

REPORT ON BASIC DESIGN

BANGSAEN MARINE SCIENCE CENTER
IN
THE KINGDOM OF THAILAND

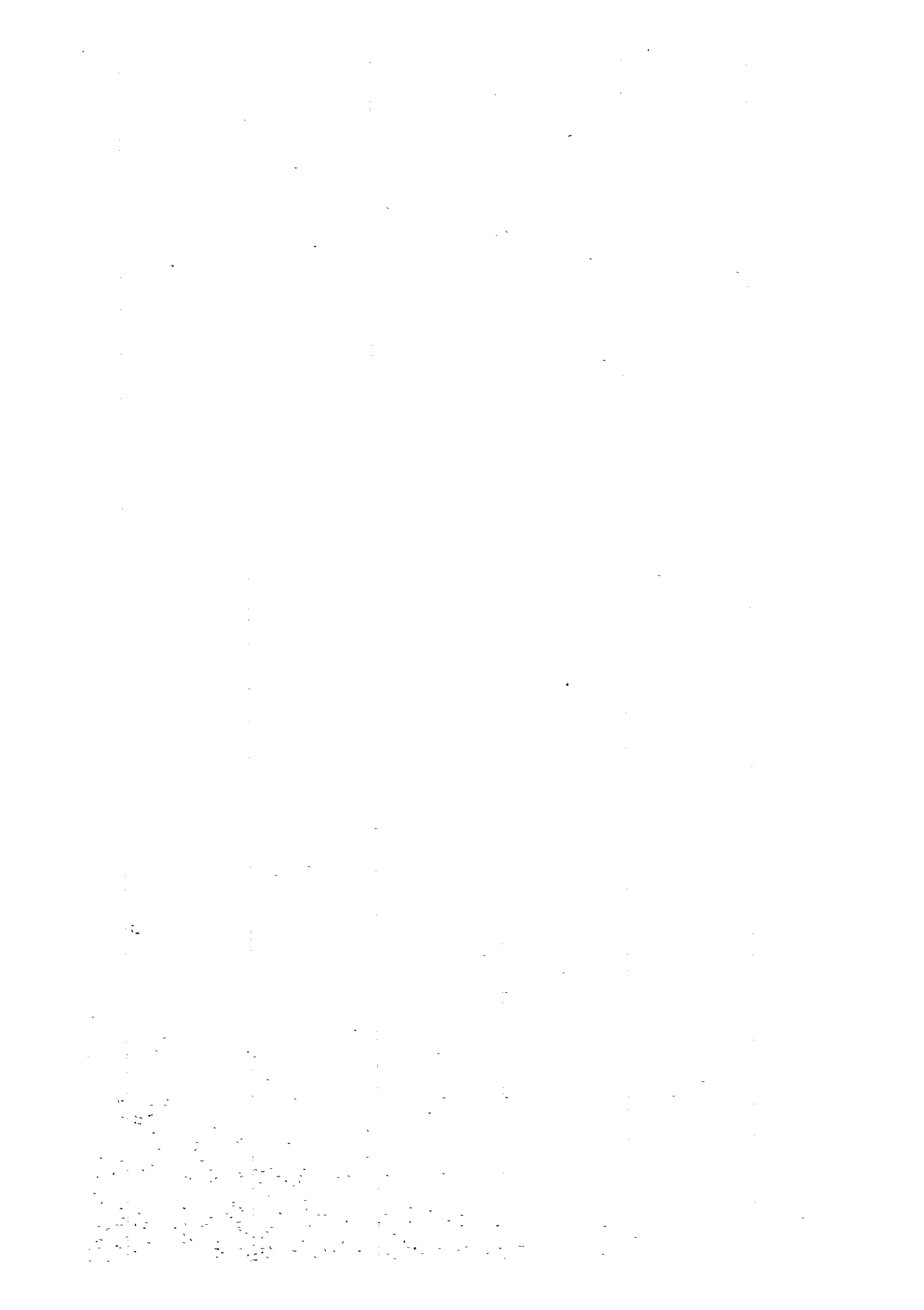
MARCH 1981

JAPAN INTERNATIONAL COOPERATION AGENCY

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REPORT ON BASIC DESIGN

BANGSAEN MARINE SCIENCE CENTER

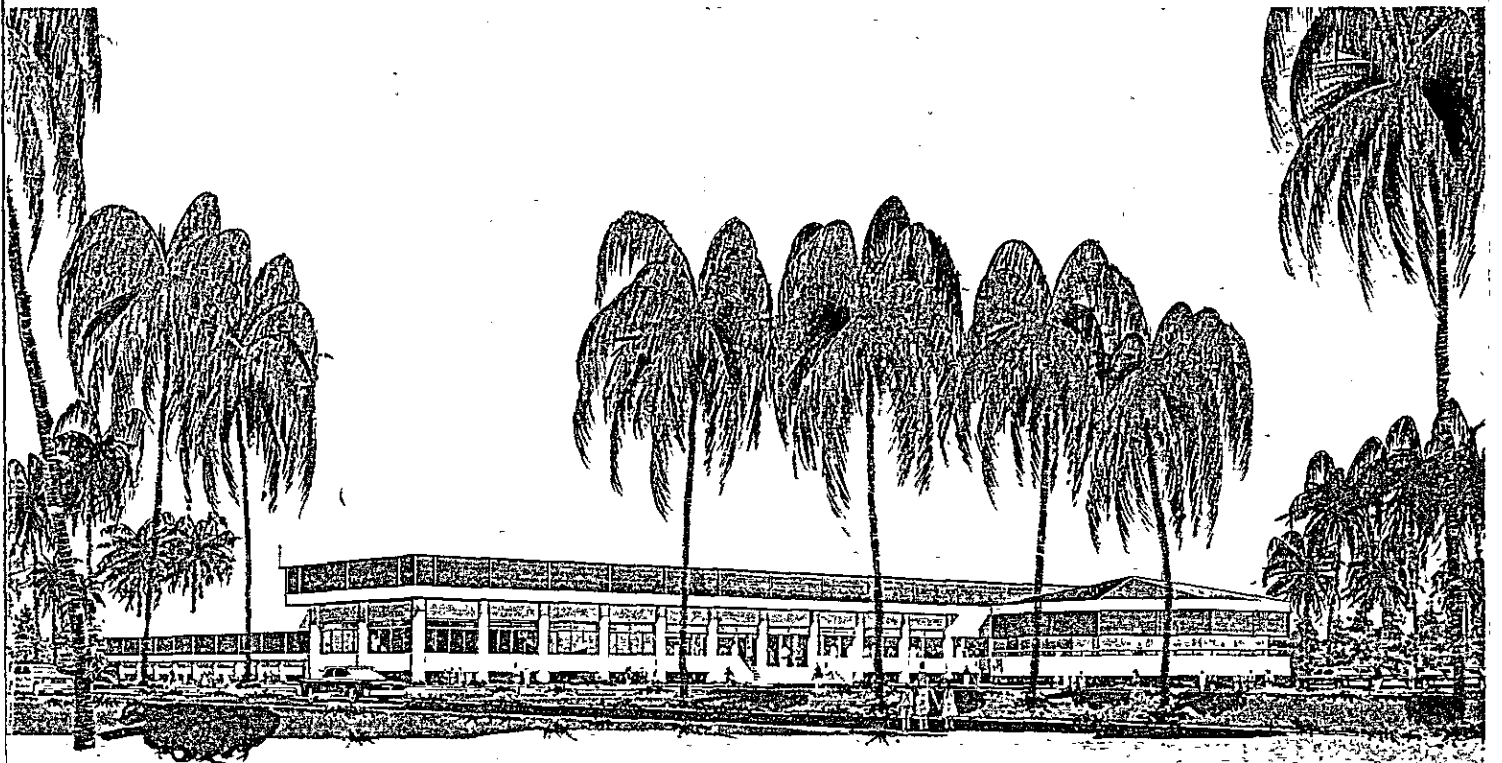
IN

THE KINGDOM OF THAILAND

MARCH 1981

JAPAN INTERNATIONAL COOPERATION AGENCY

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BANGSAEN MARINE SCIENCE CENTER

P R E F A C E

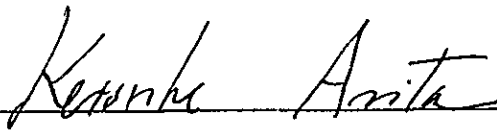
In response to a request of the Government of the Kingdom of Thailand, the Japanese Government decided to conduct a survey on the basic design for the construction project of Bangsaen Marine Science Center in the Kingdom of Thailand and entrusted the survey to the Japan International Cooperation Agency. The J.I.C.A. sent to Thailand a survey team headed by Dr. M. Nakajima from February 4th to 13th, 1981.

The team had discussions with the officials concerned of the Government of Thailand and conducted a field survey. After the team returned to Japan, further studies were made and the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of Thailand for their close cooperation extended to the team.

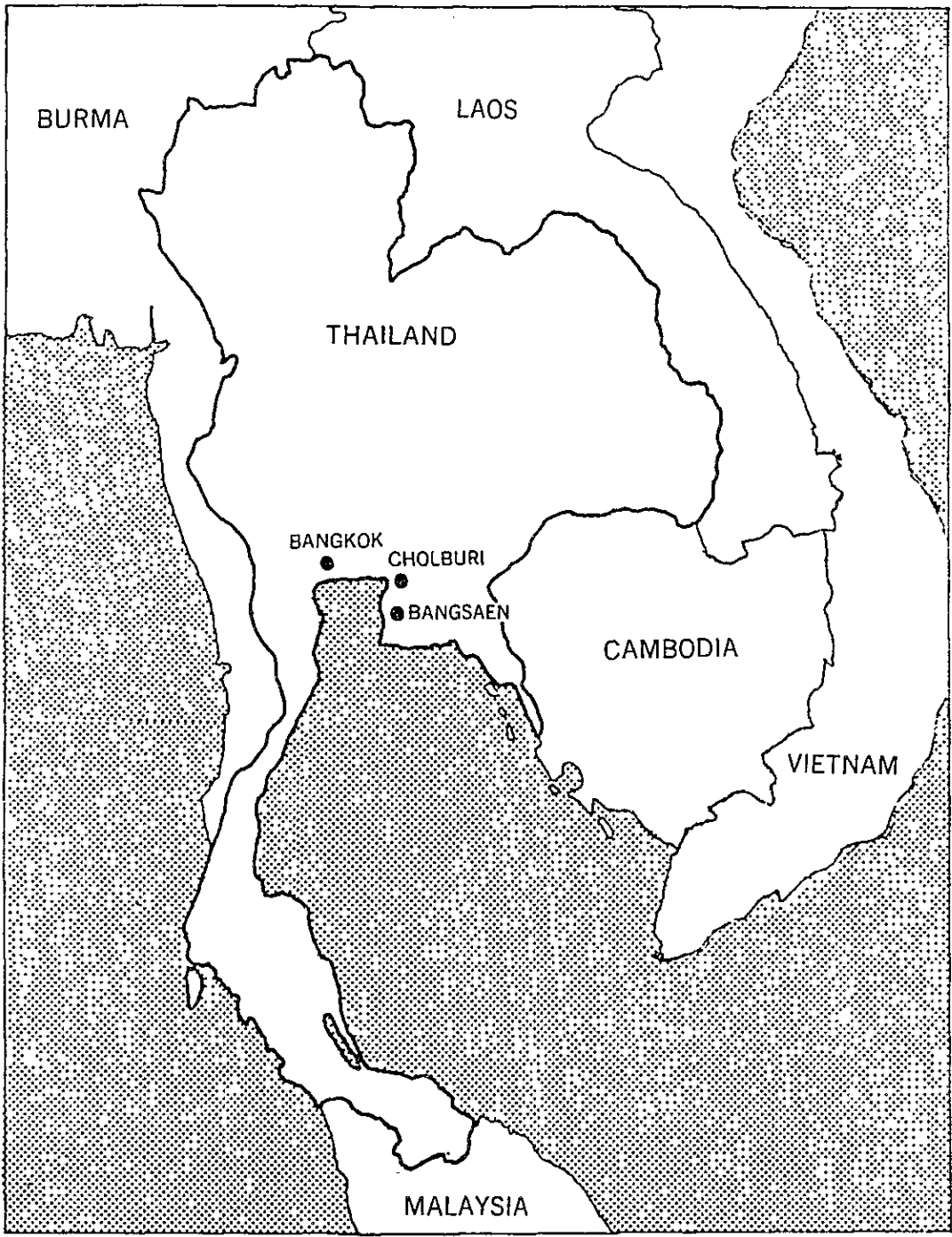
March, 1981

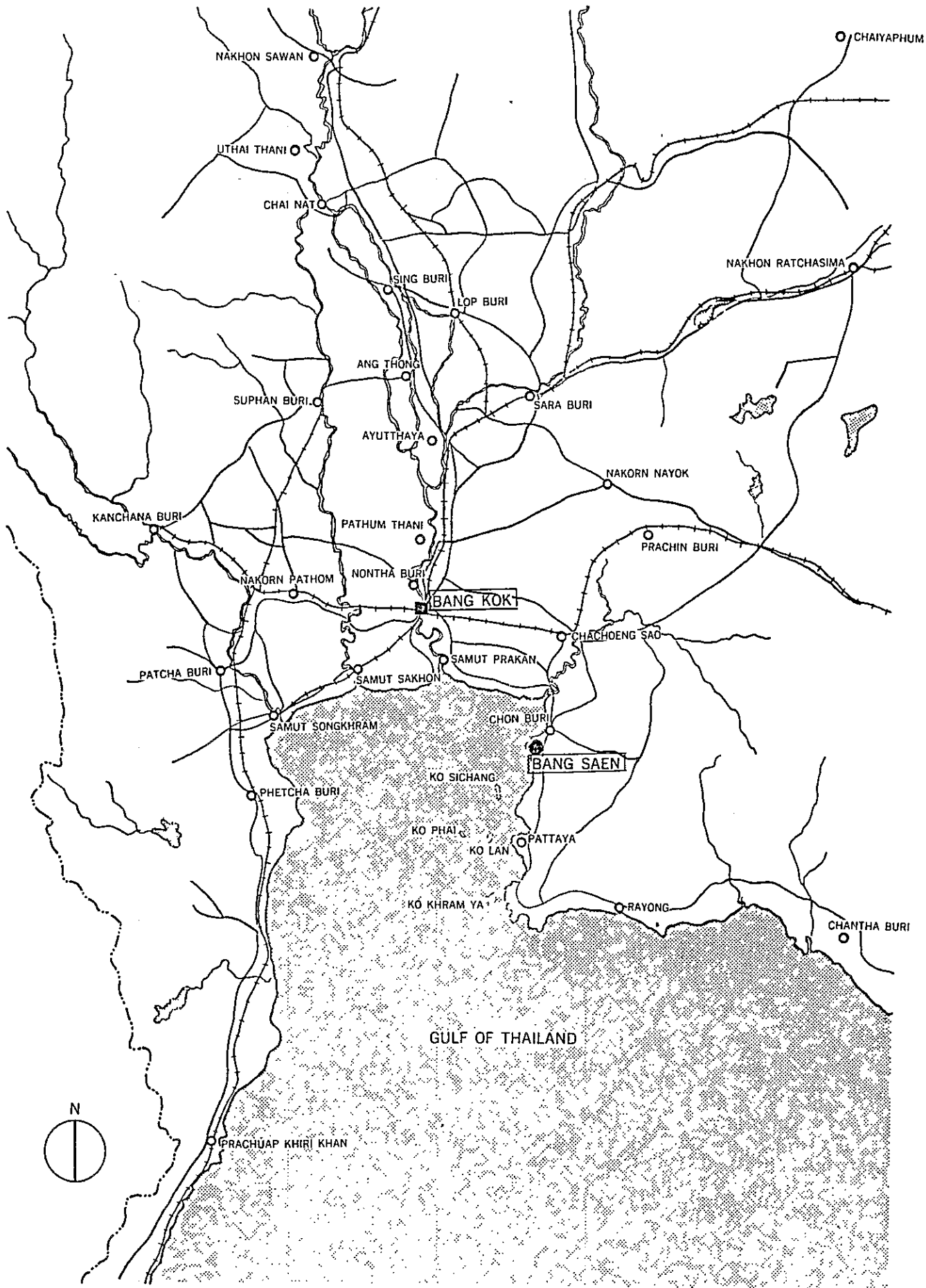
A handwritten signature in black ink, reading "Keisuke Arita", is written over a horizontal line.

Keisuke Arita

President

Japan International Cooperation Agency







CHON BURI

BANG SAEN

GULF OF THAILAND

KO SICHANG

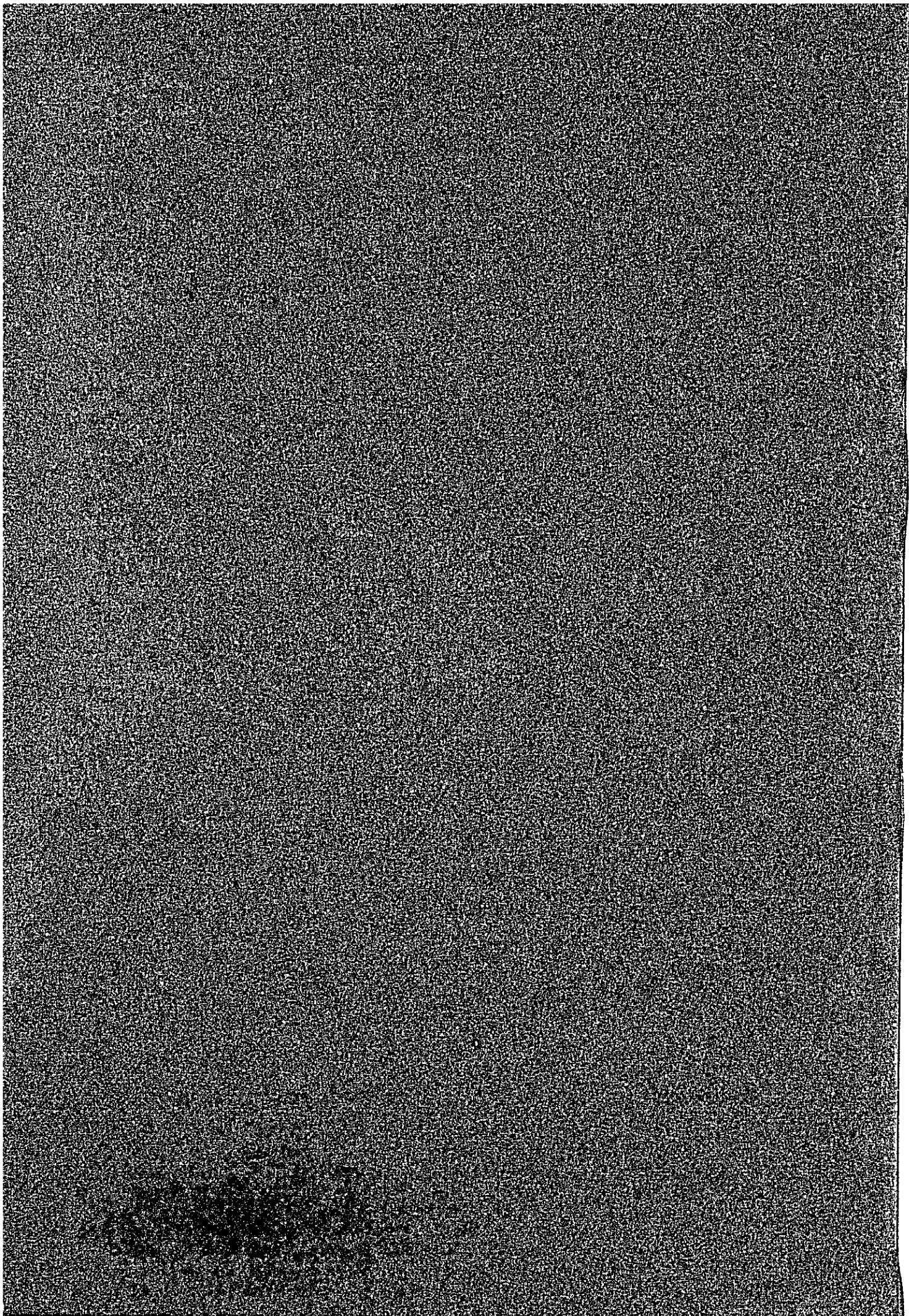
VICINITY MAP

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SUMMARY



SUMMARY

1. OBJECTIVES AND BACKGROUND OF THE PROJECT

In 1969 Srinakarinwirot University established the Zoological Museum and Marine Aquarium in Bangsaen campus. Since then the University has been conducting research and education of marine science through the collection and exhibition of marine animals of the museum and the aquarium. The facilities there, however, have now become too small and deteriorated by age to accommodate the increasing visitors and collections. In order to improve the situation, the University intended to construct a new facility and requested a cooperation of the Japanese Government.

2. BASIC DESIGN SURVEY

In response to this request, the Japanese Government sent the Basic Design Survey Team headed by Dr. M. Nakajima to Thailand in February 1981. The survey team undertook the investigation to obtain necessary informations in preparing the basic design and hold a series of discussions with the University officials to establish the basic scheme of the new facility. Both parties exchanged the minutes of discussions on February 10, 1981.

3. BASIC DESIGN

Bangsaen Marine Science Center is to be constructed in the Bangsaen campus of the Srinakarinwirot University. The Center will comprise three principal components; marine research aquarium, marine animal museum and laboratories. The scope of the Project will be the buildings, marine research aquarium installations, outdoor installations and supply of equipments.

The buildings consist of the center building and ancillary buildings. The center building will consist of four blocks; marine animal museum

and administration block, marine research aquarium block, laboratory block and auditorium block. In the marine animal museum, specimens and replicas of marine animals and their environments will be collected and exhibited. In the marine research aquarium, marine animals will be reared and exhibited. Both facilities will be open to the general public for educational purposes. The auditorium will seat 200 and will be equipped with audio-visual facilities. Ancillary buildings, such as gate house, garage and service building will be provided.

Marine research aquarium installations will include tanks, rearing installations, display and signs. In addition to 29 indoor display tanks including a large tank of 200 ton capacity, 4 outdoor display tanks will be provided. Emphasis shall be placed on low running cost and easy maintenance.

Supply of equipments comprise laboratory equipments, educational equipments and rearing equipments.

4. SCOPE OF WORK, OVERALL SCHEDULE

Japanese Government will undertake the following items through grant aid scheme:

- (1) Buildings.
- (2) Marine Research Aquarium Installations.
- (3) Outdoor Installations.
- (4) Supply of Equipments.
- (5) Detailed Design and Construction Supervision.

Thai Government will undertake the following items:

- (1) Reclamation of swamps and basins.
- (2) Clearance and leveling of the site.
- (3) Electric power supply and telephone line connection into the building.
- (4) Fresh water supply.

- (5) Sea water intake and supply to the reservoir in the building
Provision of facility for effluent water from the Center.
- (6) Office furniture, miscellaneous equipment, utensils etc.
- (7) Landscaping, reflection pools and fences.
- (8) Supply of marine animals for marine research aquarium.
- (9) Supply of specimens and exhibiting items for marine animals
museum.
- (10) Provision of data and information necessary for the construction
of the Center, including topographic survey, soil test and other
geological data.

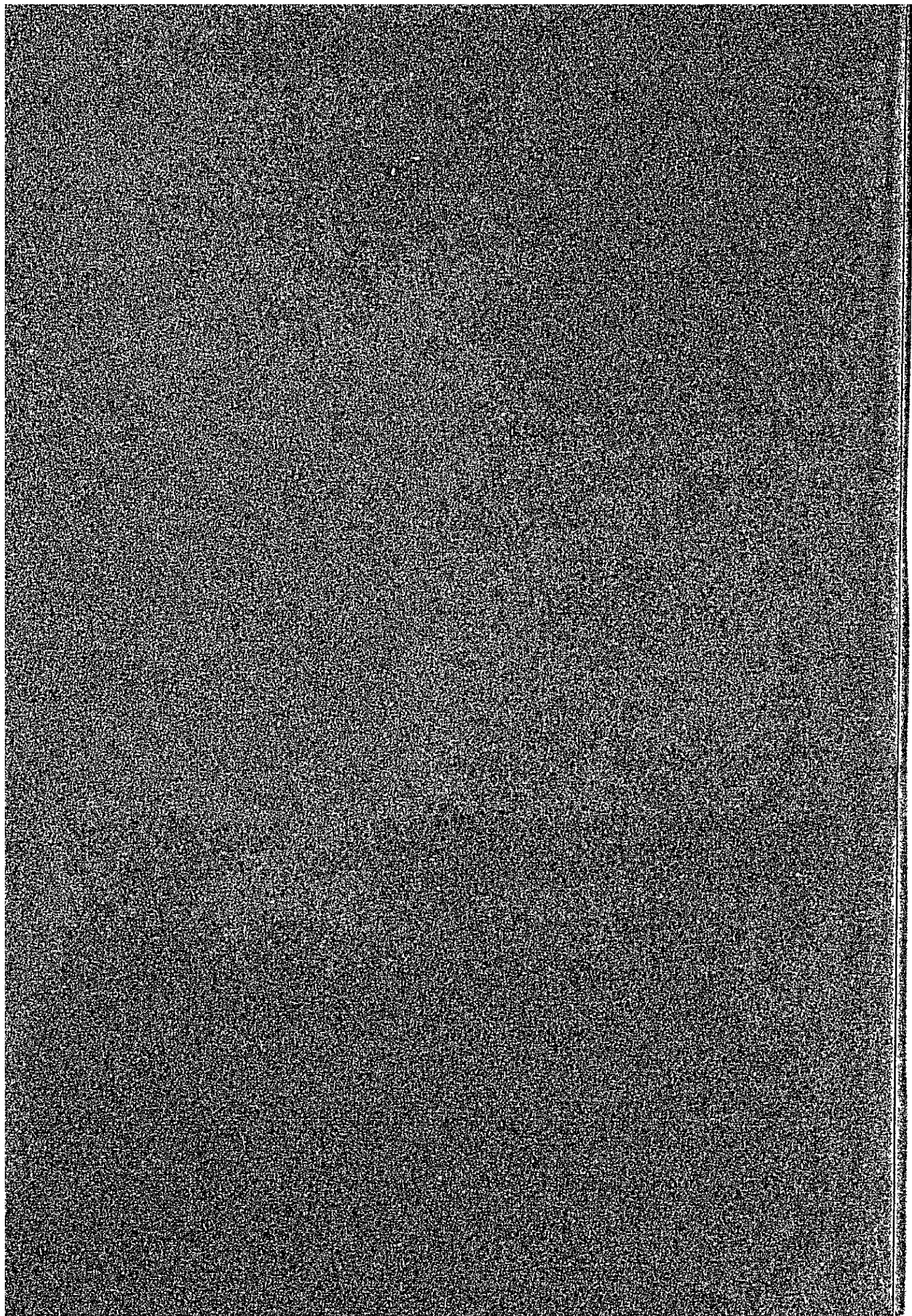
It is scheduled that detailed design will be completed by the end of July 1981, construction work will be commenced in the beginning of October 1981 and will be completed by the end of February 1982.

5. EVALUATION OF THE PROJECT

The planned Bangsaen Marine Science Center is expected to become the best of its kind not only in Thailand, but in Southeast Asia, and to help promote research studies, development of marine resources and education. Particularly, it is anticipated that the Center will play a role of the central research facility on Thai inshore marine animals under the joint research collaboration with other universities and research institutes in Thailand.

It is expected that this Project as implemented with Japan's aid will disseminate a good image of Japan through the impression imprinted in a large numbers of Thai general public who will visit the projected Center, and will promote the cultural and friendly bondages between Thailand and Japan.

CHAPTER 1 OBJECTIVES AND BASIC DESIGN SURVEY



CHAPTER 1 OBJECTIVES AND BASIC DESIGN SURVEY

1.1 OBJECTIVES AND BACKGROUND OF THE PROJECT

Srinakarinwirot Univerisity, originally established as an teachers' college thirty eight years ago, is a large univeristy with eight compuses.

Bangsaen campus of the University is located within about 100 Km south of Bangkok. In the campus there are four faculties: the faculty of science, the faculty of physical education, the faculty of education and the faculty of humanity. (cf. APPENDIX I-1)

In September 1969, the Zoological Museum and Marine Aquarium of Srinakarinwirot University were established in its Bangsaen campus. They were open to the public in autumn of 1970. Since then, they have been serving for research studies and the education of the general public including elementary and secondary school pupils. The facilities there, however, have now become too small and deteriorated by age to accommodate the increasing visitors and collections and advanced research studies.

In order to improve the situation and to further the research and education in an area of marine science, Srinakarinwirot University intended to construct a new facility and requested through the Thai Government cooperation of the Japanese Government.

1.2 PRELIMINARY SURVEY

In response to this request, the Government of Japan despatched the preliminary survey team to Thailand, through Japan International Cooperation Agency, to explore the objectives of the project, state of existing facility, effects of the project, appropriate facility plan and the necessary budget relevant to the implementation of the project.

(1) Period of survey: Dec. 15 1980 to Dec. 26 1980

(2) Members of the survey team:

Leader Dr. Masayuki Nakajima
 Director, Izu-Mito Sea Paradise

Members Mr. Koji Yajima
 Economic Cooperation Bureau
 Ministry of Foreign Affairs

 Mr. Yoichi Seki
 Social Development Cooperation Dept.
 Japan International Cooperation Agency (JICA)

 Dr. Akira Ishifuku
 Chief advisory engineer
 Electrical & Mechanical Engineering Div.
 Nikken Sekkei Ltd

 Mr. Koichiro Shikida
 Senior Architect
 Nikken Sekkei Ltd

1.3 BASIC DESIGN SURVEY

(1) Subsequently to the preliminary survey, the Government of Japan sent the basic design survey team to Thailand, through Japan International Cooperation Agency, to obtain informations and conditions necessary to prepare a basic design such as condition of the site, functions of the Center, optimum size of facilities, technical matters related to construction, through investigation and discussion with the Thai government officials.

(2) Period of survey:

Period of 10 days from February 4, 1981 to February 13, 1981.
APPENDIX I-2 shows a summary of the survey.

(3) Members of the survey team:

Leader	Dr. Masayuki Nakajima Director, Izu Mito Sea Paradise & Hakoneen Aquarium
Member (Project coordination)	Toshio Hida Personnel Dept. Japan International Cooperation Agency
Member (Project Management)	Dr. Akira Ishifuku Chief Advisory Engineer Electrical & Mechanical Engineering Div. Nikken Sekkei Ltd
Member (Planning)	Masami Tanaka Manager, Design & Supervisory Div. Nikken Sekkei Ltd
Member (Structural engineering)	Kyohei Saimi Senior Structural Engineer Structural Engineering Div. Nikken Sekkei Ltd
Member (Elect. & Mech. Engr.)	Koichi Masuda Mechanical Engineer Electrical & Mechanical Engineering Div. Nikken Sekkei Ltd

(4) Response of Thai Government

Dr. Nibondh Sasidhorn, President of Srinakarinwirot University, Dr. Prasert Witayarut, Vice president of the University, Dr. Twee Hormchong, Vice President of the University, and other Thai government authorities concerned were very cooperative. They participated in the discussions and investigations with enthusiasm. The survey team owe to the Thai officials the smooth execution of their work.

Names of Thai officials participated in the survey are listed in APPENDIX I-3.

1.4 RESULTS OF SURVEY

1.4.1 Outline of Bangsaen Marine Science Center

Described in chapter 2

1.4.2 Site

(1) Location:

Bangsaen campus of Srinakarinwirot University is located about 100 Km south of Bangkok, one hour drive by car. The proposed site for the Center occupies the best part of the Bangsaen campus. It is adjacent to the main gate of the campus and faces the main public road. A bus stop is located just in front of it.

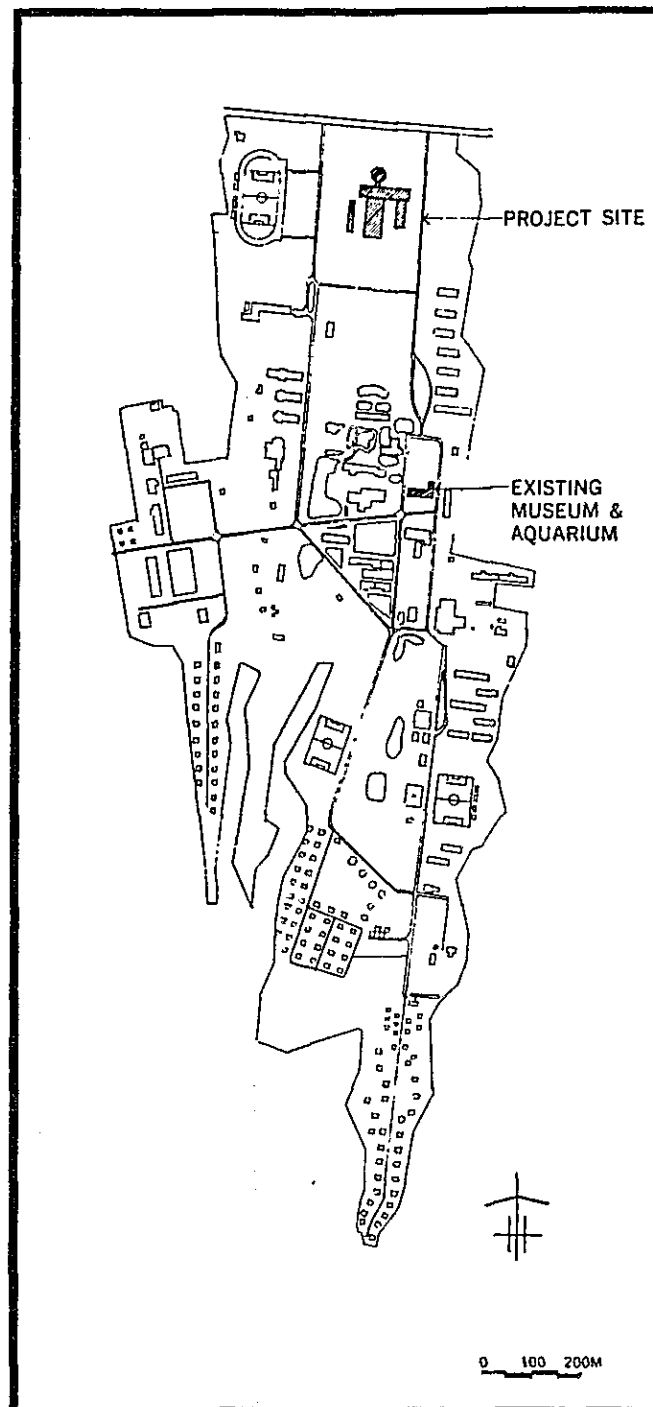
(2) Condition of the site:

Central part of the site is low, swamp, as indicated on APPENDIX II-1. Tall coconut trees surround the swamp, creating a superb natural environment for the future Center, although some of them are senile and ready to be removed.

(3) Geological Feature:

Geological map issued by the Ministry of National Development shows that geological features of this area belongs to the Tanaosi group of Silurian, Devonian to Carboniferous period, consisting of sandstone, sandy shale and shale. The soil of this area is composed of this sub-stratum with an alluvium overlayer. The surface layer of the project site is composed of swamp and sand bar which was formed over two thousand years ago by ocean wave movements, and is about

1.5 m thick. Underneath the surface layer, there will presumably be a stratum of sandstone or shale. The results of the soil test which has started early March by the University will serve as the basis of final evaluation of the soil.

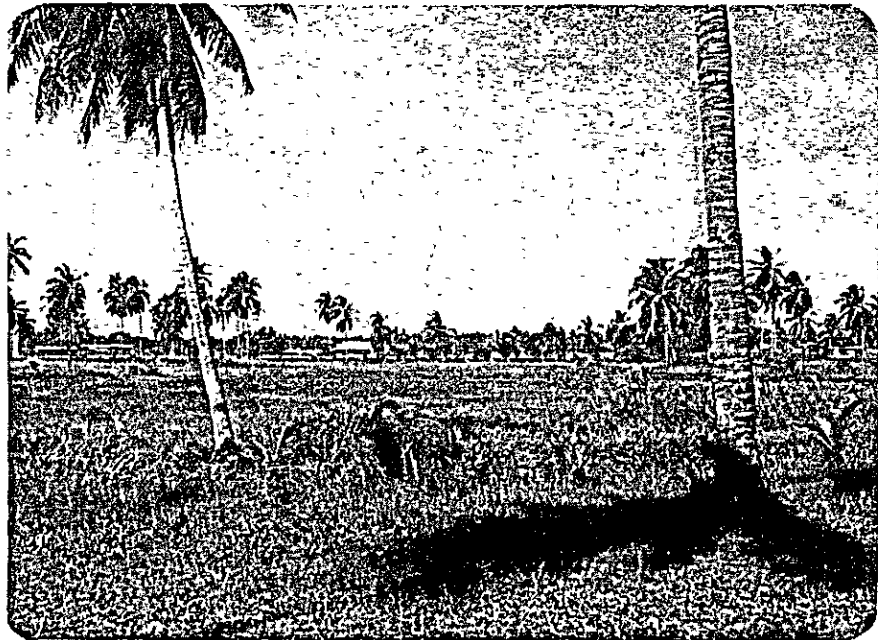


Srinakharinwirot University Bangsaen Campus plan

PICTURES OF PROJECT SITE



EASTERN PART OF PROJECT SITE



CENTRAL PART OF PROJECT SITE



MAIN ROAD



EXISTING CAMPUS ROAD

1.4.3 Infrastructure

(1) City water supply:

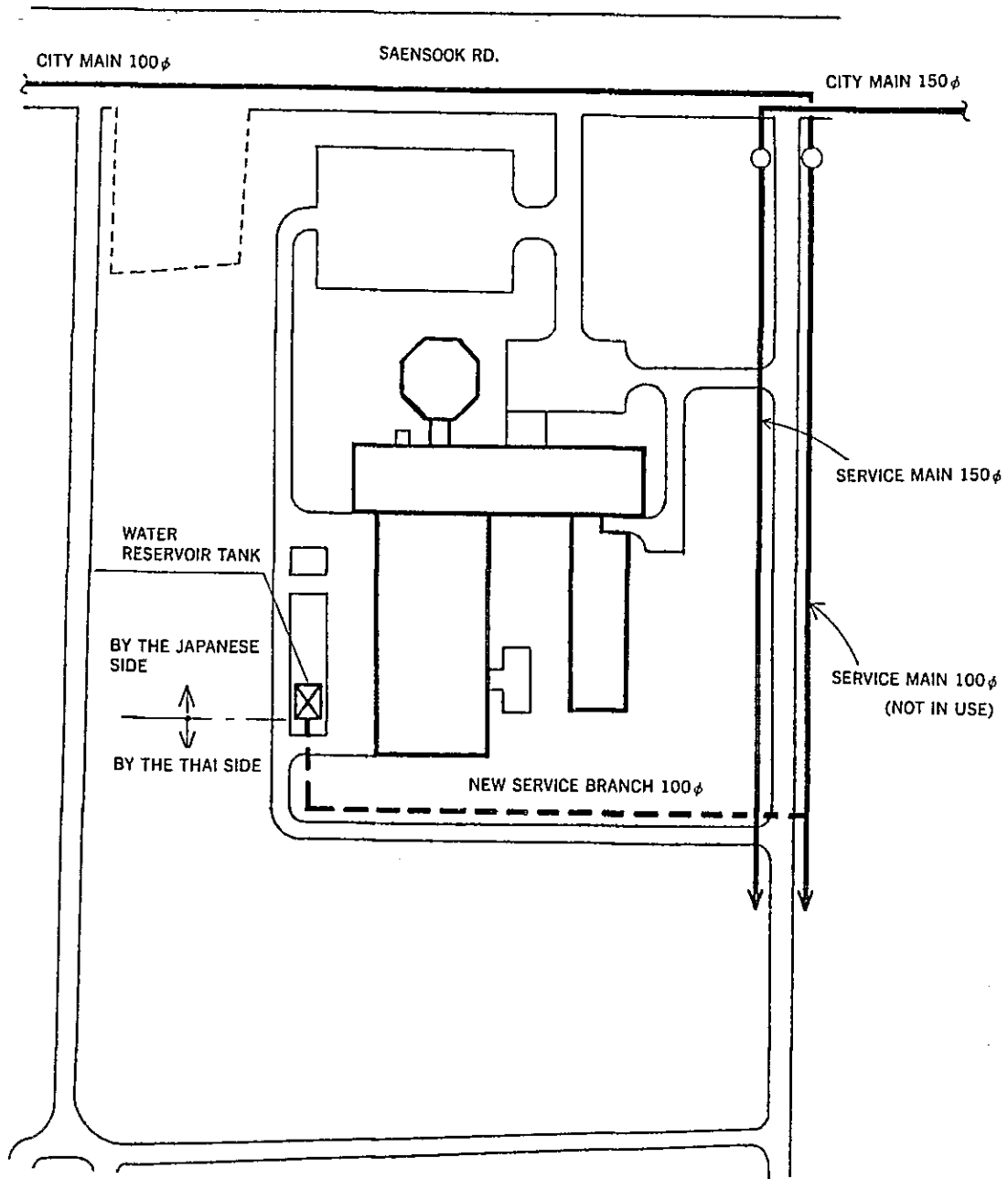
There are two city mains in the front road of the campus. From these two city mains, two service mains, 150mm ϕ and 100mm ϕ , are led into the campus.

The 150mm ϕ service main is connected to the water reservoir tank of 500m² capacity. Water is pumped up from it to the elevated water tank of 50m³ capacity, and then delivered throughout the campus by gravity.

The 100mm ϕ service main is not in use now. The University is going to supply city water from the 100mm ϕ service main to the new water reservoir tank of this building, because the capacity of the existing water supply facility is not sufficient to serve for the new Center. The University may provide another line from the existing water supply facility to this building to secure the supply of water. In this area there happens the shortage of city water supply in dry season.

(2) Sewage and drainage:

The Thai side has a future plan to install a sewer along in the front road of the campus. However, at present all waste water is discharged to the ponds or the swamps in the campus in which waste water is treated naturally. It is so-called closed system. For this building, the University will provide a pond at the southern area next to the site of this building. The waste water from this building will be discharge to the pond after receiving waste water treatment.



CITY WATER SUPPLY DIAGRAM

(3) Electricity:

There are super high tension power line (22 kv) along the front road of the campus. The power is transformed into 3 phase 380 volts and single phase 220 volts at transformers installed on the electric poles near the buildings and distributed into the buildings in the campus. For this building, the Thai side will install the transformers and supply power of 3 phase 380 volts and single phase 220 volts to the electrical room of the service building as shown on the diagram.

(4) Telephone:

There are main telephone cables along the front road of the campus. The University will provide about 4 trunk lines from outside to the main terminal board in this building.

(5) Communication:

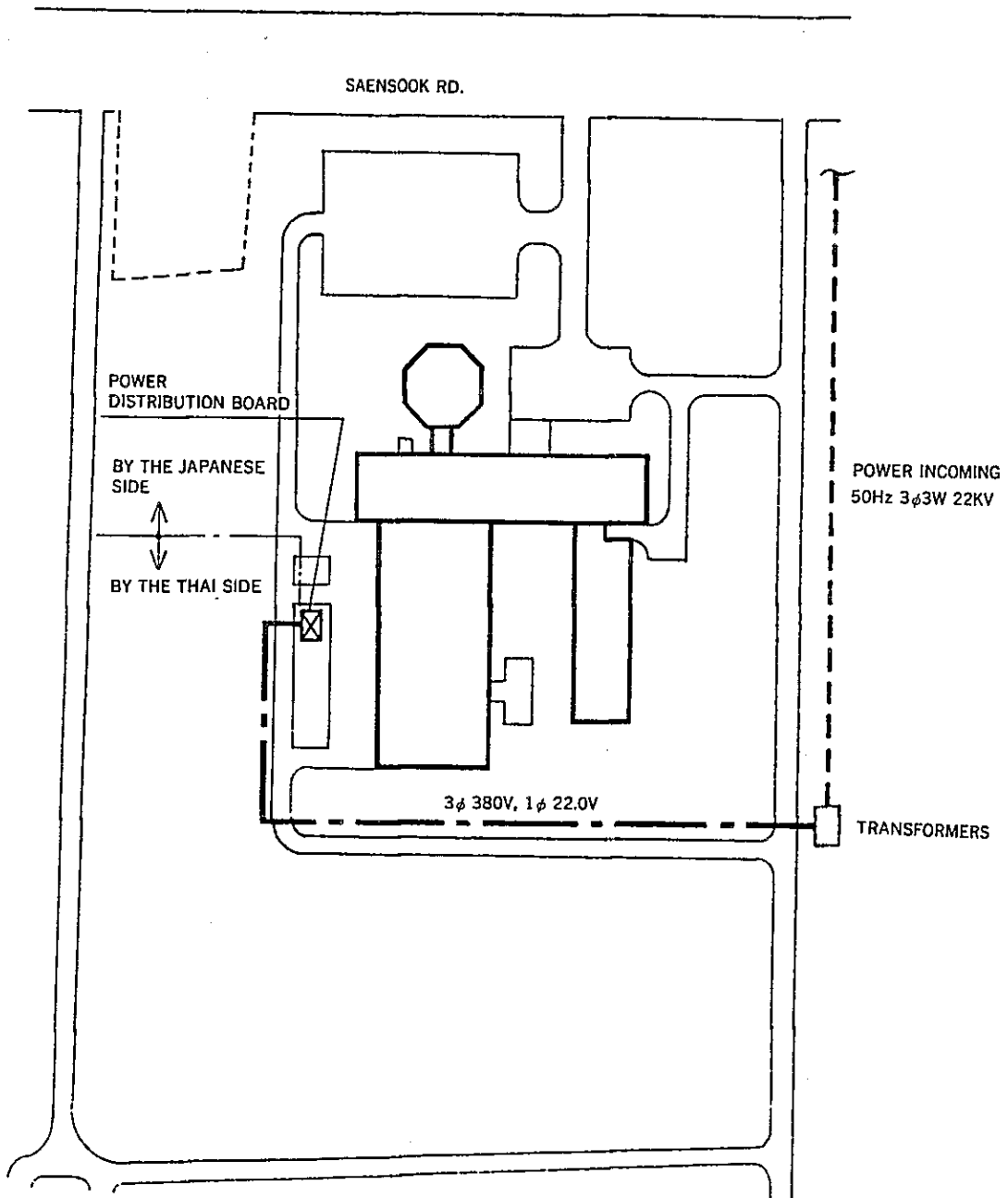
As a communication facility other than telephone, there are TV net-work and radio broadcasting.

(6) Gas:

There is no city gas supply around the campus and LPG is utilized in the campus.

(7) Garbage disposal:

The garbage from this building is to be carried out by the city truck every other day.



POWER SUPPLY DIAGRAM

1.4.4 Meteorological data

(1) The Climatic condition in Bangsaen is as indicated below, referring to the Climatological data (APPENDIX II-2) prepared by the Chonburi station.

(1951 - 1975)

Item		Max.		Min.		
		Value	Month	Value	Month	
Temperature [°C]	Mean	29.6	Apr	25.8	Dec	
	Ext. Max.	38.0	Apr	-	-	
	Ext. Min.	-	-	9.0	Jan	
	Mean Max.	34.1	Apr	31.0	Dec	
	Mean Min.	25.5		20.1	Jan	
Relative Humidity [%]	Mean	80.0	Apr, Oct	66.1	Dec	
	Mean Max.	93.0	Oct	85.0	Jan	
	Mean Min.	67.1	Sep	50.1	Dec	
Rainfall	Mean mm/M	302.0	Sep	10.1	Dec	1379.4mm/Y
	Greatest in 24 hr	145.4	-	-	-	Oct. 14, 1952
	Mean rainy days [D/M]	20.0	Sep	1.6	Dec	
Wind [Knots]	Mean wind speed	7.1	Mar, Jun	5.0	Oct	
	Max. wind speed	63.0	Oct	-	-	
	Prevailing wind	S	Feb to Sep	-	-	
Thunder-storm	Number of days [D/M]	15.9	May	0.7	Jan, Dec	

(2) Monsoon:

Prevailing direction of winter monsoon during January to March is northeast, while that of summer monsoon during July to September is southwest. Wind velocity is smaller than that of typhoons in Japan.

(3) The Climatic condition in Bangsaen may be summarized as follows

- a. Temperature and relative humidity are very high during a year.
- b. Temperature difference between mean max. and mean min. in a day and that during a year is comparatively small.
- c. Mean rainfall in a month is not so much.
- d. Max. wind speed is not so high.

1.4.5 Earthquake

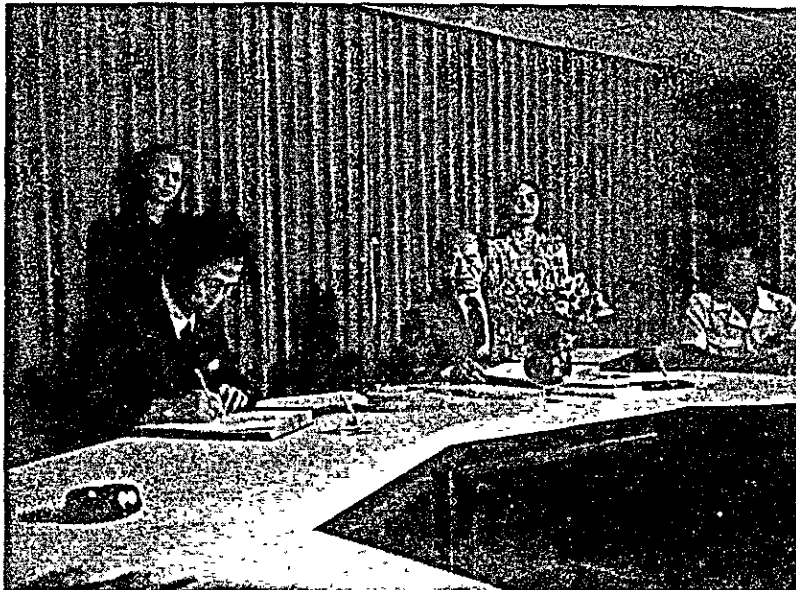
It is known that most of earthquakes take place on two major seismic belts which are Circum-Pacific belt and Alps-Himalaya belt. Since Thailand lies outside those belts, seismic activity in this country is very low. Local records indicate no actual damages due to earthquakes in the past. Although there have been some earthquakes sensible to human senses in recent years, it will not be necessary to take earthquakes into account in structural design.

1.4.6 Results of the survey

The survey team had fruitful discussion with the University on facilities plan, site plan, floor plan, structural design, utility system and supply of equipments. They used as working material the draft basic design report which had been prepared by the Team based upon the results of the preliminary survey. The outcome of the meetings is well incorporated in this basic design.

1.5 EXCHANGE OF MINUTES

Key issues agreed between the Thai authorities and the survey team in the basic design survey were written in the form of Minutes of Discussion for confirmation, which was duly signed by Dr. Nibondh, president of the University and Dr. Nakajima, the leader the survey team.



MINUTES OF DISCUSSION
ON
THE CONSTRUCTION PROJECT OF THE BANGSAEN MARINE SCIENCE CENTER
THE KINGDOM OF THAILAND

At the request of the Government of the Kingdom of Thailand for assistance in establishing the BANGSAEN MARINE SCIENCE CENTER (hereinafter referred to as "THE CENTER") in Bangsaen, the Government of Japan through Japan International Cooperation Agency (JICA) has sent a survey team headed by Dr. Masayuki Nakajima (Director, Izu-Mito Sea Paradise Japan) to hold the Basic Design Survey on the project from February 4 to February 13, 1981.

The team held a series of discussions and exchanged views with the relevant Authorities of the Government of the Kingdom of Thailand on the establishment and construction of the Center.

As a result of the survey, both parties have agreed the following items:

1. The Center will be established in Bangsaen campus, Srinakharinwirot University, Bangsaen, the Kingdom of Thailand.
2. The objectives of the establishment of the Center are to conduct research on marine science and to educate the people of Thailand to have fundamental knowledge on marine science.
3. The Center will comprise the following principal facilities:
 - (1) Laboratory
 - (2) Marine research aquarium
 - (3) Marine animals museum
4. The following buildings, facilities and equipments for the Center are to be provided by the Government of Japan.

(to be continued)

(1)

- (1) Buildings
 - (Including utility services)
 - a. Center building, comprising
 - I. Marine animals museums & administration bloc
 - II. Research aquarium bloc
 - III. Laboratory bloc
 - IV. Auditorium bloc
 - b. Ancillary building
 - I. Gate house
 - II. Garage
 - III. Service buildings
- (2) Research aquarium installations
 - a. Exhibition tanks
 - b. Nursing tanks
 - c. Rearing utility services
 - d. Displays and signs
- (3) Outdoor installations
 - a. Gate
 - b. Driveway, parking and service yard
 - c. Seawater reservoir tank
 - d. Waste water treatment facility
 - e. Outdoor utility services
- (4) Supply of equipments
 - a. Laboratory equipments
 - b. Educational equipments
 - c. Rearing equipments

(to be continued)

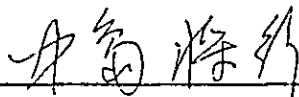
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5. The Government of the Kingdom of Thailand will undertake the following items:

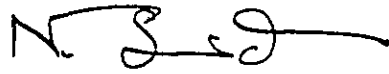
- (1) Reclamation of swamps and basins.
- (2) Clearance and leveling of the site.
- (3) Electric power supply and telephone line connection into the building.
- (4) Fresh water supply.
- (5) Sea water intake and supply to the reservoir in the building
Provision of facility for effluent water from the Center.
- (6) Office furniture, miscellaneous equipment, utensils etc.
- (7) Landscaping, reflection pools and fences.
- (8) Supply of marine animals for marine research aquarium.
- (9) Supply of specimens and exhibiting items for marine animals museum.
- (10) Providing of data and information necessary for the construction of the Center, including topographic survey, soil test and other geological data.

6. Basic design prepared by the survey team was basically accepted by the authorities of the Government of Thailand.

February 10 , 1981



Dr. Masayuki Nakajima
Head of the Japanese
Basic Design Survey Team



Dr. Nibondh Sasidhorn
President of the Srinakarinwirot
University

(3)

Attendants to the Meeting
(On 10th Feb.1981 at Srinakarinwirot University)

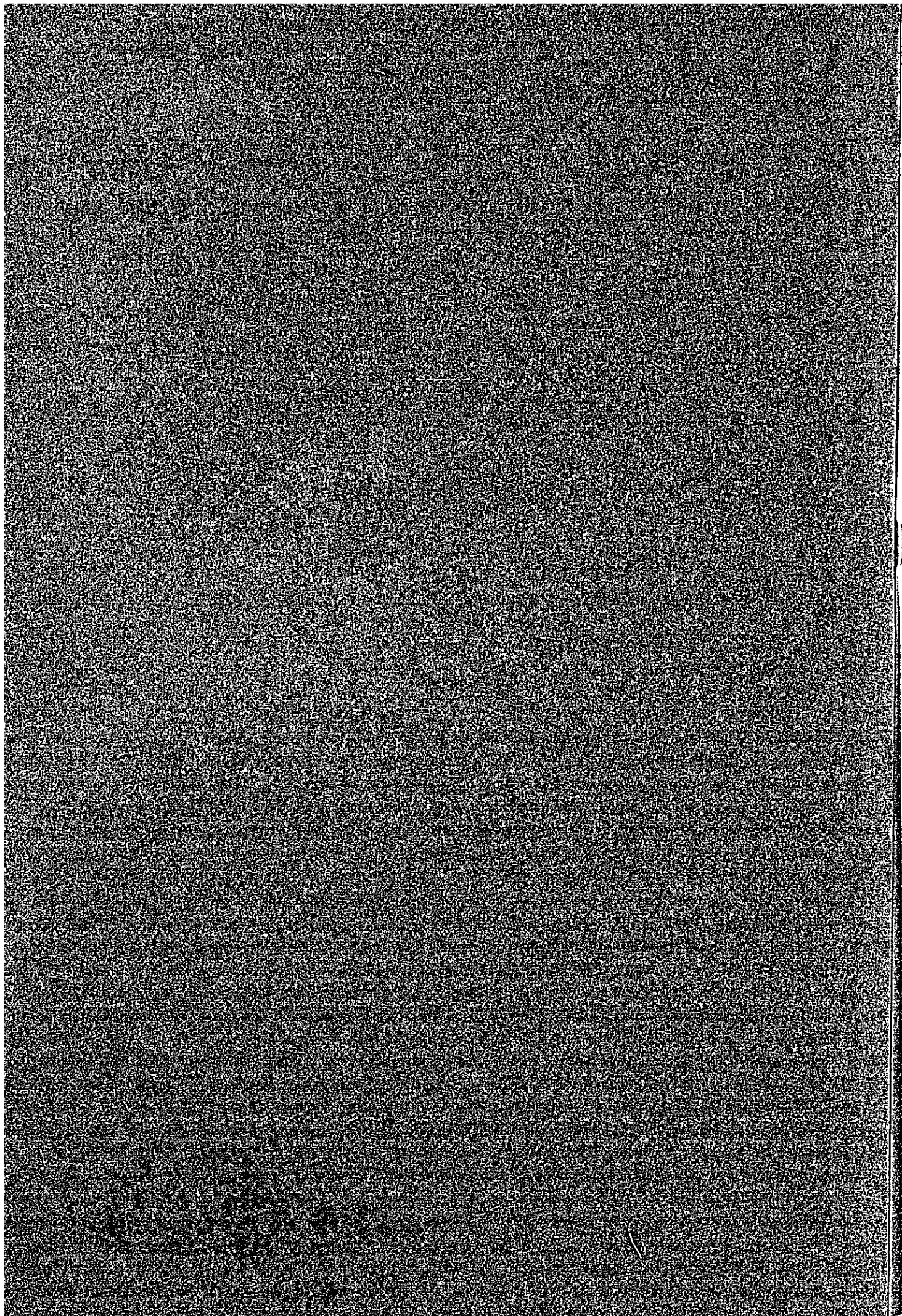
From Japanese Side

Dr. Masayuki NAKAJIMA (Leader of the Team)
Mr. Morikuni AKIGUCHI (Japanese Embassy)
Mr. Takashi KANEKO (J.I.C.A. Bangkok)
Mr. Toshio HIDA (J.I.C.A.)
Dr. Akira ISHIFUKU (Member of the Team)
Mr. Masami TANAKA (-ditto-)
Mr. Kyohel SAIMI (-ditto-)
Mr. Koichi MASUDA (-ditto-)

From Thai Side

Dr. Nibondh SASIDHORN (President of the Srinakarinwirot University)
Dr. Prasert WITAYARUT (Vice President)
Dr. Twee HORMCHONG (Vice President)
Dr. Pratern MAHAKHAN (Deputy to the Vice President)
Dr. Sumeth DEOIORES (Secretary to the Vice President)
Asst. Prof. Smarn SRITHANYA (Director of Zoological Museum)
Mr. Sithipan SIRIRATANACHAI (Marine Scientist)
Mr. Witthaya BOONTHANON (Biochemist)
Mrs. Thanomsin DISATHAPORN (Biochemist)
Mr. Subin PUSUWAN (Assistant Curator)
Mr. Sutin SUSILA (D.T.E.C.)
Mr. Jiroj ITHARATTANA (D.T.E.C.)

CHAPTER 2 OUTLINE OF BANGSAEN MARINE SCIENCE CENTER



CHAPTER 2 OUTLINE OF BANGSAEN MARINE SCIENCE CENTER

2.1 THE EXISTING FACILITIES

Marine Science Center of Srinakarinwirot University was established in September, 1969, for the dual purpose of research and education in the field of marine science, by means of collection, rearing and exhibition of marine animals. It has been open to the general public since October, 1970. The facilities have been improved year after year and there has been a steady increase of visitors to the Center. Upon completion of the new Center, the University expects to have 80,000 visitors per month.

Year	Per month	Annual
1975	22,340	268,080
1976	27,946	335,352
1977	30,673	464,076
1978	43,897	526,764
1979	48,227	578,724

NUMBER OF VISITORS

Currently no admission is charged to the visitors as the Center is financially covered by the annual budget of the University. Furthermore contributions from other universities, private companies and organizations as well as donation from the visitors support the operation of the Center.

The floor plan of the existing facilities are attached as an APPENDIX II-4. They are too small and deteriorated by age to serve effectively for research studies and education.

APPENDIX II-4, II-5 show the existing collection of marine animals, specimens and replicas of marine animals. They are high in quality and abundant in quantity. Therefore some more improvements will make the Center a first-class aquarium and museum in this region.

2.2 Program for the new Center

- (1) The new center is an ideal one which has three functions in one entity: namely aquarium, museum and laboratory. Such a multi-functional center will be an ideal place for the promotion of research and education.

The university plans to cooperate in research with the following universities and institutions:

- Chulalongkorn University
- Kasetsart University
- Dept. of Fisheries, Ministry of Agriculture & Cooperatives
- Office of the Environment
- Fishery Association of Thailand
- Hydrographic Department

- (2) The following research projects in marine science will be conducted by the University utilizing the new facilities and in cooperation with the organizations as mentioned above:

- a. Aquaculture
 - i. Marine Animals
 - ii. Brackish Animals
- b. Ecological Study
 - i. The Gulf of Thailand
 - ii. Mangrove Areas
 - iii. Marine Flora & Fauna
 - iv. Coastal Areas
- c. Economic Marine Plants & Animals
 - i. Marine Animals
 - ii. Marine Algae

- d. Coral Reefs
 - i. Taxonomic Study
 - ii. Ecological Study
 - iii. Biochemical Study
- e. Oceanography

Saltiness, current, temperature, plankton, element, instrument utilization etc.
- f. Pollution
- g. Physiological Studies

feeding, digestion, endocrine glands, circulatory systems, respiratory systems, muscular systems, nervous system and reproductive systems.
- h. Fishery Technology
- i. Marine Animal Processing
- j. Training

(3) Staff members

At present, the existing center is operated by the following staff:

Specialized area	Degree	Number
Biology & Entomology	Doctor	1
Zoology	Master	2
Oceanography	Master	1
Marine Biology	Bachelor	2

Upon completion of the new facilities, the number of staff will be gradually increased to twenty seven.

- (4) According to the Fifth National Economic Development Plan, the department of Aquatic Science is to be established in the Faculty of Science of the Bangsaen Campus of the University in 1982. New Center is expected to serve for research works by the new department.

