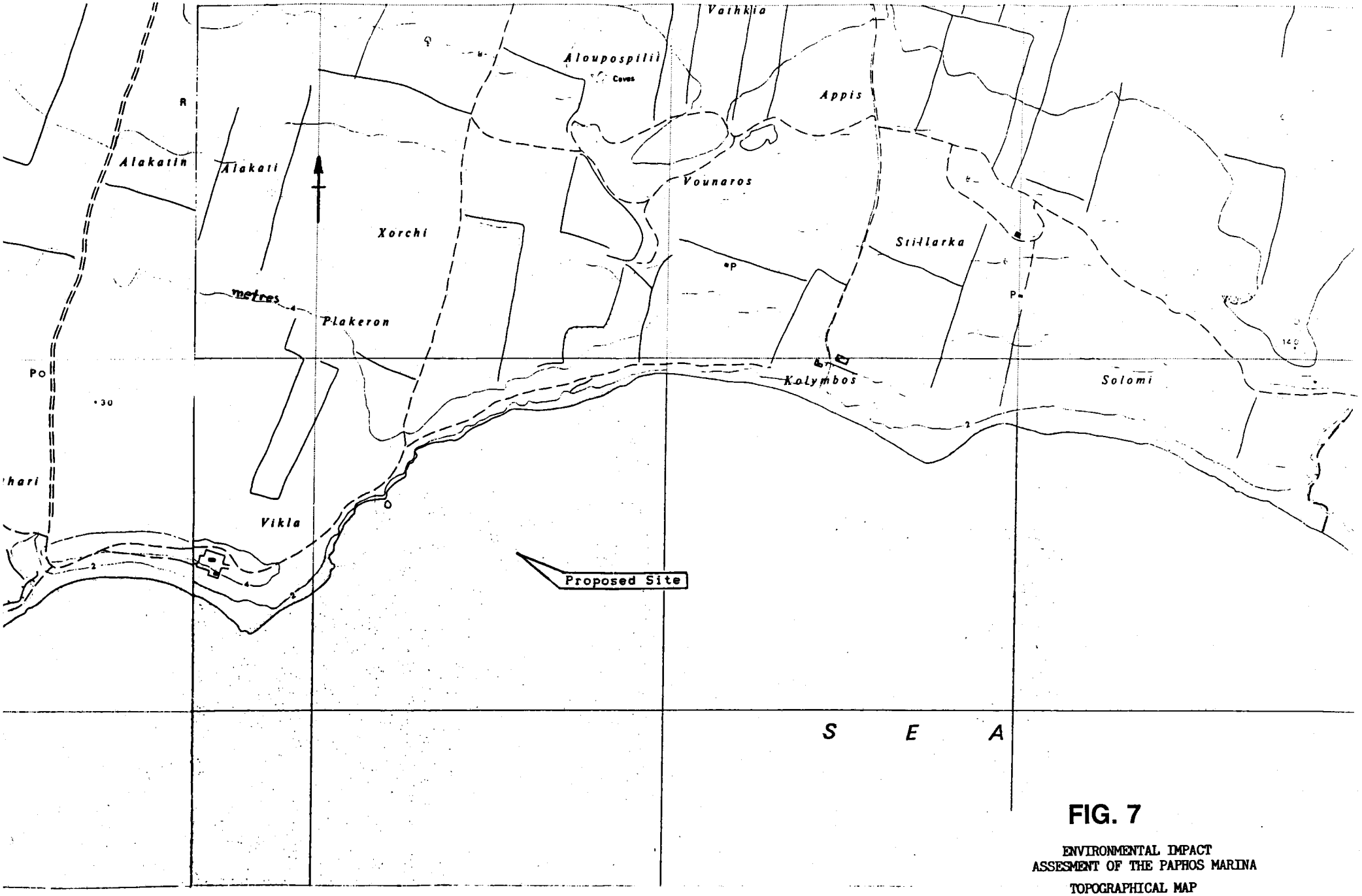


FIG. 7

ENVIRONMENTAL IMPACT
ASSESMENT OF THE PAPHOS MARINA

TOPOGRAPHICAL MAP

Scale 1:5000 PLAN NO. 3

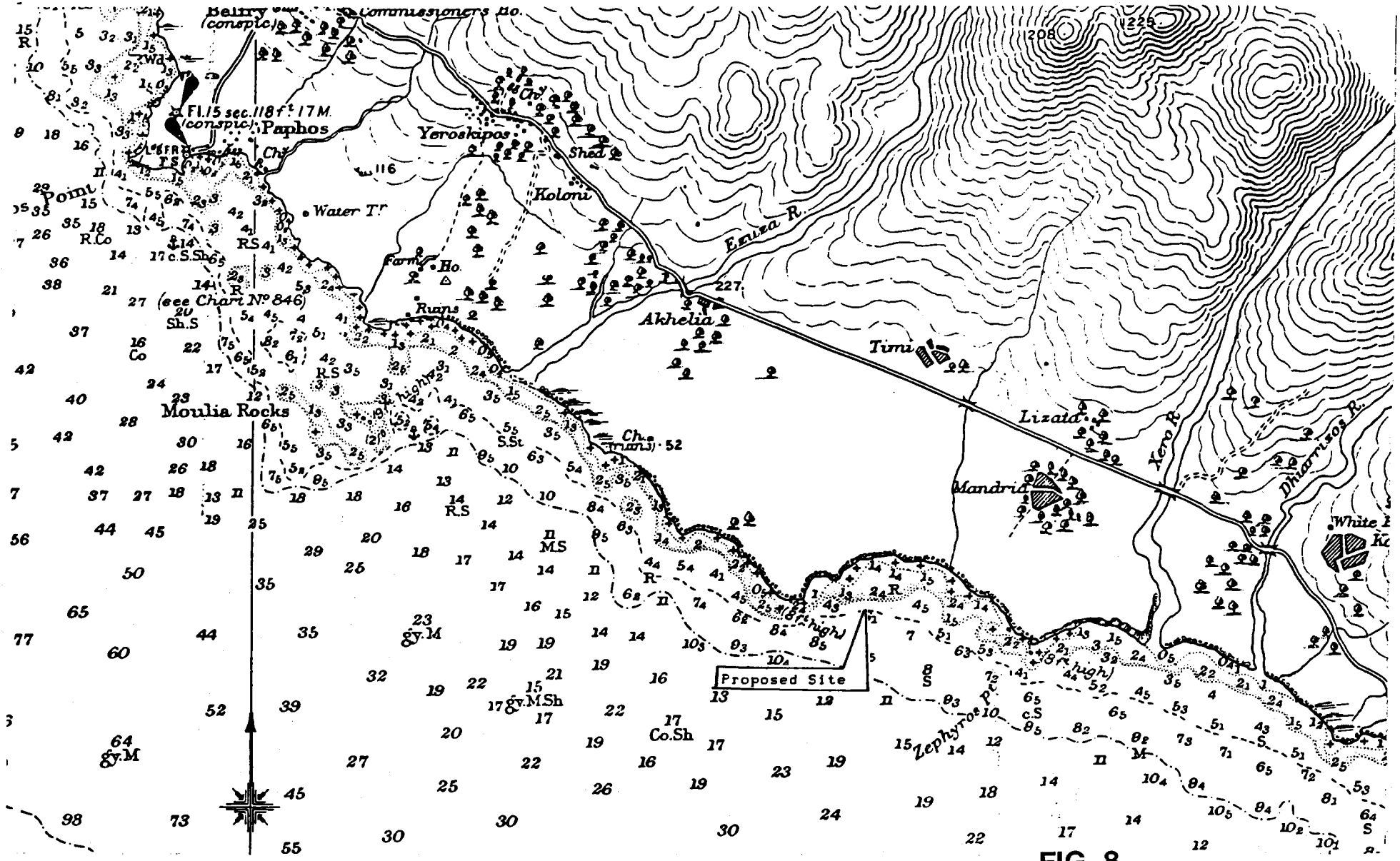


FIG. 8

ENVIRONMENTAL IMPACT
ASSESMNENT OF THE PAPHOS MARINA

BATHYMETRIC CHART
(fathoms)
Scale 1:50000

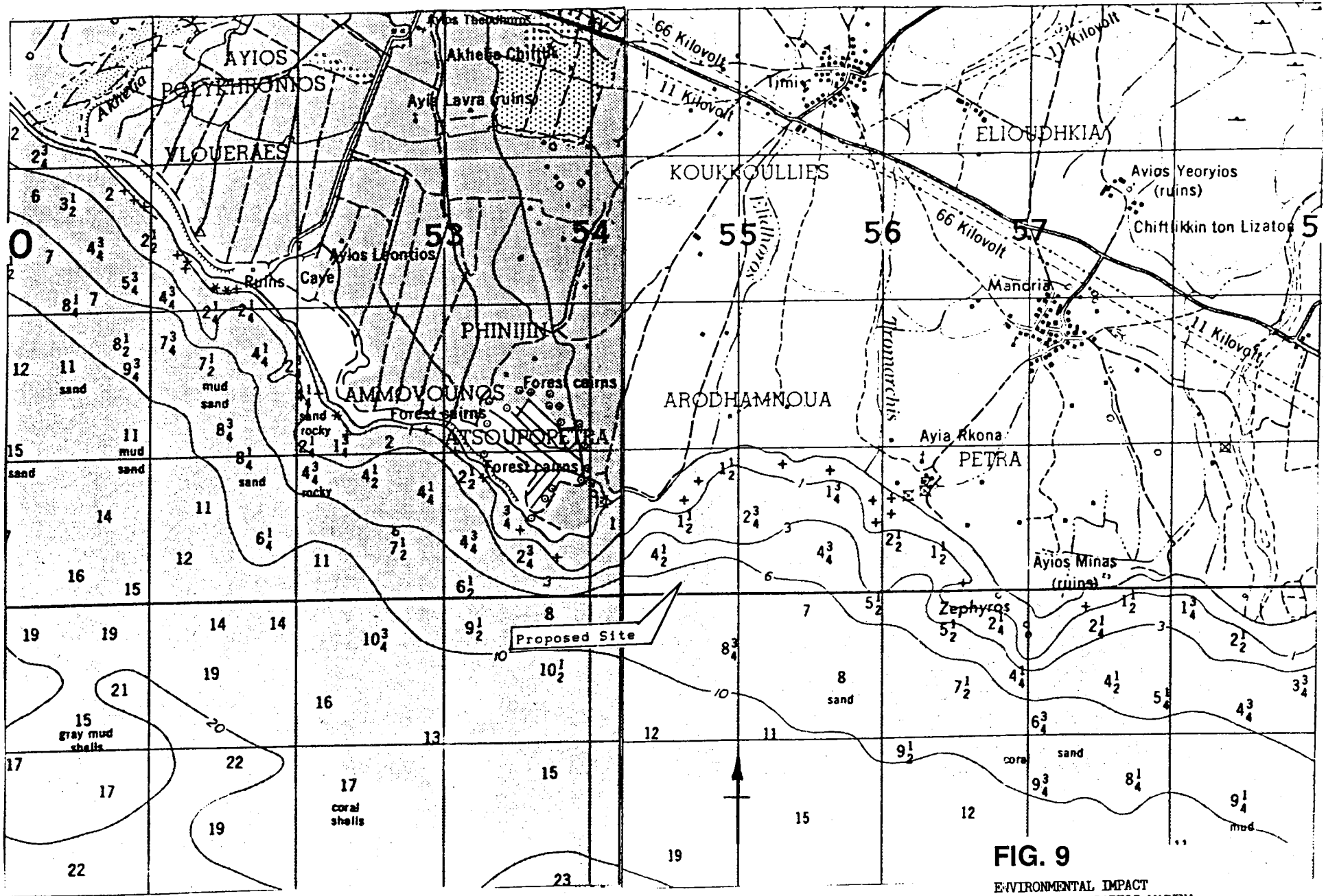
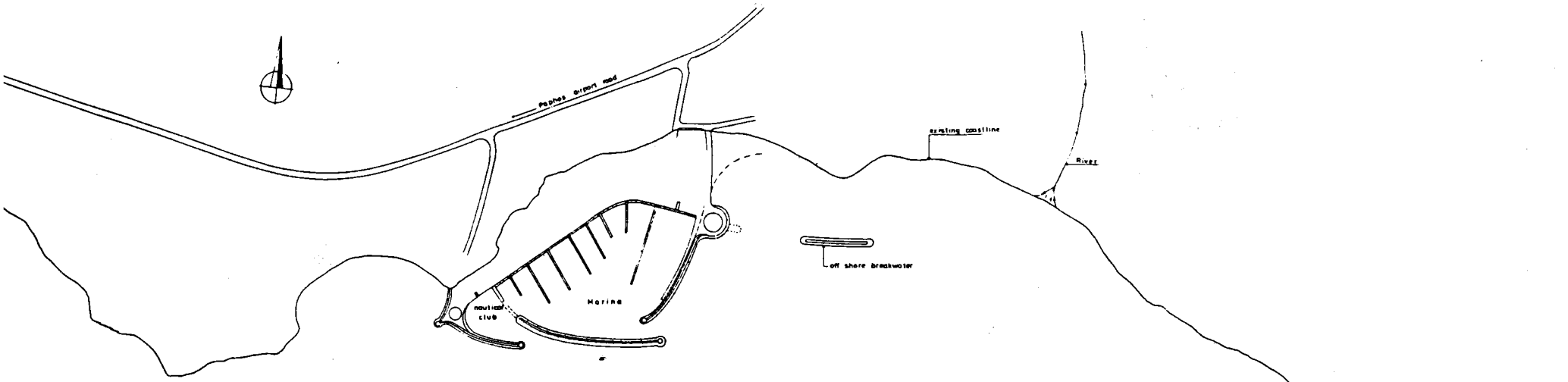


FIG. 9

ENVIRONMENTAL IMPACT
ASSESMENT OF THE PAPHOS MARINA

BATHYMETRIC CHART
(fathoms)

Scale 1:25000



Description	Coastal Observations					
formations	Low, soft ground nearly plane (agricultural)	Low, soft ground nearly plane (agricultural)	Low, soft ground nearly plane (agricultural)	Low, soft ground nearly plane (agricultural)	Low, soft ground nearly plane (agricultural)	Low, soft ground nearly plane (agricultural)
line	Rock outcrops and soft formations	Soft formations	Rock outcrops and some soft formations	Soft formations	Soft formations	Soft formations (River deposits)
line	Rock outcrops	Sand and gravel with some rock at the boundaries of the bay	Rock outcrops	Sandy	Sand and rock	gravel and sand
conditions	Rock outcrops	Rock and gravel	Rock	Sand and rock	Rock outcrops	gravel/ sand and rock
wave direction off shore	W N	W N	W N	W N	W N	W N
current — near shore	→	reduced because of morphology and refraction	→	reduced	→	reduced →
current — off shore	⌒	⌒	⌒	⌒		
shore transport	Very small (no movable material)	Very small (no movable material)	Small, from coastal erosion	Small	Small	Small
condition — prior	erodable but stable because of rock outcrops	Stable	Partly stable because of rock	Stable	erodable but stable because of rockoutcrops	possibly stable (course material)
condition — after	-II-	Stable	Marina	Possible erosion		
	none	improvement of sea bottom conditions if required	none	Realignment of beach and stabilization, off shore breakwater	none	none
prior	none	none	due to Marina users	none	none	none
after				possible		
	none	none	Central system of disposal	Subject to Morel studies	none	none
wind	W N	W N	W N	W N	W N	W N
1:30m						

NOTE
All statements have been based on visual inspection and bathymetric charts.

FIG. 10

ENVIRONMENTAL IMPACT ASSESMENT OF THE PAPHOS MARINA

COASTAL OBSERVATIONS

Scale 1:10000

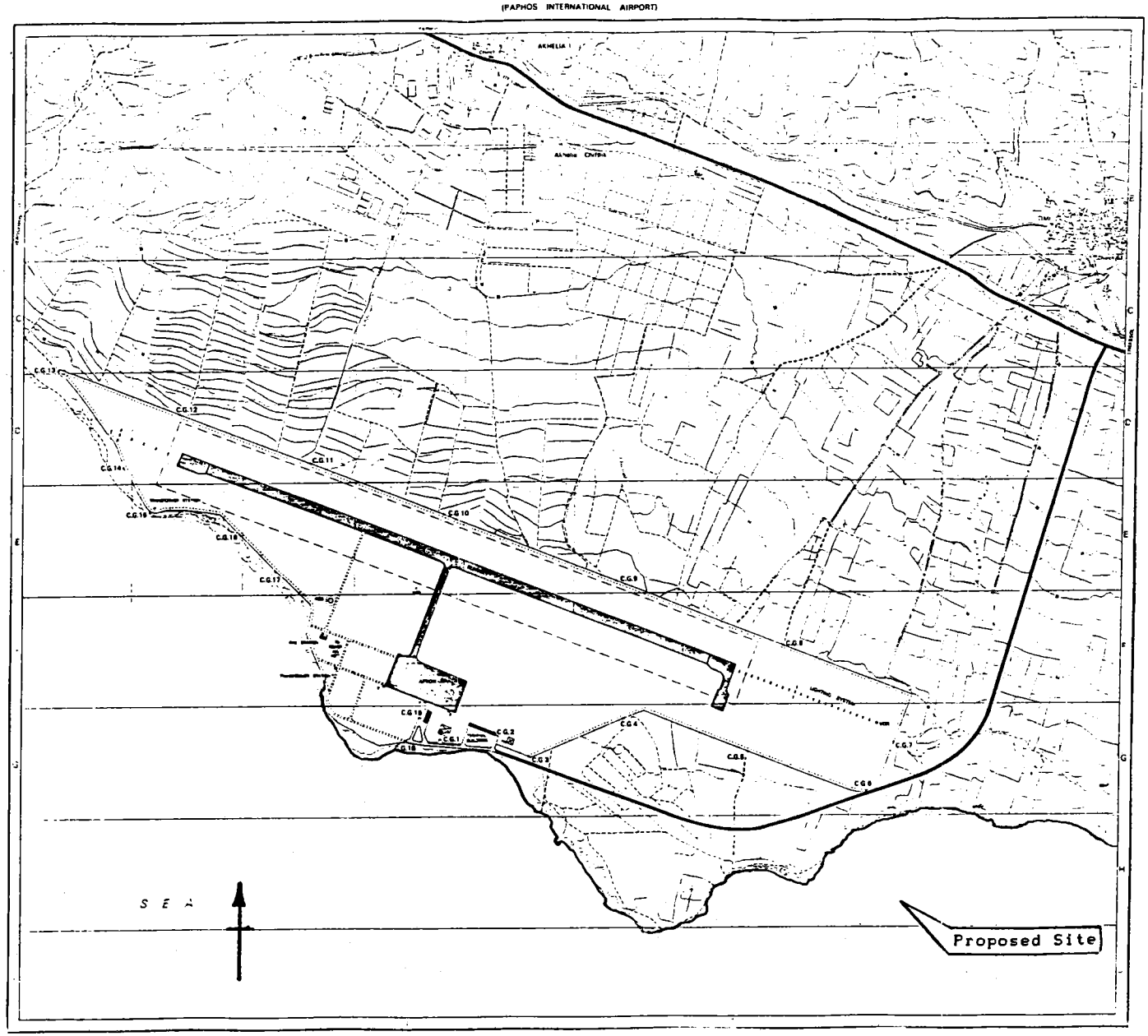


FIG. 11

ENVIRONMENTAL IMPACT
ASSESMENT OF THE PAPHOS MARINA

PAPHOS AIRPORT

Scale 1:20000

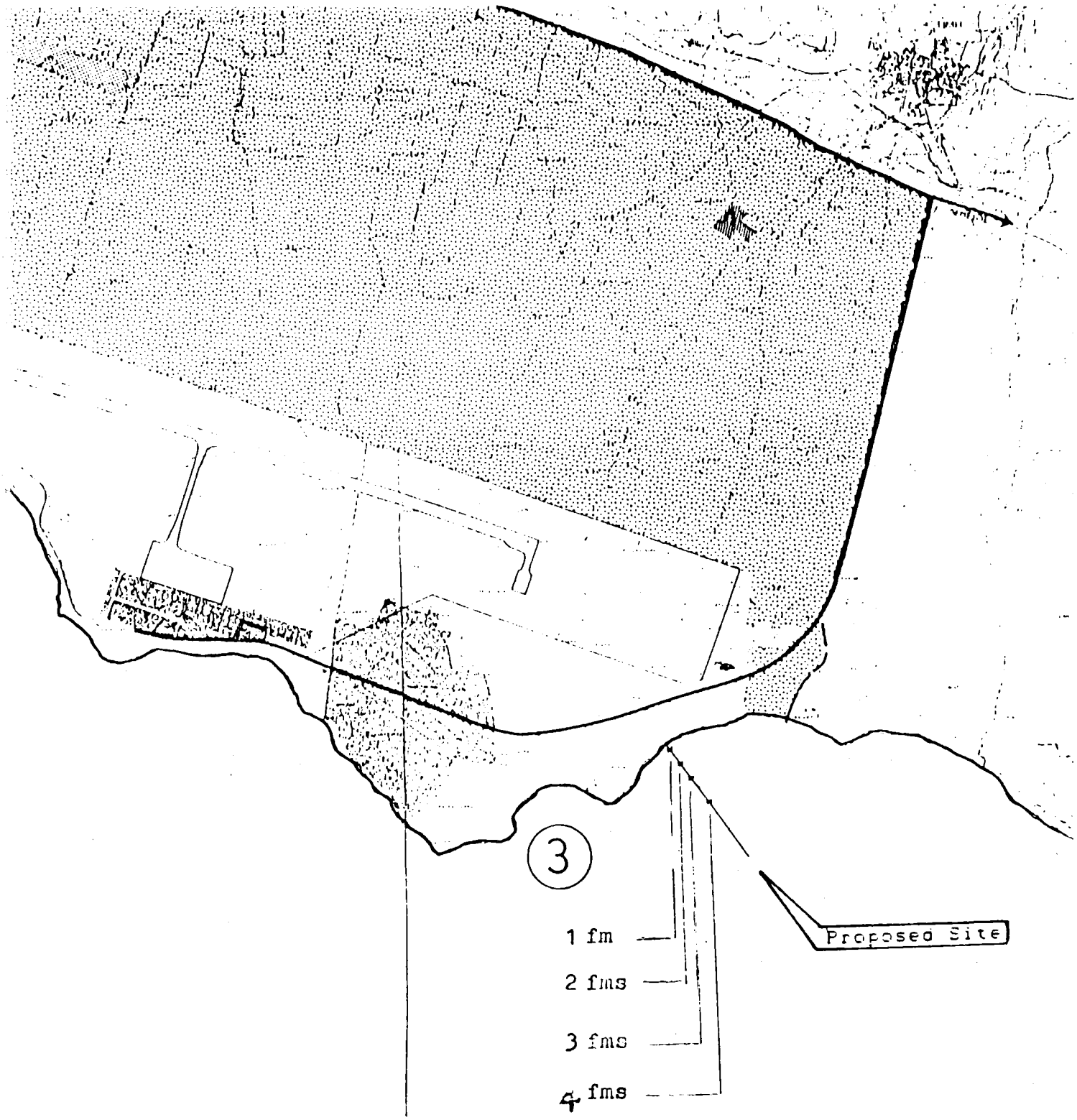


FIG. 12

Biological and sediment test sites

PAPHOS MARINA PROJECT

GENERAL BATHYMETRIC CHART

Scale 1:25000 (depths in metres)

PLATE Nº1

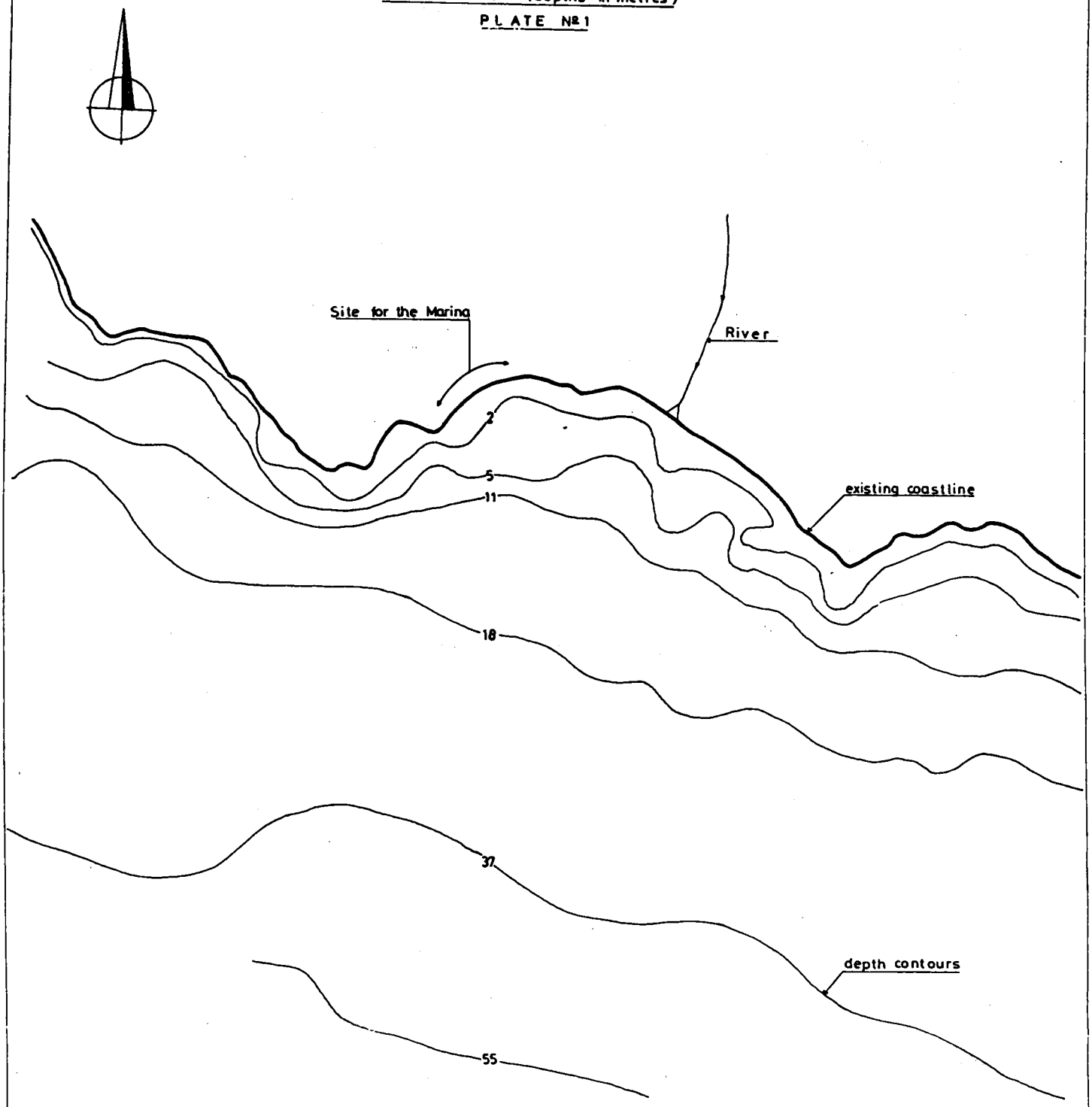


FIG. 13

PAPHOS MARINA PROJECT DEPTH SOUNDINGS AT THE PROPOSED SITE

(soundings in metres)

Scale 1:5000

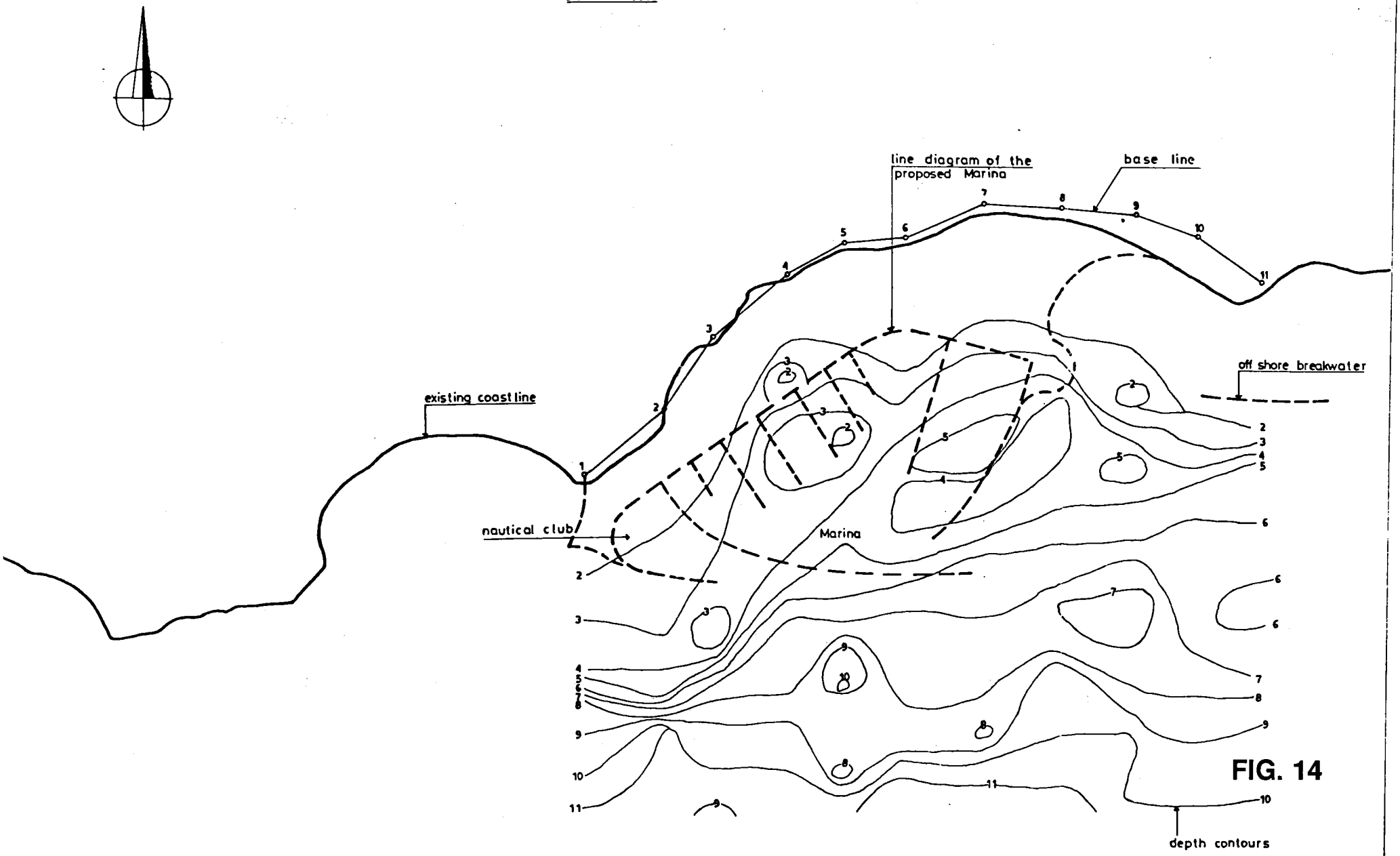


FIG. 14

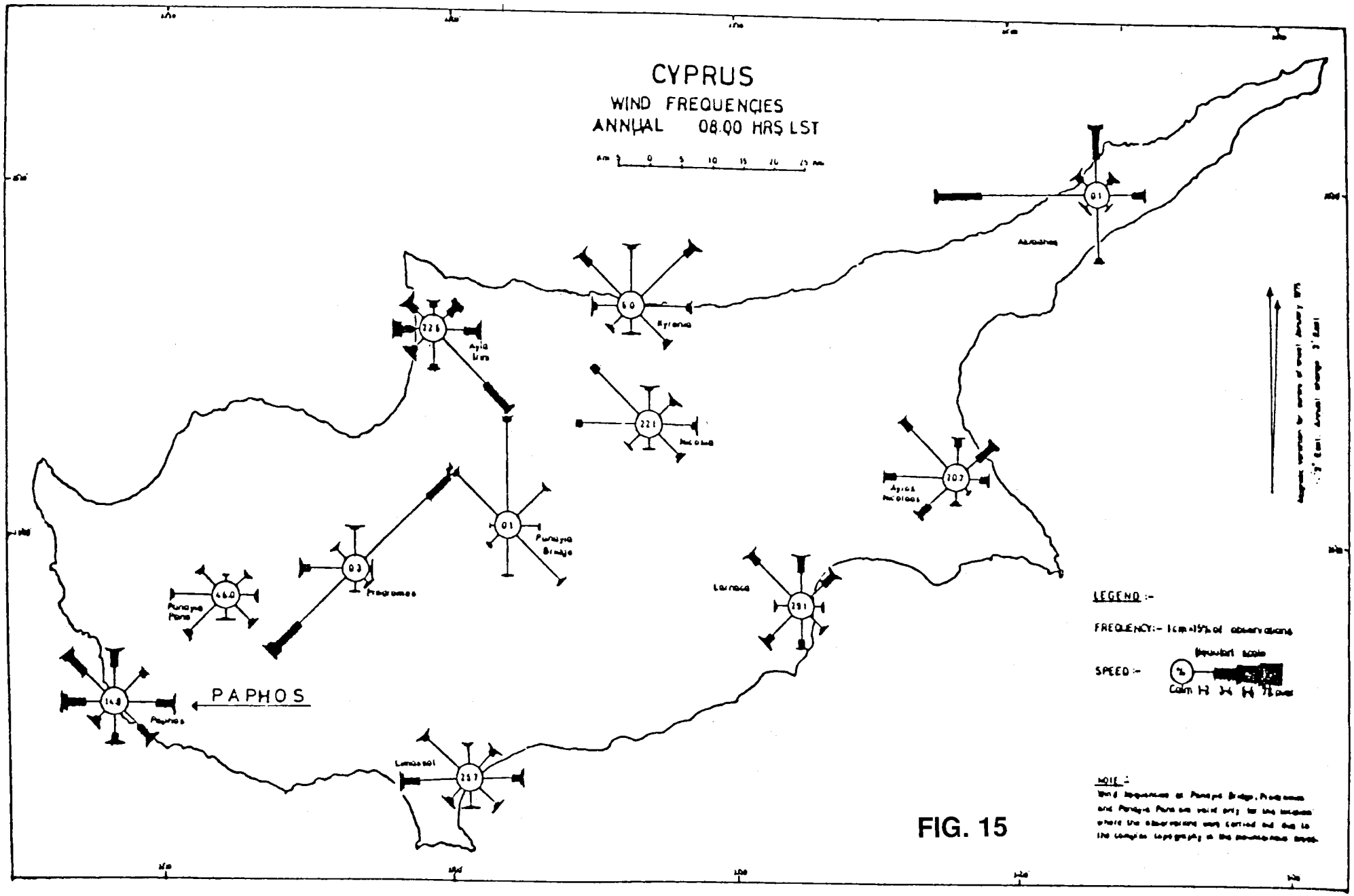

CYPRUS
WIND FREQUENCIES
ANNUAL 08.00 HRS LST
PAPHOS
LEGEND :-
FREQUENCY:- 1 cm = 5% of observations
SPEED :-
Calm
NOTE :-

FIG. 15

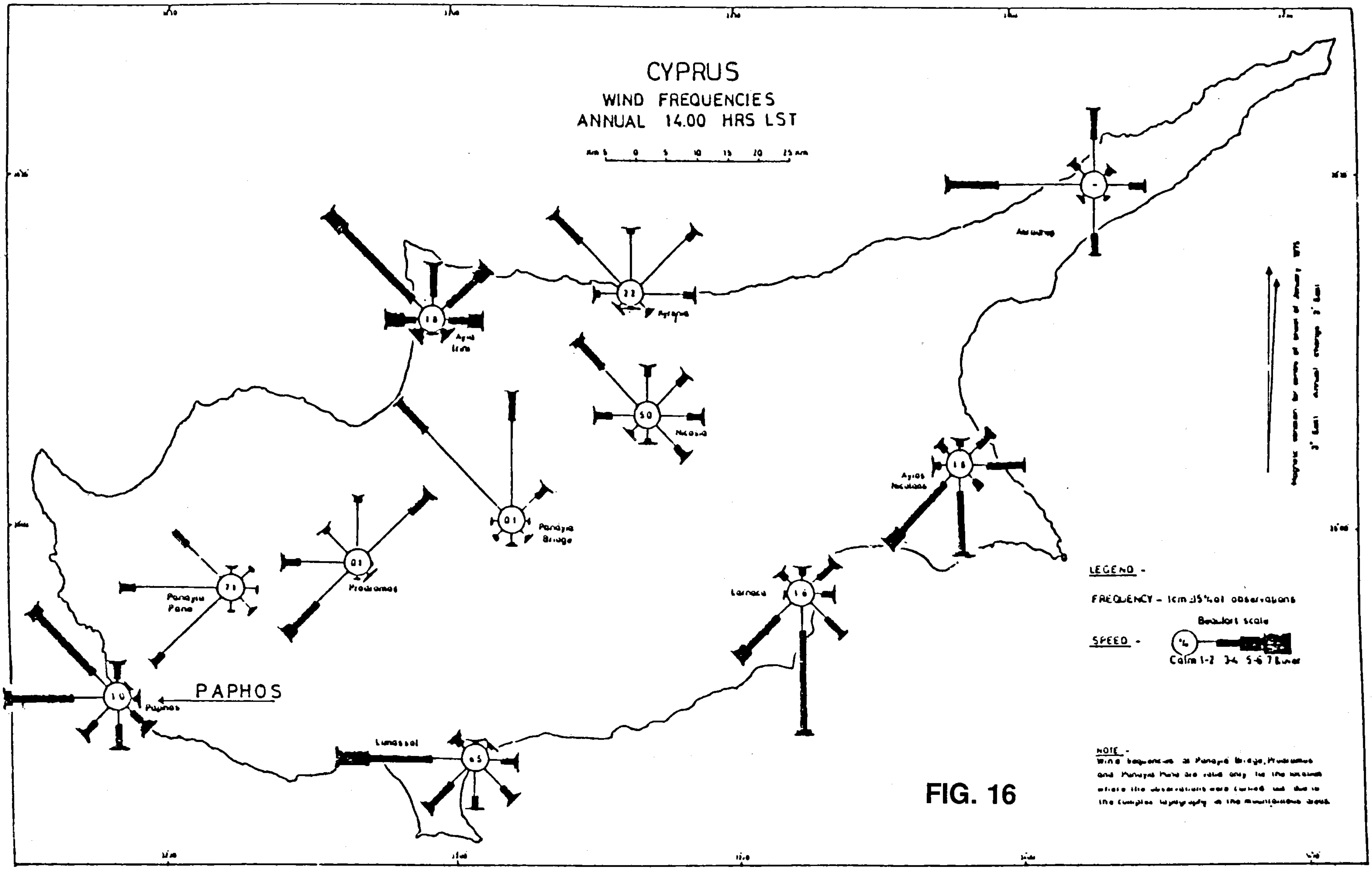

CYPRUS
WIND FREQUENCIES
ANNUAL 14.00 HRS LST
PAPHOS
Paphos
Panayia Pano
Prodromos
Panayia Bridge
Nicosia
Larnaca
Limassol
Ayios Nicolaos
LEGEND -
FREQUENCY - 1cm = 5% of observations
Beaufort scale
SPEED -
Calm 1-2 3-4 5-6 7 & over
NOTE -

FIG. 16

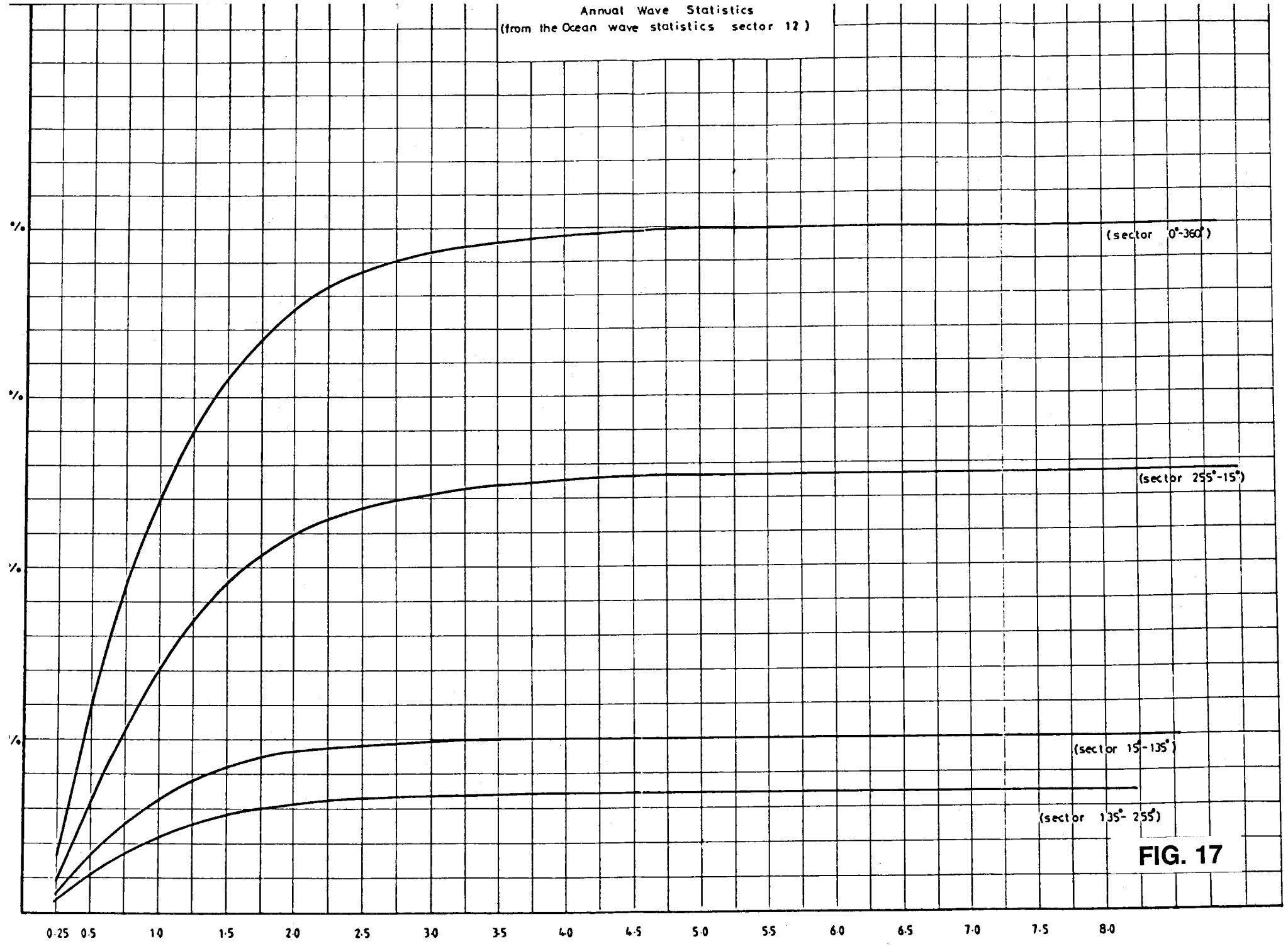

Annual Wave Statistics
(from the Ocean wave statistics sector 12)
%
%
%
%
(sector 0°-360°)
(sector 255°-15°)
(sector 15°-135°)
(sector 135°-255°)
0·25 0·5 1·0 1·5 2·0 2·5 3·0 3·5 4·0 4·5 5·0 5·5 6·0 6·5 7·0 7·5 8·0

FIG. 17

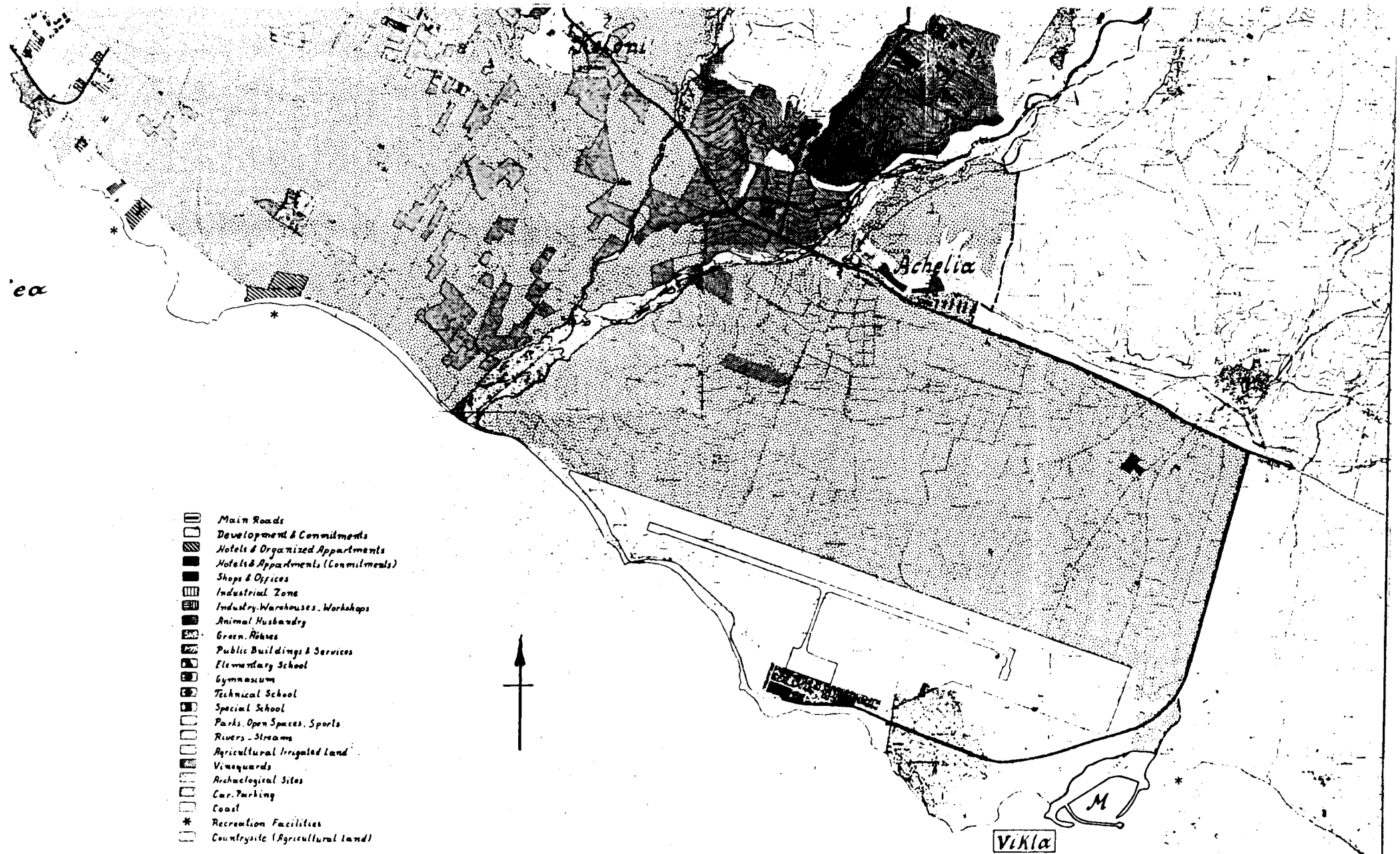
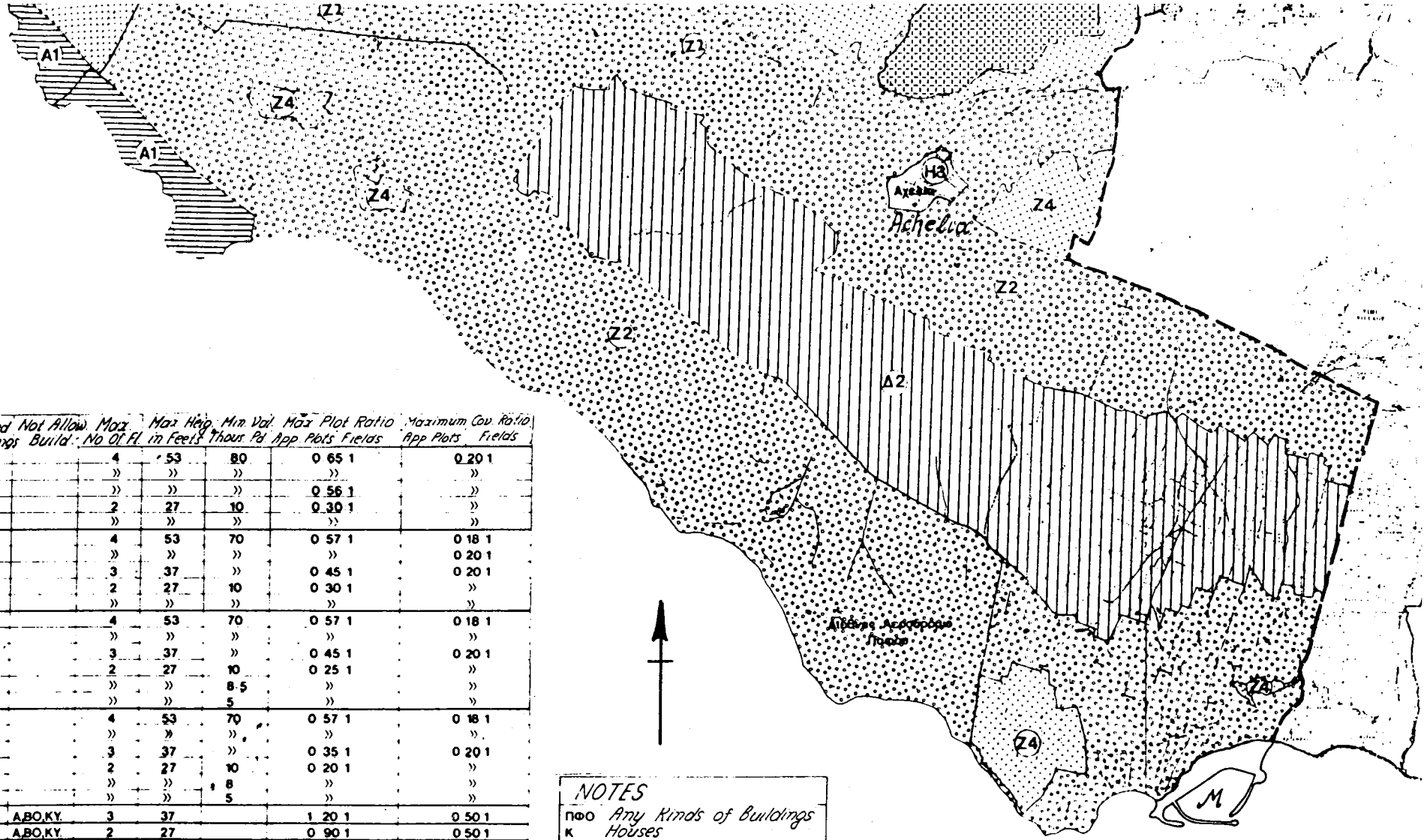


FIG. 18

ENVIRONMENTAL IMPACT
ASSESMENT OF THE PAPHOS MARINA

EXISTING LAND USE

Scale 1:25000



Zone	Allowed Buildings	Not Allow. Build.	Max. No Of Fl.	Max Heig. in Feet	Min Val. Thous. Pd	Max Plot Ratio App. Plots	Max Plot Ratio Fields	Maximum Cov. Ratio App. Plots	Maximum Cov. Ratio Fields
A1	Ξ		4	53	80	0 65 1		0 20 1	
	ΠΞ		»	»	»	»		»	
	ΟΔ		»	»	»	0 56 1		»	
	ΤΕΥ		2	27	10	0 30 1		»	
	ΤΠ		»	»	»	»		»	
A2	Ξ		4	53	70	0 57 1		0 18 1	
	ΠΞ		»	»	»	»		0 20 1	
	ΟΔ		3	37	»	0 45 1		0 20 1	
	ΤΕΥ		2	27	10	0 30 1		»	
	ΤΠ		»	»	»	»		»	
B2	Ξ		4	53	70	0 57 1		0 18 1	
	ΠΞ		»	»	»	»		»	
	ΟΔ		3	37	»	0 45 1		0 20 1	
	ΤΠ		2	27	10	0 25 1		»	
	Κ		»	»	8.5	»		»	
	ΚΑΤΑ		»	»	5	»		»	
B4	Ξ		4	53	70	0 57 1		0 18 1	
	ΠΞ		»	»	»	»		»	
	ΟΔ		3	37	»	0 35 1		0 20 1	
	ΤΠ		2	27	10	0 20 1		»	
	Κ		»	»	8	»		»	
	ΚΑΤΑ		»	»	5	»		»	
H2	ΠΦΟ	ΑΒΟ,ΚΥ.	3	37		1 20 1		0 50 1	
H3	ΠΦΟ	ΑΒΟ,ΚΥ.	2	27		0 90 1		0 50 1	
H4	ΠΦΟ	ΑΒΟ,ΚΥ.	2	27		0 60 1		0 35 1	
H4 Χλ.	ΠΦΟ	ΑΒΟ,ΚΥ.	2	27		0 60 1	0 40 1	0 35 1	0 25 1
H5 Χλ.	ΠΦΟ	ΑΒΟ,ΚΥ.	2	27		0 45 1	0 30 1	0 25 1	0 20 1
Z1	ΠΦΟ	ΑΒΟ,ΚΥ.	2	27		0 01 1			
Z2	»	»	»	»		0 05 1			
Z3	»	»	1	17		0 03 1			
Z4	»	»	2	27		0 08 1			
Z5	»	»	1	17		0 01 1			
Δ1	ΠΦΟ	ΑΒΟΚΥ,ΚΥΧ	2	27		0 08 1			
	ΚΥ		2	27		0 50 1			
Δ2	ΠΦΟ	ΑΒΟΚΥ,ΚΥΧ	2	27		0 05 1			
	ΚΥ		2	27		0 50 1			
Δ3	ΠΦΟ	ΑΒΟ,ΚΥΧ	»	»		0 08 1			
	ΚΥΧ		2	27		0 50 1			
Γ3	ΠΦΟ	ΑΒΟ,ΚΥ.	»	»		0 10 1			
E Μεσ.	ΑΒΟ.					0 80 1		0 60 1	
E	»					0 80 1		0 40 1	

NOTES

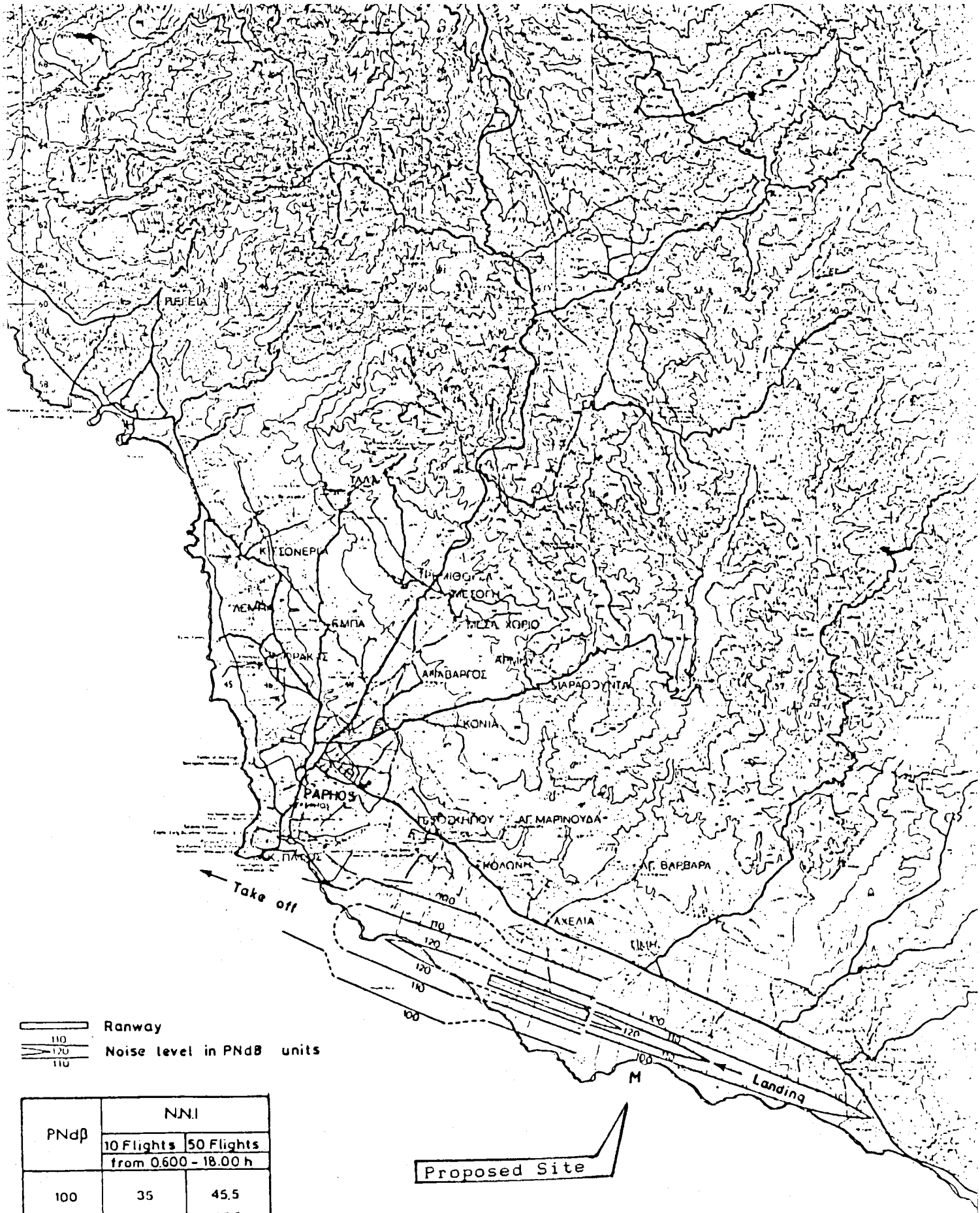
ΠΦΟ	Any Kinds of Buildings
Κ	Houses
ΚΑΤΑ	Shops
ΚΥΧ	Piggery
ΚΥ	Animal Husbandry
ΤΕ	Tourist Villas
ΤΚ	Tourist Lodging
ΤΕΥ	Tourist Premises
ΤΠ	Tourist Pavillions
ΑΟ	Other kinds of Buildings
Ξ	Hotels
ΠΞ	Motels
ΟΔ	Organised Flats
Α	Warehouses
ΒΟ	Industrial Buildings
ΕΤΑ	Approval By Antiquities Dept.
Χλ.	Chlorakas
Μεσ.	Mesoyi

FIG. 19

ENVIRONMENTAL IMPACT
ASSESMENT OF THE PAPHOS MARINA

EXISTING TOWN PLANNING ZONES

Scale 1:25000



PNdβ	N.N.I	
	10 Flights	50 Flights
	from 0.600 - 18.00 h	
100	35	45,5
110	45	55,5
120	55	65,5

PAPHOS LOCAL PLAN	PAPHOS AIRPORT	

ANNEX 2

LIST OF TABLES

Table 1 : Microbial pollution at the site of the Marina, F.C./100 ml

Site opposite Floria beach

1985			1986			1987		
Day	Month	Bacterial Count	Day	Month	Bacterial Count	Day	Month	Bacterial Count
15	01	NIL	28	01	NIL	13	01	NIL
12	02	NIL	26	02	1	10	02	NIL
02	04	NIL	18	04	NIL	17	03	13
08	05	1	13	05	NIL	28	04	9
22	05	NIL	24	06	2	26	05	NIL
04	06	NIL	22	07	NIL	23	06	NIL
18	06	NIL	19	08	406	21	07	3
17	10	NIL	02	09	318	01	09	NIL
10	12	3	16	09	NIL	20	10	NIL
			07	10	NIL	07	11	4
			04	11	NIL	08	12	NIL
			09	12	NIL			

Site opposite Timis Forest

15	01	NIL	28	01	NIL	13	01	NIL
12	02	NIL	26	02	NIL	10	02	NIL
12	03	NIL	18	03	NIL	17	03	36
08	05	NIL	22	04	NIL	28	04	NIL
22	05	NIL	13	05	NIL	26	05	NIL
04	06	NIL	24	06	NIL	23	06	NIL
18	06	NIL	22	07	2	21	07	NIL
17	10	NIL	19	08	3	04	08	4
10	12	NIL	16	09	3	01	09	NIL
			07	10	2	20	10	NIL
			04	11	NIL	07	11	NIL
			09	12	1	08	12	NIL

Table 2 : Microbial pollution at the site east of SHERATON Marina F.C./100 ml

	St. No. 67 Opposite Moni Cement Factory		St. No. 68 Opposite Moni Power Station	
	Date	Bacterial counts	Date	Bacterial counts
1985	19 06	NIL	19 06	1
	19 07	NIL	19 07	10
1986	18 03	NIL	18 03	NIL
	22 04	2	22 04	3
	01 07	NIL	01 07	260
	05 08	NIL	05 08	NIL
1987	03 02	1	03 02	5
	26 03	2	26 03	2
	06 05	NIL	06 05	NIL
	02 06	NIL	02 06	NIL
	07 07	NIL	07 07	NIL
	18 08	NIL	19 08	NIL
	08 09	NIL	08 09	NIL
	10 11	NIL	10 11	1
	01 12	3		

SHERATON Marina started operating in Sept. 1986

Table 3 : Benthic flora and fauna

Stations	St. 1	St. 2	St. 3	St. 4
Depth	**1 fm**	**2 fm**	**3 fm**	**4 fm**
Algae				
Padina pavonina	*			
Cystoseira barbata	*			
Marine plants				
Posidonia oceanica			**	
Zostera nana		*	*	
Polychaeta				
Polychaetus sp1	1	1	1	
Polychaetus sp2	1	1	1	
Polychaetus sp3	1	1		
Polychaetus sp4	1	1		
Polychaetus sp5			1	
Glycera rouxianica				1
Crustacea				
Diogenes pugilator	1			
Catapaguroides timidus	1			
Lumella limicola (Cumacea)		1		
Mollusca				
Dentalium rubescens	1			
Dentalium terentinum				1
Nassarius mutabilis			1	
Tellina distorta				1
Philine quadripartita			1	
Echinodermata				
Echinocardium cordatum	1	1		1
Various				
Phascolosoma sp1				1
Phascolosoma sp2				1
Physcosoma granulatum	1			
Total number of species	11	7	7	6

Table 4 : Recommended criteria for control of development in areas affected by aircraft noise

Level of aircraft noise to which site is, or is expected to be exposed		60 NNI and above	50-59 NNI	35-39 NNI
Dwellings	Refuse		No major new developments. Infilling only with appropriate sound insulation	Permission not to be refused on noise grounds alone
Schools	Refuse	Most undesirable. When exceptionally it is necessary to give permission e.g. for a replacement school, sound isolation should be required.	Undesirable Sound isolation to be required	Permission not to be refused on noise grounds alone
Hospitals	Refuse	Undesirable Appropriate sound isolation to be required.	Each case to be considered on its merits	Permission not to be refused on noise grounds alone
Offices	Undesirable Full isolation to be required	Permit	Permit but advise isolation of Conference Rooms depending upon position, aspect etc.	
Factories warehouses etc.			Permit	

APPENDIX

ORGANIZATIONS AND INSTITUTIONS WHICH WERE REPRESENTED IN THE REVIEW MEETING ON EIA PROCEDURES

Nicosia, Cyprus, 24-27 October 1988

- Six departments of the Ministry of Agriculture and Natural Resources (Cyprus): 14 participants
- Department of Town Planning and Housing of the Ministry of the Interior (Cyprus): 5 participants
- Department of Public Works of the Ministry of Communications and Works (Cyprus): 2 participants
- Ministry of Commerce and Industry (Cyprus): 1 participant
- Ministry of Health (Cyprus): 1 participant
- Ministry of Justice (Cyprus): 1 participant
- Planning Bureau (Cyprus): 2 participants
- Cyprus Ornithological Society: 1 participant
- Ministry of Urban Development and Ecology (Mexico): 1 participant
- Organization for Physical Planning and Environmental Protection (Greece): 1 participant
- Ministry of the Interior (Morocco): 1 participant
- Department of Natural Sciences, Faculty of Arts, University of Split (Yugoslavia): 1 participant
- PAP/RAC: 1 staff member and 1 consultant
- UNEP (Co-ordinating Unit for MAP): 1 staff member
- UNEP (OCA/PAC): 1 consultant