# REPORT ON ENVIRONMENTAL EFFECTS OF COAL FIRING POWER STATIONS AND INTEGRATED STEEL MILL IN THE REPUBLIC OF SINGAPORE

## VOLUME I

## -WATER QUALITY-

## (SUMMARY)

FEBRUARY 1982

JAPAN INTERNATIONAL COOPERATION AGENCY

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## 1. Background of Study

The Government of the Republic of Singapore has requested the Government of Japan to extend its technical assistance to conduct the study on the environmental effects of coal firing power stations and integrated steel mill which will be sited in the new industrial estates under the development plan of the Republic of Singapore.

In response to the request, the preliminary survey team has been sent to Singapore in December 1980 and the team entered into agreement on the scope of work including survey items, survey schedule and so on.

The environmental study has been conducted for air and water quality based on the above scope of work.

This report has been compiled on the water quality survey.

## 2. Objective of Study

The objectives of the study are (1) to conduct the field survey on the water quality of the sea areas of the proposed sites of the coal firing power stations and integrated steel mill and (2) based on the data obtained through the field survey and the collected data related to the present and future effluent sources, to conduct simulation of COD and water temperature which will predict the environmental impact of the coal firing power stations and integrated steel mill under operation in 1990.

## 3. Survey Area

The survey areas are the following 2 areas of the proposed sites of the coal firing power stations and integrated steel mill and these locations are shown in Fig. I.

(1) Pulau Seraya Area (proposed site of coal firing power station)
(2) Pulau Tekong Area (proposed site of coal firing power station and integrated steel mill)

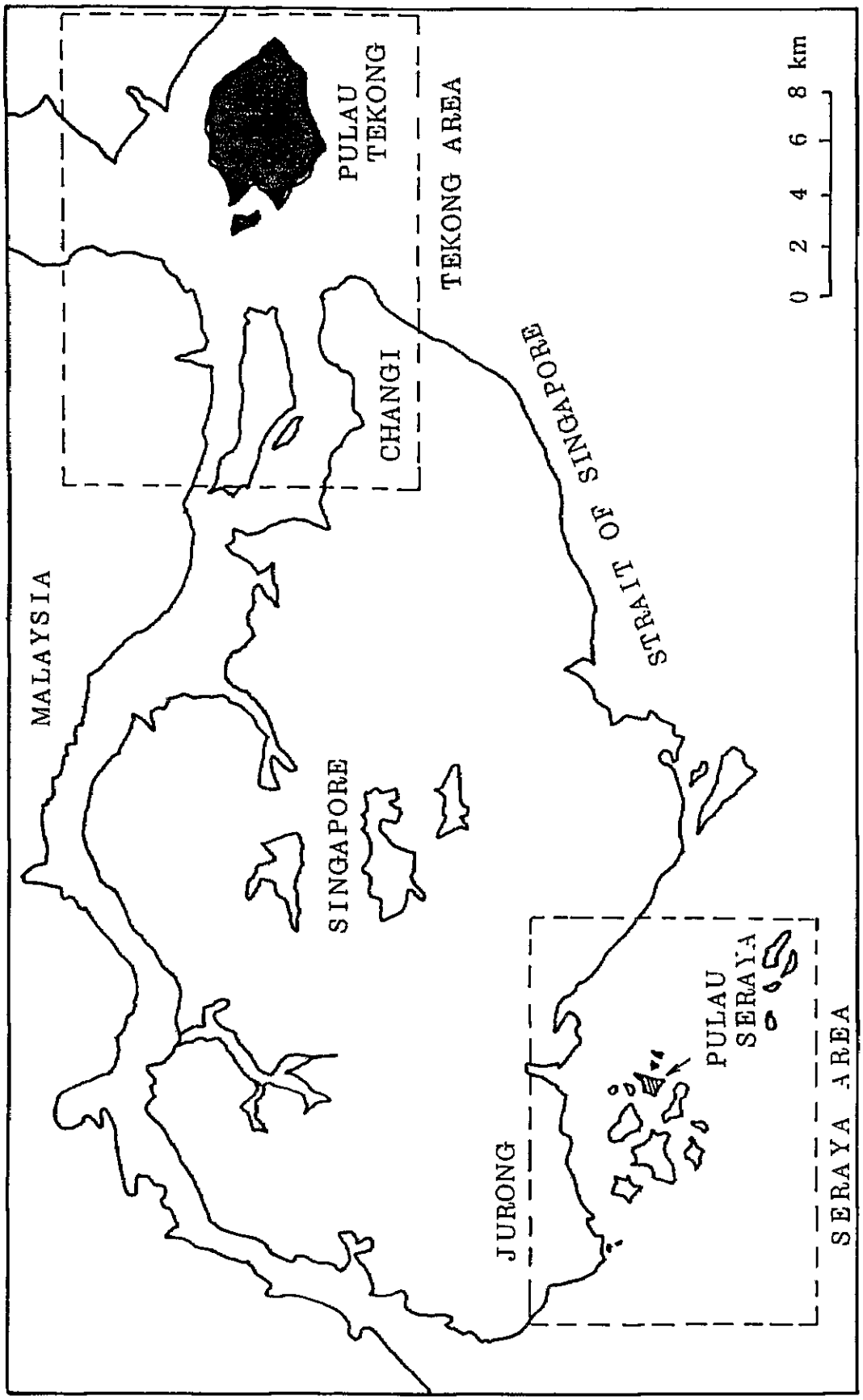


Fig. I Survey area

4. Survey Schedule

The survey schedule is as follows :

(1) Field survey during February 15th to March 26, 1981
(2) Collection of data and simulation during April to October, 1981

5. Outline of Survey Items and Survey Methods

5-1. Field Survey

In order to survey the present current conditions of the survey area and to obtain the basic data for simulation of future conditions, the following field survey has been conducted.

The survey has been carried out under the close cooperation of Jurong Town Corporation (JTC), Port of Singapore Authority (PSA) and National University of Singapore (NUS).

(1) Current survey

The continuous and automatic monitoring of current direction, current velocity and water temperature has been conducted for 15 days by AANDERRA current meter as follows :

At surrounding area of Pulau Seraya --- 6 points (one depth)
At surrounding area of Pulau Tekong --- 4 points (one depth)

(2) Survey on water temperature and salinity

The survey on horizontal and vertical distribution (average 5 depths) of water temperature and salinity has been conducted as follows :

At surrounding area of Pulau Seraya --- 49 points (survey on salinity conducted at 28 points for only surface layer)

At surrounding area of Pulau Tekong --- 35 points (survey on salinity conducted at 24 points for only surface layer)

(3) Survey on water quality

(a) COD (Par-Manganate Method)

At surrounding area of Pulau Seraya — 21 points (surface)
At surrounding area of Pulau Tekong — 11 points (surface)

In addition to the above, the chemical analysis of COD by Dichromate Method has been carried out and the analysis of Chrolophyll-a has been conducted at 5 points of the above areas respectively.

(b) Transparency and water colour

At surrounding area of Pulau Seraya — 49 points
At surrounding area of Pulau Tekong — 35 points

(4) Collection of past survey data

The data of the tide and meteorological conditions of Singapore have been collected through JTC and the report on the joint survey of the tide and tidal current of the Straits of Malacca and Singapore has been collected from Maritime Safety Agency, Japanese Government.

5-2. Analysis of Field Survey Data

The data obtained through the field survey together with the collected data of the past survey have been brought back to Japan and the following analysis have been conducted.

(1) Statistical analysis of current direction and velocity fluctuation
(2) Analysis of current pattern
(3) Statistical analysis of tides
(4) Arrangement of meteorological data
(5) Horizontal and vertical distribution of water temperature and salinity
(6) Vertical distribution of COD

## 5-3. Collection of Effluent Sources' Data and Future Assessment

The effluent sources' data which will be used for numerical simulation have been collected and supplied by JTC based on the questionnaire prepared by Japanese side.

The effluent data related to the coal firing power stations and integrated steel mill under planning have been discussed and fixed between Singapore and Japanese side.

The data related to other emission sources have been supplied by JTC and those data have been used by Japanese side for assumption of future effluent conditions.

## 5-4. Simulation

Establishing the calculation parameter based on the above basic data and effluent data, the following simulations have been conducted.

(1) Current conditions (present and future)
(2) COD (present and future)
(3) Thermal effluent (present and future)

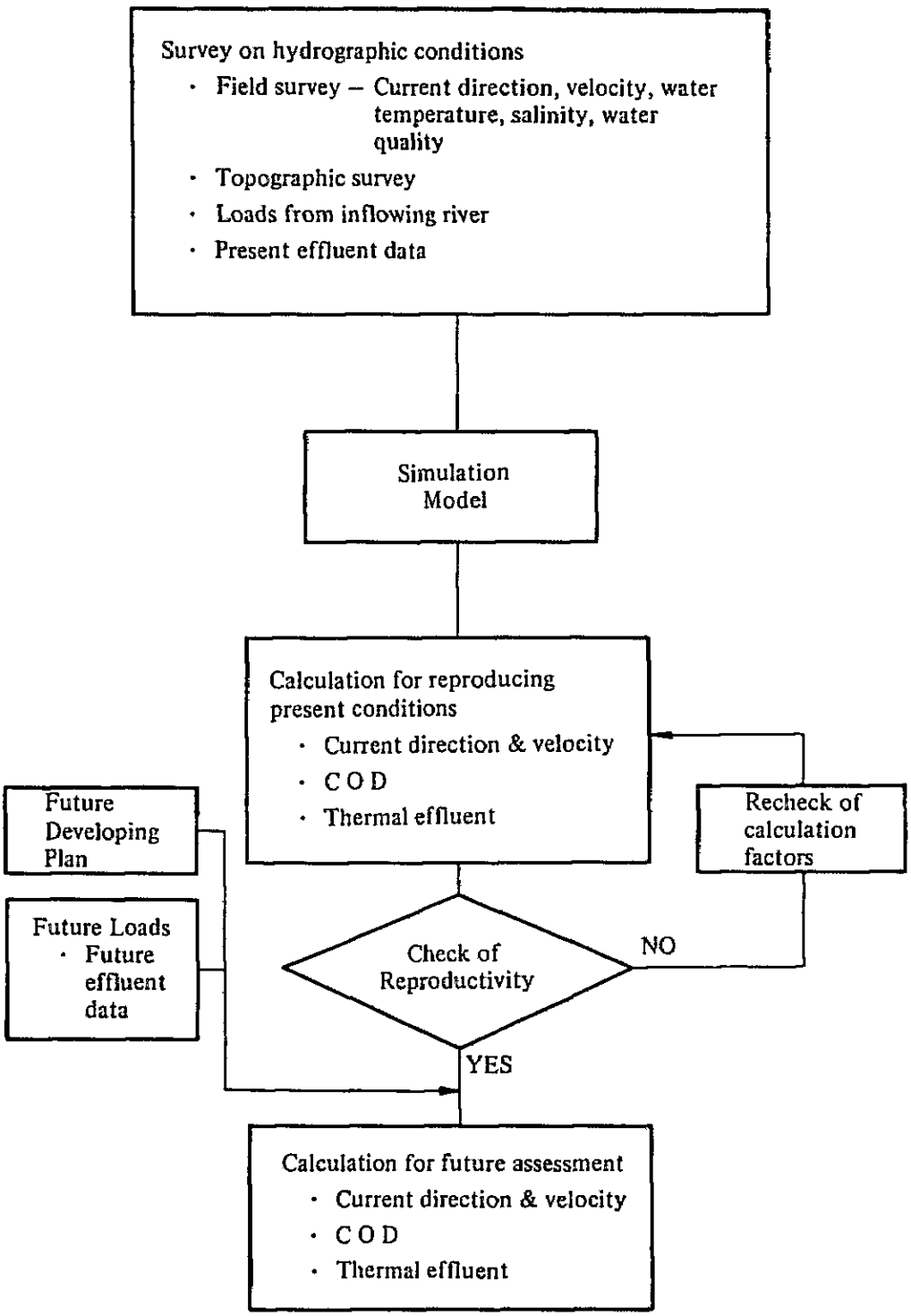


**Fig. II Processes of simulation**

6. Survey Results

(1) The present conditions of water quality is satisfactory, showing the low values in terms of COD which is one of the scientific indicator of water pollution level.

(2) The future conditions after reclamation of the sites and operation of new plants are :

i) The changes of current conditions will be only limited to a part of coastal areas and the slight change in current velocity is predicted.

ii) The increases of COD concentration and water temperature by the effluent discharge will be also limited to the small extent and their impact on the surrounding areas will be negligible. This is mainly due to the fact that the pollutants are well diffused by the fast current which is one of the characteristics of the sea areas of Singapore.