No.

Directorate General of Sea Transportation (DGST)
Ministry of Transportation
The Republic of Indonesia

IMPLEMENTATION REVIEW STUDY REPORT ON THE PROJECT FOR ENHANCEMENT OF VESSEL TRAFFIC SYSTEM IN MALACCA AND SINGAPORE STRAITS IN INDONESIA

STAGE-2

July 2009

JAPAN INTERNATIONAL COOPERATION AGENCY

ORIENTAL CONSULTANTS CO., LTD.
JAPAN AIDS TO NAVIGATION ASSOCIATION

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PREFACE

In response to a request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct an implementation review study on the The Project for Enhancement of Vessel Traffic System in Malacca and Singapore Straits and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Indonesia a study team from October 9 to November 12, 2008, November 30 to December 24, 2008, March 15 to March 27, 2009 and May 24 to May 30, 2009.

The team held discussions with the officials concerned of the Government of Indonesia, and conducted a field study at the study area. After the team returned to Japan, further studies were made, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the teams.

July, 2009

Toshiyuki Kuroyanagi
Director General
Economic Infrastructure Department
Japan International Cooperation Agency

July, 2009

Letter of Transmittal

We are pleased to submit to you the implementation review study report on the Project for Enhancement of Vessel Traffic System in Malacca and Singapore Straits in the Republic of Indonesia.

This study was conducted by the Consortium of Oriental Consultants Company Limited and Japan Aids to Navigation Association, under a contract to JICA, during the period from October 2008 to July 2009. In conducting the study, we have examinated the feasibility and rationale of the project with due consideration to the present situation of Indonesia and formulated the most appropriate basic design for the project under Japan's Grant Aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Masahiko Koshimizu
Project Manager,
Implementation Review Study Team on
The Project for Enhancement of
Vessel Traffic Sysytem in
Malacca and Singapore Straits
The Consortium of
Oriental Consultants Co., Ltd. and,
Japan Aids to Navigation Association

SUMMARY

SUMMARY

1 Background and Outline of Proposal for Official Grant Aid

Malacca and Singapore Straits (hereafter called "the Straits") are international shipping thoroughfares essential to world trade. More than 90,000 ships per annum pass through the Straits of which some 14,000 are Japanese related vessels. The Straits however contain many obstructions including shoals, wreckage of ships and objects among others. As measure to enhance traffic safety, the Traffic Separation Scheme (TSS) was established by splitting inbound and outbound traffic and the Mandatory Ship Reporting System in the Straits (STRAITREP) was introduced.

The ships passing through the Straits are constantly subjected to high risks of accident because the Straits are narrow and shallow with presence of occasional sunken rocks and ships. Moreover, the high volume of marine traffic among the littoral states, including passenger ships, cargo vessels, fishing vessels and others crossing the TSS daily is posing high risk of disaster. In order to reduce the likelihood of possible accidents, "Precautionary Areas" was established so that large ships cruising the TSS will proceed with caution for crossing vessels.

With the foregoing situation in consideration, a Meeting on the Straits of Malacca and Singapore: Enhancing Safety, Security and Environmental Protection was organized by International Marine Organization (IMO) in co-operation with the three littoral states, namely Government of the Republic of Indonesia, the Government of Malaysia and the Government of the Republic of Singapore. The first meeting took place in Jakarta Indonesia in September, 2005 (the Jakarta Meeting). This was followed by a second meeting in September 2006 at Kuala Lumpur, Malaysia (the "Kuala Lumpur Meeting"). The final meeting was held on September 4 to 6, 2007 in Singapore. In that meeting, a resolution was adopted to enhance the safety and environmental protections of the Straits, that the work initiated by the TTEG on Safety of Navigation should continue to be supported and encouraged through Co-operative Mechanism, comprising: i) a Co-operation Forum, ii) a Project Co-ordination Committee and, iii) the Aids to Navigation Fund. The resolution should be supported and encouraged, by user States, shipping industry and other stakeholders and should endeavour to contribute, on a voluntary basis, to the work of the Co-operative Mechanism.

On the basis of the foregoing, the Indonesian Government requested for a Grant Aid Fund to the Japanese Government in March 2006 for the establishment of VTS System for equipment procurement and construction of VTS Center and related facilities to enhance traffic safety in the Indonesian side of the Straits. The request is summarized as follows:

Proposed Sites and Objectives:

[VTS Sensor (Radar) Station]: i) Tanjung Medang (Rupat Island), ii) Tanjung Parit (Bengkalis Island), iii) Jantan (Karimun Island) or Hiyu Kecil Island, iv) Batu Ampar (Batam Island), v) Tanjung Berakit (Bintan Island)
[Relay Stations]: Dangas (Batam Island)
[VTS Center]: Batu Ampar (Batam Island)
[VTS Sub-Center]: Dumai

Equipment

Radar system with GPS, radar tracking system, multi-function console, VHF radio communication system, transmission and communication links, AIS, CCTV camera system, VTS data system and web server, recording and playback unit, meteorological sensor, power generator, air conditioner.

In response to the request of the Indonesian Government, the Japanese Government deployed a JICA Study Team which conducted a basic design study from January 2007 to February 2008, and the basic design study was prepared and complied with the draft basic design report. The project was composed of two stages, and the Stage-1 Project was approved by the Cabinet on May 2008 and the Exchange of Notes were signed on November 2008.

To expedite execution of the project by ensuring the technical consistency from the basic design, the Consultants which shall be a Japanese national in accordance with E/N, is recommended to the Recipient for the Project. However, before starting implementation of the Project, it was required to re-select the Consultants.

After the re-selection of the Consultants, the Implementation Review Study Team was dispatched three times from October 9 to November 12, 2008, from November 30 to December 24, 2008 and March 15 to March 27, 2009, respectively to Indonesia and a series of site inspections and discussions were made with the Directorate General of Sea Transportation (DGST) of the Ministry of Transportation, and other concerned agencies for the review of the basic design study, and verification and reconfirmation of the intent of the request of the Indonesian Government. After the team returned to Japan, the review of the basic design study was prepared and complied with the draft implementation review study report for Stage-2. From May 24 to May 30, 2009, the draft implementation review study explanation team was dispatched to Indonesia to explain the draft implementation review study report and the contents of the Project.

For the Stage-1, implementation review study report for Stage-1 was completed in February 2009, and implementation of the Project was started.

2 Outline of the Study Results and Contents of the Project

Followings are the components of the Stage-2 Project concluded in the implementation review study.

(1) Project Sites

- Tanjung Medang : VTS Sensor Station
- Tanjung Sair : Repeater Station
- Dumai : VTS Sub-Center
- Selincing : Repeater Station
- Simpang Ayam : Repeater Station
- Tanjung Parit : VTS Sensor Station
  (Radar system excluded)

(2) Outline of the Project Component

The table below shows the outline of the project component.

1) Main Equipment to be Procured

Equipment	1 Tanjung Medang	2 Tanjung Sair	3 Dumai	4 Selincing	5 Simpang Ayam	6 Tanjung Parit
Equipment for VTS Sensor and Repeater Stations						
Radar System	○					
VHF Marine Radio System	○					○
AIS Base Station System (AIS System)	○					○
CCTV Camera Equipment (CCTV System)	○					
Area Surveillance Camera		○			○	
Meteorological Sensor Unit with Data Logger	○					
Air Conditioner for Radar Sensor Station	○					
Diesel Engine Generator	○					
Solar Power Generator		○			○	○
Housing Unit (with accessories)		○			○	○
Equipment for VTS Sub-Center						
Tracking System			○			
Multi-function Console with VHF Radio Communication Unit			○[1)]			
Data Base for Vessel Information			○			
Record and Playback System for Vessel Traffic			○			
AIS Server System (AIS System)			○			
CCTV Video Display Equipment (CCTV System)			○			
Meteorological Monitor Console			○			
Resource Management System			○			
Printer System (Monochrome and Color)			○			
Connecting Devices for Internet Communication between Dumai and Batu			○[2)]			
Equipment for VTS Sub-Center, Sensor and Repeater Stations						
Equipment Desk and Others			○			
Multiplex Radio Equipment (Data Communication System)	○	○	○[3)]	○[3)]	○	○

1) 2) One another unit will be installed at Batu Ampar VTS Center
3) Equipment installed by MTSD Project IV will be used for data Transmission between Dumai and Selincing.

2) Scale of the Facilities

a Buildings

Building	Structure Type	Function	Total Floor Area
VTS Sub-Center (Dumai)	Reinforced Concrete, one story	Operation room, Engineer room, UPS room, Staff room, napping room, toilet etc.	207.36m^2
Equipment Building (Tanjung Medang)	Reinforced concrete, one story	Machine room, UPS room	42.25m^2
Generator House (Type A) (Tanjung Medang)	Reinforced concrete, one story	Generator room	55.00m^2
Generator House (Type B) (Dumai)	Reinforced concrete, one story	Generator room	45.00m^2

b Steel Tower for the Radar and Communication Facilities

Steel towers will be erected for the radar scanners and parabola antennae needed for the multiplex communication links. The lists below show the required height of the steel tower for each site.

- Tanjung Medang : 73.0m
- Tanjung Sair : 85.0m
- Dumai : 50.0m (*)
- Selincing : 50.0m (*)
- Tanjung Parit : 87.5m
- Simpang Ayam : 84.5m

(*) In the above, Steel towers of Dumai and Selincing will be constructed by the Marine Telecommunication System Development (MTSD) Project Phase IV.

3 Implementation Schedule and Project Cost

The implementation schedule of the Project (Stage-2) is about 21 months for detailed designs, construction of building facilities and equipment procurement including manufacturing, transportation and installation. The cost of the Project provided to the Indonesian Government is roughly estimated at Rp. 688.0 million.

4 Project Evaluation and Recommendations

The Project will generate the following benefits:

(1) Direct Effect

- Indonesia will be having a VTS System of its own for the surveillance of marine traffic in the Straits for the enhancement of navigation safety.
  - The System will enable the surveillance of ship movements by radar and monitor console.
  - The System will enable the monitoring of vessel identitiy by AIS.
- The System will enable the dissemination of service information particularly on weather information through VHF and AIS for enhancement of traffic safety.
- It will be possible to provide of service information to related guard and rescue organizations for joint rescue cooperation in times of accidents.

(2) Indirect Effects

- The system will enhance navigation safety and will contribute to reduction of the risk of possible marine disasters in the Straits.
- The system will contribute to enhance rescue missions for saving lives and assets.
- The system will provide the needed deterrence against illegal acts in the Straits and will contribute enhancement law enforcement against illegal ships and activities in the Straits.
- It will enhance the development of legal systems required for ship control within the territorial waters in Indonesia, coordination among three littoral states and international organizations and training of ship control operators.

(3) Recommendations

The VTS System is envisioned to contribute to the safety of navigation in the Straits. To achieve the objective, the following is strongly recommended.

1) Operation and Maintenance

- Enhancing the basic understanding of operators and administrators for the operation of the VTS System,
- Training of staffs for the efficient operation of the VTS System,
- Training of staffs for inspection, trouble shooting and maintenance of the VTS System,
- Establishment of operation and maintenance organization, preparation of operation and maintenance rules, manuals and, establishment of logistics system for fuel and consumer goods supply to each site for efficient VTS System operation,
- Preparation of training program for operators and supervisors for the operation of the VTS System,
- Establishment of pertinent laws for ship traffic in territorial waters of Indonesia,
- Coordination with other related organization in Indonesia including BAKORKAMLA.

2) Cooperation and coordination with the littoral States and International Organizations

Malacca and Singapore Straits are international straits and any duly foreign registered vessel can pass through the Straits. Therefore, VTS operations for the Straits are necessary to be supported with appropriate agreement and collaboration among the littoral states and International Organizations including the IMO. Until such time that an agreement has been reached, operations of the VTS System shall be limited only for the monitoring of the Straits at the Indonesian Side.

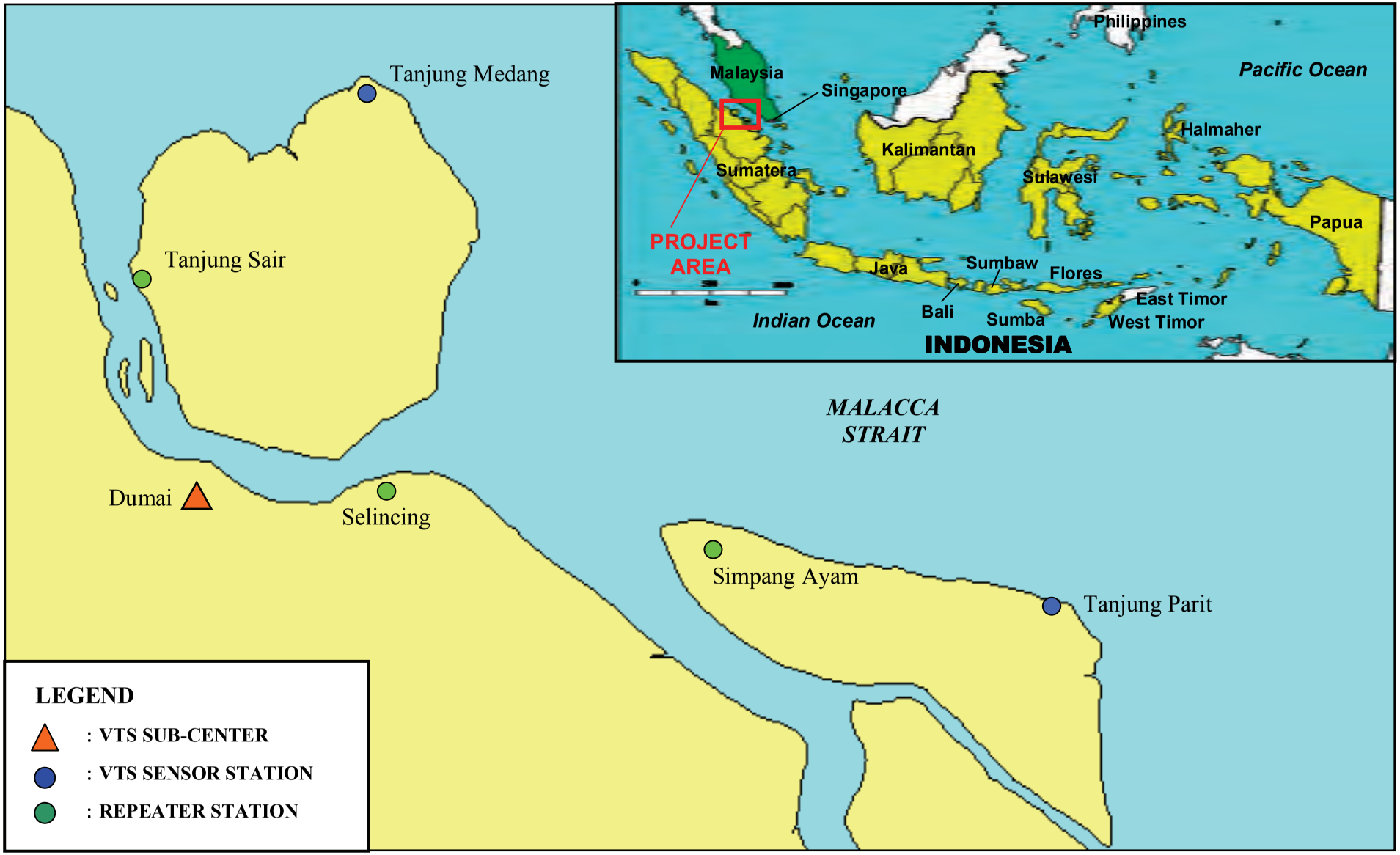
The main purpose of the VTS System to be provided by this Project is for the surveillance of small vessels crossing the TSS which are posing hazard to safety of traffic particularly for very large vessels navigating along the TSS main routes. Under this concept, for the time being, the operations of the VTS System will be limited only for the monitoring of the Straits at the Indonesian Side. However, Indonesia may soon be jointing its colleagues (Malaysia and Singapore) which have already been operating their own VTS.

Considering the limited space in the Straits, the individual operation of VTS System will most likely create possible confusion in the surveillance of the Straits if joint operation is not pursued. The MEH project is also currently coordinating with littoral states and IMO in enhancing the safety navigations and environmental protections in the Straits.

Measures to enhance traffic safety, protection of marine environment in support to the search and rescue missions and oil pollution protection programs are topics of discussions in Tripartite Technical Experts Group (TTEG) meeting by the littoral states. Indonesian Government's initiative to promote effective VTS System operations through appropriate tripartite discussions, coordination and cooperation are highly desirable for concurrence by International Organizations.

CONTENTS

Appendices



Location Map (Stage-2)

Dumai VTS Sub-Center

Steel Tower for Radar and Multiplex Communication Links

LIST OF FIGURES AND TABLES

ABBREVIATIONS

A	AIS	Automatic Identification System
B	BAKORKAMLA	Indonesian Maritime Security Coordinating Board (IMSCB) / Badan Koordinasi Keamanan Laut
	BAPPENAS	National Development Planning Agency / Badan Perencanaan Pembangunan Nasional /
	BIDA	Batam Industrial Development Authority
	CCTV	Closed-circuit Television
D	DGST	Directorate General of Sea Transportation
	DN	Directorate of Navigation
	DWT	Dead Weight Tonnage
G	GMDSS	Global Maritime Distress and Safety System
	GPS	Global Positioning System
	GT	Gross Tonnage
I	IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
	IMO	International Maritime Organization
	INDOSREP	Indonesia Ship Reporting System
M	MEH	Marine Electronic Highway
	MTSD Phase IV	Marine Telecommunication System Development Project Phase IV
	MSC	Malacca Strait Council
P	PDAM	Perusahaan Daerah Air Minum
	PLN	PT. Perusahaan Listrik Negara
R	RPJM	Rencana Pembangunan Jangka Menengah Tahun/ Medium Term Development Strategy
S	SOLAS	International Convention for the Safety of Life at Sea
	SPT	Standard Penetration Test
	STRAITREP	Mandatory Ship Reporting System in the Straits of Malaccan and Singapore
T	TSS	Traffic Separation Scheme
	TTEG	Tripartite Technical Experts Group
V	VHF	Very High Frequency
	VLCC	Very Large Crude Oil Carrier

VTIS	Vessel Traffic Information System
VTS	Vessel Traffic Service

Chapter 1 Background of the Project

Chapter 1 Background of the Project

1-1 Present Conditions and Issues of the Sector

(1) Present Conditions of Sea Traffic of Malacca and Singapore Straits

1) Traffic Separation Scheme

Malacca and Singapore Straits are International Shipping Thoroughfares and thereby allow the right of transit passage to any duly registered foreign vessel. Traffic safety and environmental protections in the Straits have always been a principal issue in Tripartite Technical Experts Group (TTEG) meetings among the three littoral states since 1977. The Traffic Separation Scheme (TSS) was established as a measure to enhance traffic safety by splitting inbound and outbound traffic. The system was implemented in 1977 through IMCO, NAV 20 and enforced in 1981. During the initial stages of enforcement, the TSS was established in two locations, i.e., the One Fathom Bank near the coast of Port Klang in the Malaysian side of the Strait and the other is in the Singapore Strait. The regulation which was amended in 1998 extended the range of the TSS from One Fathom Bank to Horsburgh Lighthouse in the off-shore of the eastern side of Singapore for an extent of about 263 miles or approx. 490 km which up to date is still operational.

2) Mandatory Ship Reporting System

The STRAITREP (Mandatory Ship Reporting System in the Straits of Malacca and Singapore) was introduced when the TSS regulation was amended in 1998. The STRAITREP calls for ships to report to the Vessel Traffic Information System (VTIS[1]) upon entry to the operational area of responsibility of either Malaysia or Singapore. The category of ships required to report are: i) 300 GT (Gross Tonnage) and above class, ii) vessels 50 meters or longer, iii) Tugs or pusher boats engaged in towing or pushing of 300GT vessel or more or with a combined length of 50 meter or more, iv) vessels of any tonnage but carrying hazardous cargo as defined in Paragraph 1.4 of resolution MSC.

[1] This report defined VTS based on Regulation 12, CHAPTER 12 of the International Convention of SOLAS. The System in Malaysia and Singapore however is termed as VTIS (Vessel Traffic Information System).

43(64), v) all passenger vessels that are fitted with VHF, regardless of length or GT, and vi) any category of vessels less than 50 meters long or less than 300 GT but fitted with VHF which will use the TSS in the event of emergency to avoid risk of immediate danger.

3) Vessel Traffic

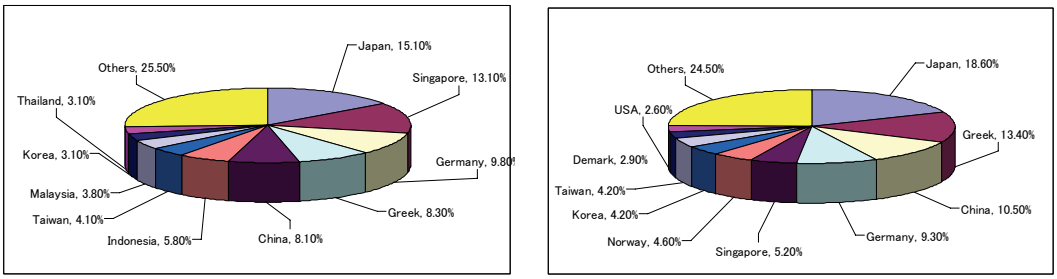
Table 1-1-1 shows the volume of traffic which passed through the TSS for the period covering 2001 to 2007. As can be seen, in 2007 more than 70,000 ships have passed through the TSS which is 194 ships/day average. Tanker vessels and container ships occupied about 30 % respectively of the total traffic volume and this trend was not changed in last 7 years.

Table 1-1-1 Record of Ships Passing the TSS in Malacca and Singapore Straits

Type of Ships	2001	2002	2003	2004	2005	2006	2007
VLCC	3,303	3,301	3,487	3,477	3,788	3,851	3,753
Other Tankers	14,276	14,591	15,667	16,403	14,759	14,784	14,931
LNG/LPG Tankers	3,086	3,141	3,277	3,343	3,099	3,297	3,413
Sub-total of Tankers	20,665	21,033	22,431	23,223	21,646	21,932	22,097
Container Ships	20,101	20,091	19,575	20,187	20,818	22,615	23,736
Others	18,548	18,910	20,328	20,226	20,157	21,102	24,885
Total Nuber of Ships (100%)	59,314	60,034	62,334	63,636	62,621	65,649	70,718
Average Ships per Day	163	164	171	174	172	180	194
Rate of Tanker	34.8%	35.0%	36.0%	36.5%	34.6%	33.4%	31.2%
Rate of Container Ships	33.9%	33.5%	31.4%	31.7%	33.2%	34.4%	33.6%

(Data Source: Web site Information of Marine Department Malaysia)

In 2006, the Ministry of Land, Infrastructure, Transport of Japan and Tourism jointly with Nippon Foundation conducted a Traffic Study for Malacca and Singapore Straits. Based on the study result, traffic volume rose from 75,061 in 1994 to 93,755 in 2004 or an increase of about 25%. Some 14,198 ships substantially owned by Japanese nationals accounted for the total traffic in 2004 or a total share of 15.1%. In terms of DWT (Dead Weight Tonnage), these ships at 18.6% occupied the largest share worldwide as shown in Fig. 1-1-1 below



(1) Number of Ships (2) Dead Weight Tonnage

(Data Source: Web site of MLIT)

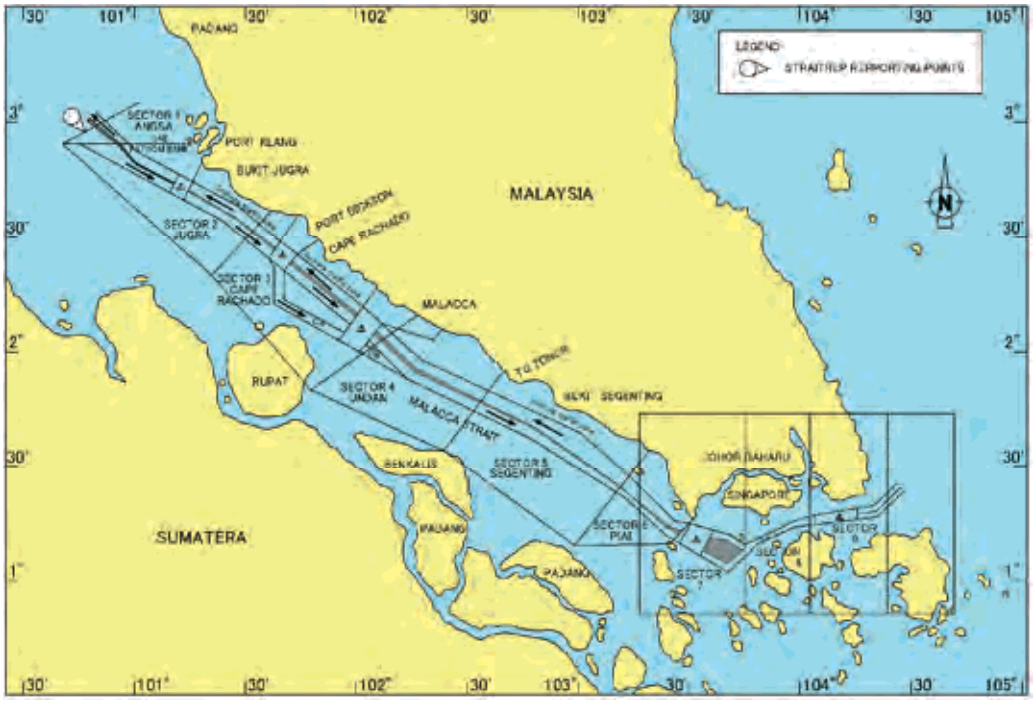
Fig. 1-1-1 Traffic Volume Share in Malacca and Singapore Straits by Country

(2) Present Conditions of Vessel Traffic Information System in Malacca and Singapore Straits

1) Malaysia and Singapore

Vessel traffic in the Straits is being monitored through VTIS by 19 radars of Singapore and Malaysia. Likewise, the STRAITREP is operated through VTIS providing the needed information to assist the cruising of vessels in the Straits to maintain and enhance traffic safety. As shown in Fig. 1-1-2, the operational area of the STRAITREP covers the Straits of Malacca and Singapore between longitudes 100° 40′ E and 104° 23′ E. The area of operations is divided into nine segments with Malaysia responsible for 1 to 6 segments and Singapore for 7 to 9 segments. Upon entry to the operation area of responsibility, the ship is mandated to report in accordance with STRAITREP as sanctioned by the International Maritime Organization (IMO).

The VTIS Centers of Malaysia and Singapore calls for the mandatory reporting of vessels of their direction, speed and other navigational information upon entry to the operational area of responsibility of the STRAITREP. Information gathered by radar, AIS system and reported by ships are processed by computers and depicted on electronic screens for intensive monitoring/surveillance. Any risk of danger is relayed to the ships to avert/avoid the occurrence of possible accident. The VTIS also provides any service information based on the ships' request.



(Draw up based on the Information of the World VTS Guide WEB Site)

Fig. 1-1-2 STRAITREP Sector Areas

2) Status of VTS System in Indonesia

The similar system which are called VTIS have been established at five ports in Tg. Priok (Jakarta), Tg. Perak (Surabaya), Belawan, Semarang, Makassar in 2005, introduced to Teluk Bayur and Balikpapan in 2007, and Bintuni in 2008 for monitoring the ships entering to and leaving from these ports. However, VTS System for monitoring ships passing through the Malacca and Singapore Straits are not established yet.

Under the Indonesia's Medium Term Development Strategy 2004 - 2009 (PRJM: Rencana Pembangunan Jangka Menengah Tahun 2004-2009), the Ministry of Transportation (MOT) draw up a "Strategic Development Plan 2005-2009" (Tentang Rencana Strategis Departemen Perhubungan Tahun 2005-2009) based on a Decree issued in 2005 by the Minister of Transportation (Keputusan Menteri Perhubungan, KM 41 Tahun 2005).

The Directorate of Navigation (DN) envisaged the introduction of VTS System for Sunda and Lombok Straits, Malacca and Singapore Straits, Pontianak, Toli-toli, Bitung, and Sorong recently. Among them, development of VTS System for Malacca and Singapore Straits are included in the "List of Project and Technical Assistance Proposals",

commonly called “Blue Book”, of the National Development Planning Agency (BAPPENAS) in 2005 together with Ship Reporting System. The establishment of VTS System for Malacca and Singapore Straits is therefore placed high priority project.

(3) Present Conditions of Vessel Traffic Safety

The ships passing through the Straits of Malacca and Singapore are constantly subjected to high risks of accident due to the narrow navigational width and shallow depth coupled with occasional scattering of sunken rocks and ships. Moreover, many vessels from the adjoining states including passenger ships, cargo vessels, fishing vessels among others are crossing the TSS daily. For this reason, vessels traffic crossings as “Precautionary Areas” are provided with measures to avoid the risk of occurrence of possible accidents.

1-2 Background and Outline of Proposal for Official Grant Aid

(1) Background Information

Malacca and Singapore Straits are essential international shipping thoroughfares. Some 90,000 ships passed through the Straits per annum 14,000 of which are Japanese cargo related vessels. However, shoals and shipwrecks coupled with the heavy traffic of tanker and container ships are threats facing the navigation of the Straits.

Under these circumstances, a Meeting on the Straits of Malacca and Singapore was organized by the IMO in co-operation with the three littoral states the objective of which is how to enhance safety, security and protection of the environment. The first meeting took place in Jakarta, Indonesia in September, 2005 (the “Jakarta Meeting”). The second meeting was held in September 2006 at Kuala Lumpur, Malaysia (the “Kuala Lumpur Meeting”). The three littoral states hosted the Kuala Lumpur Meeting, and twenty-eight countries including Japan participated. A resolution was arrived at to continue with the efforts to enhance safety of navigation and environmental protection and that the littoral States, user States, as well as the shipping industry and other stakeholders cooperation were sought towards the establishment of a mechanism for voluntary funding and/or burden sharing for the cost of the projects and the maintenance and the renewal/rehabilitation of the navigational aids system in the Straits.

The final meeting was held on September 4 to 6, 2007 in Singapore. In that meeting, the participants agreed to continue with the enhancement of safety and environmental protections of

the Straits. A "Singapore Statement" was also adopted with the continuance of on-going works initiated by TTEG on Safety of Navigation. The works will be given support and encouragement by Co-operative Mechanism, to compose of the following: i) Co-operation Forum, ii) the Project Co-ordination Committee and iii) the Aids to Navigation Fund, from the adjoining states, user states, shipping industry and other stakeholders.

On the basis of the foregoing, the Indonesian Government requested for a Grant Aid to the Japanese Government in March 2006 for the establishment of VTS System for equipment procurement and construction of VTS Center and related facilities to enhance traffic safety in the Indonesian side of the Straits.

(2) Composition of the Request

The proposed project locations as listed hereunder were confirmed during the first site survey from February to March 2007 of the Study Team in the Basic Design Study (hereinafter called "the BD Study"). The locations are depicted in Fig. 1-2-1 hereafter

1) VTS Sensor Stations[2]:

(i) Tanjung Medang (Rupat Island), (ii) Tanjung Parit (Bengkalis Island), (iii) Jantan (Karimun Island) or Hiyu (Iyu) Kecil Island, (iv) Batu Ampar (Batam Island), (v)Tanjung Berakit (Bintan Island)

2) Relay Station: Dangas (Batam Island)

3) VTS Center: Batu Ampar (Batam Island)

4) VTS Sub-Center: Dumai

[2] In the basic design study, sensor equipment such as radar scanner, AIS (Automatic Identification System) and others will be installed as additional for these sites, while monitoring operations will be conducted in other sites. These sites are defined as "VTS Sensor Stations, and monitoring sites are termed as "VTS Center" and/or "VTS Sub-Center" in the Basic Design Study Report. Same definitions are applied in this Implementation Review Study Report..

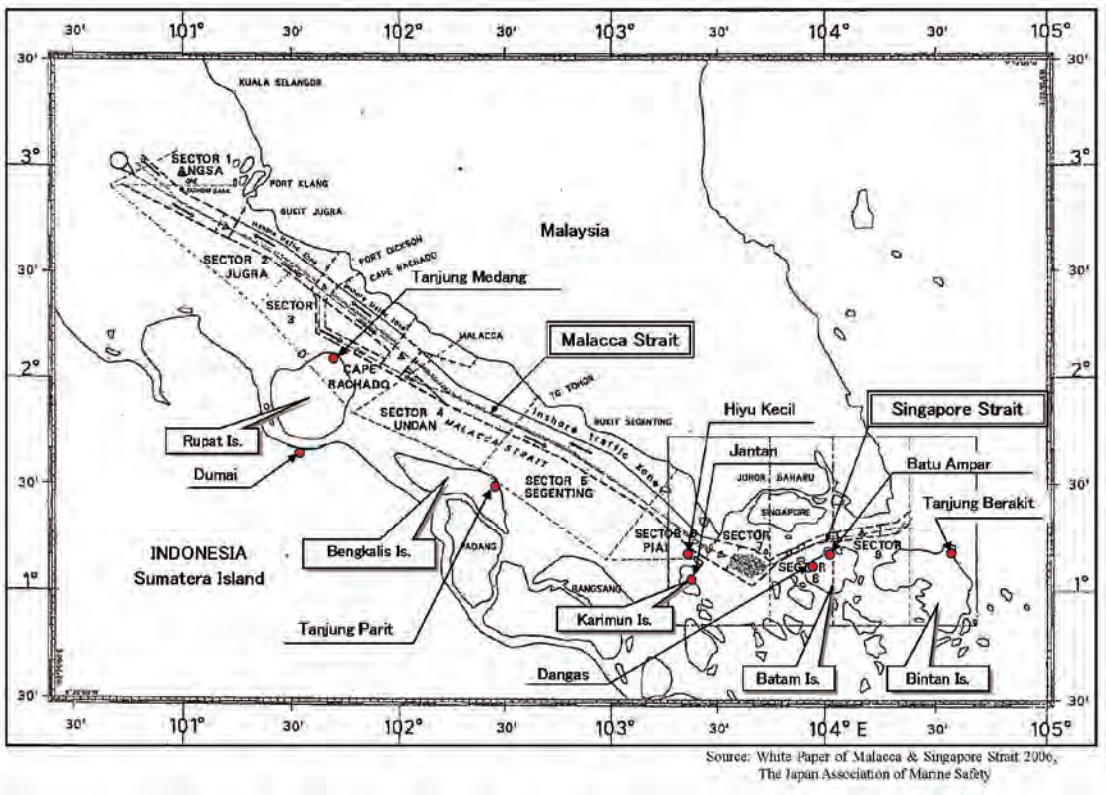


Fig. 1-2-1 Location Map of the Proposed Project Sites

5) Proposed Equipment for Possible Official Grant Assistance

Listed hereunder are the equipment requested by the Indonesian Government to the Japanese Government for possible assistance.

Radar System with GPS, radar tracking system, multi-function console, VHF radio communication system, transmission and communication links, AIS, CCTV camera system, VTS data system and web server, recording and playback unit, meteorological sensor, power generator, air-conditioner.

1-3 Official Assistance to Marine Transport Sector

Japan (as a user state of the Straits) has continuously been cooperating for the enhancement of traffic safety and protection of environment in the Straits since the establishment of the Malacca Straits Council (MSC) in 1969. Japan collaborated with the littoral states for i) technical cooperation regarding bathymetry surveys including sea chart productions, tide and current measurements, ii) salvaging of wreck ships, iii) deepening of shallow depths, iv) installation and

maintenance of navigation aids and , v) procurement of buoys, vi) contributed for buoy tender and others.

Of the 51 beacons and lighthouses in the Straits, 30 were installed by MSC. Annual maintenance of the facilities including replacement of spare parts is also being carried out in cooperation with littoral states and MSC. In 2003, a new buoy tender "Jadayat" was donated to the Indonesian Government by MSC under the full sponsorship of Nippon foundation. From 1996 to 1998, a resurvey was carried out through JICA development study, and sunken ships and shoals were discovered. By using of the survey data, electronic charts were produced and the charts are for sale in Japan and the littoral states since December 2005.

Additionally, Japan conducted the following cooperation for maritime transportation.

Table 1-3-1 Japanese Cooperation for Maritime Transport

Type	Year	Study
ODA Loan	2004 to 2009（Planned）	Marine Telecommunication System Development Project (IV)
Development Study	2006	The Study on the Port Security Enhancement Program of Major Indonesian Trade Ports
	2001 to 2002	Maritime Traffic Safety System Development Plan Study
	1996 to 1998	Joint Survey of Critical Areas and Investigation of Dangerous / Unconfirmed Shoals and Wrecks in the Straits of Malacca and Singapore (Governments of Indonesia, Malaysia, Singapore and Japan.)
Grant Aid Project	2009	The Project for Enhancement of Vessel Traffic System in Malacca and Singapore Straits (Stage-1)
	2006	Provision of Patrol Ships for Anti-Piracy, Anti-Maritime Terrorism, and Non-Proliferation Project
	2004	Security Equipment Improvement in Major Air & Sea Ports Project

1-4 Current Situation of the Project Sites

1-4-1 Status of Infrastructures

(1) Tanjung Medang

The site is accessible only by sea and has no infrastructures for landing. There are no vehicles around the site. A lighthouse operated by DN is located in the north end of Rupat Island where

small villages are located. Electrical power for the operation of the lighthouse is supplied by generator. Rain is the source of potable water.

(2) Tanjung Sair

The site locates at west side of the Rupat island. Access to the site is available only sea transport. There is a jetty, therefore, the access is relatively good. There are no vehicles around Tanjung Sair, but there are about 3m width roads which can pass motorcycles. The site is almost flat area. There are no public electrical power supply and water supply.

(3) Dumai

The site is a Coastal Radio Station in Dumai City. Power is supplied by PLN but power failures frequently occur. PDAM supplies water in the City but the site is not yet provided distribution lines. Office buildings exist in the site. Sufficient space is available for the construction of a new VTS Sub-Center Building. Access to the site is relatively good.

(4) Selincing

The site is located 28 km away east of the construction site of Dumai VTS Sub-Centre, which is about one and a half hours by vehicle at current road condition but will be shortened if road condition is improved. Land acquisition by DGST is already completed. The area is 15m x 20m for the construction of steel tower for the relay station of the Marine Telecommunication System Development Porject (Phase IV) (hereinafter called “MTSD Project IV”). The site is adjacent to private houses and requires further improvement. Electrical power and water supply by public are not provided yet.

(5) Simpang Ayam

Access to the site by vehicle from Bengkalis is available. The candidate site is behind of a house of local inhabitants. The site is relatively flat but it is necessary to tree cut off and leveling the land for construction. Electrical power supply by PLN is under developing in and near the village, however, water supply by PDAM is not available yet..

(6) Tanjung Parit

The site is located in the north east corner of Bengkalis Island where a lighthouse, an office and living quarters of DN employees are located. Road while available from Bengkalis City is narrow with poor surface. Many segments of the road are available for passage of small vehicles only. Power supply is available from a location approx. 1 km from the site but due to large voltage fluctuations, electricity for the operation of the lighthouse is supplied by diesel engine generator. Rain is the source of potable water.

1-4-2 Natural Conditions

Indonesia is the world's largest archipelago with more than 18,000 islands. Its total land area at 1,890,800 km² is five times that of Japan. Indonesia has two distinct climates. Wet season is from November to March and dry season is from June to October. Rainfall intensity at 1800 to 3200 north of the equator does not vary significantly. High temperature and humidity is prevalent throughout the year. Temperature ranges from 23 to 30 ºC.

Weather in Malacca and Singapore Straits is hot and humid. Wet and dry season do not vary distinctively. The project sites which are close to the coast of Malacca and Singapore Straits are subjected to salty air breezes.

Topographic surveys and soil investigations have been conducted[3] during the BD and Implementation Review Studies (hereinafter called "the IR Study") Studies. Soil profiles for each site based on soil investigations at site are summarized as follows:

(1) Tanjung Medang (Conducted in the BD Study)

Clay layer is found from ground surface up to 10m depth with N-value of about 15. From 10 to 23 depths, N-value varies from 20 to 30. N-value of more than 50 exists at about 25m depth.

[3] Topographic maps and boring logs are attached in Appendices 5-1-1 and 5-1-2 respectively.

(2) Tanjung Sair (Conducted in the IR Study)

Soft clay layer exists from the surface up to about 14m depth. Deeper than 14m is fine sand and N-value is 20 to 30 up to 20m and deeper than 20m to 30m, N-values are about 30 to 40. There is hard clay layer with N-value about 30 at 30 to 32 m depth. Underneath of that layer is fine sand layer with N-value about 40 and the N-value is reached more than 50 at deeper than 36m from the ground surface.

(3) Dumai (Conducted in the BD Study)

Thick soft clay layer exists from the surface up to 10m depth. Hard layer of silty sand with N-value of more than 50 exists from 11 m to 14m depth. Sandy laminated clayey layer with N-value varying from 15 to 30 is found from 14m to 30m depths. N-value is increased from 30m depth and hard clay layer with N-value of more than 50 is found at 32m depths.

(4) Selincing (Conducted in the IR Study)

Very soft clay sediment exists up to 48m depth from the ground surface. At 24.5m to 26m, 34.5m to 37.5m exist peat layer. N-value is less than 3 up to 24.5m depth from the ground surface. Underneath of the upper peat layer up to 42m depth, N-values are about 10 and increased deeper than 42m depth. At 48m depth from the ground level, N-value is reached about 30, and appears fine sand layer. The fine sand layer will continue and N-values are increased 40 to 50 at about 60m depth from the ground surface.

(5) Simpang Ayam (Conducted in the IR Study)

Very soft layer N-value less than 5 exists up to 18.5m depth from the ground surface. The clay is dominant in this layer but occasionally sandy layer appears. There are about 1.5m thickness sandy layer with N-value about 10 at about 18.5m depth from the ground surface. Underneath of the sandy layer, clayey layer appears and N-value decrease less than 5 and the layer is up to about 38m depth. N-value is gradually increased from 38m and reached about 10 at about 44.5m depth. Silty sand layer is appears at 44.5m and N-value increased suddenly and reached more than 50 at 48m depth from the ground surface.

(6) Tanjung Parit (Conducted in the BD Study)

Thick soft clay layer with N-value of less than 10 exists from the surface up to a depth of 45m. Hard clay layer with N-value of about 30 is found at 45m depth.

(7) Sepahat (Conducted in the IR Study)

As one of a candidate site of repeater station, topographic survey and soil investigations were conducted in this IR Study. The results are attached in Appendices with the results of the above sites.

Chapter 2 Contents of the Project

Chapter 2 Contents of the Project

2-1 Basic Concept of the Project

(1) Objective of the Project

Under the Indonesia's Medium Term Development Strategy 2004 – 2009 (RPJM: Rencana Pembangunan Jangka Menengah Tahun 2004-2009), the Ministry of Transport drew up a Strategic Development Plan (SDP) 2005-2009 (Tentang Rencana Strategis Departemen Perhubungan Tahun 2005-2009) based on a Decree issued in 2005 by the Minister of Transport (Keputusan Menteri Perhubungan, KM 41 Tahun 2005). The SDP has conceived the development of a VTS System for implementation in 2005 in 2 packages as described hereafter.

The VTS System will be established in seven locations, i.e., Sunda Strait, Lombok Strait, Malacca and Singapore Straits, Pontianak, Toli-toli, Bitung and Sorong. Among the candidate sites, the establishment of VTS System in Sunda Strait, Lombok Strait and, Malacca and Singapore Straits are given high priority due to the high density of traffic at those areas

With Malacca and Singapore Straits as the focal areas, the DN has planned to install VTS System in: i) eight locations between Sabang in North Sumatra Island and Rupat Island along the east coast of Sumatra, ii) seven locations between Batam Island and Bangka Strait along Sumatra Island and iii) five locations between the Rupat Island and Bintan Island.

To pursue the SDP RPJM Priority Targets, the Indonesian Government applied for possible assistance to the Japanese Government for the establishment of VTS System for the aforesaid five sites. The developments are included in the "2005 List of Projects and Technical Assistance Proposals", commonly called as the "Blue Book" of the National Development Planning Agency (BAPPENAS) together with the Indonesian Ship Reporting System. Considered as a vital project of the Indonesian Government, the establishment of VTS System for Malacca and Singapore Straits is accorded with high priority.

The primary objective of the project is to establish VTS System along the Indonesian side of the Malacca and Singapore Straits to enhance traffic safety threat.

(2) Outline of the Project established in the Basic Design Study

To accomplish the objectives of the Project, the setting up of two VTS Sensor Stations and one VTS Sub-Center along Malacca Strait are considered for Stage 2 Development of the Project. The VTS System will comprise of radar images, AIS information and other data from each of

the VTS Sensor Stations to be relayed to the VTS Sub-Center through multiplex links for intensive monitoring.

Traffic monitoring along the Malacca and Singapore Straits are currently being conducted by nine radar stations established in Malaysia and eleven radar stations in Singapore. With the establishment of the VTS System for this project, it will be possible to monitor the Indonesian side of the Strait which at present can not be monitored by the existing VTS System. The information on vessel movement using the proposed VTS System is expected to enhance safety of traffic along the Indonesian Side of the Malacca and Singapore Straits.

The project sites, system configurations, equipment procurement and construction of the facilities planed as Stage-2 Project under the BD Study are described hereafter.

1) Project Sites

In response to the written request of the Indonesian Government, the Government of Japan deployed a Basic Design Study Team for the ocular inspections and field surveys to assess the conditions of the candidate sites. On the basis of the survey results and several discussions with concerned Indonesian and Japanese Officials, the candidate sites as discussed below were identified for the basic design of VTS System to achieve the objectives of Stage-2 development of the Project. Fig. 2-1-1 hereunder shows the site locations.

a. VTS Sensor Station

Two sites for Tg. Medang and Tg. Parit

b. VTS Sub-Center

Dumai and Bengkalis

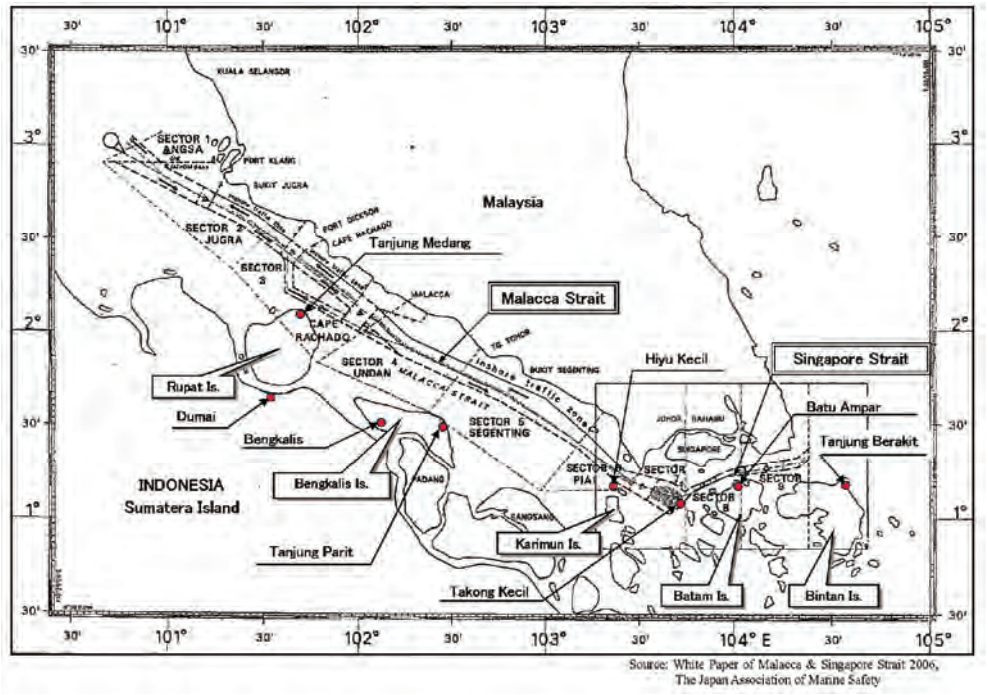


Fig. 2-1-1 Project Sites (Basic Design)

2) VTS System Plan

VTS System configuration for Stage-2 Project which was concluded in the BD Study is as shown in Fig. 2-1-2.

Fig. 2-1-2 VTS System Concept (by the BD Study)

The BD Study initially considered the establishment of radar scanners in Tanjung Medang and Tanjung Parit along the Malacca Strait and the data to be obtained from these Sensor Stations were planned for transmission to Dumai VTS Sub-Center for monitoring. Regrettably, however, due to the absence of appropriate sites for the establishment of Repeater Stations, multiplex link between Tanjung Parit and Dumai is not possible. For this reason, the establishment of a VTS Sub-Center in Bengkalis was planned as an alternative for the monitoring of data from Tanjung Parit.

3) Reasons for Site Allocations into Two Stages of Development

Considering the importance of VTS establishment without unnecessarily increasing the Project cost, the development of the VTS system was divided into two Stages as follows:

a. Stage-1
Development of four sites along Singapore Strait in Hiyu Kecil, Takong Kecil, Batu Ampar and Tanjung Berakit

b. Stage-2
Development of four sites along Malacca Strait in Tanjung Medang, Tanjung Parit, Bengkalis and Dumai

The implementation of Stage-1 Development is ongoing based on the Exchange of Notes concluded by both Governments on November 7, 2008.

2-2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

2-2-1-1 Review of the Basic Design Study

Regarding Stage-2 Development, several outstanding issues from the BD Study still remains to be resolved which are now the focus of this IR Study. The scope of works of Stage-2 Development to be re-examined in this IR Study based on the review and inventory of outstanding issues identified in the BD Study are described hereafter.

(1) Scope of Assistance Summarized in the Basic Design Study

Based on information from DN, scores of small vessels is frequently crossing the main route of the Malacca and Singapore Straits thus posing hazard to the safety of navigation of large ships cruising the TSS. The objectives of DGST for the establishment of the VTS are: i) to monitor

the ships passing the TSS and, ii) to monitor the crossing of the TSS by small vessels to enhance traffic safety.

The basic design study was therefore carried out pursuant to the DGST concept for "the monitoring of small vessels crossing the TSS" and based on this premise; the scope of cooperation was formulated as described hereunder.

Firstly, based on the request of the Indonesian Government, suitable sites were selected for possible Japanese Grant Aid considering land ownership, suitability of the site and absence of obstructions. Secondly, a study was conducted to determine the relations between the objective vessels and the extent of surveillance area by radar scanner to be provided with VTS for this project. Thirdly, a study was made on the importance/necessity of the locations as VTS Sensor Stations considering the physical and traffic conditions in the area.

On the basis of the foregoing studies, the Project to be implemented are concluded as follows:

1) Equipment and facilities will be designed for all the sites
2) Development will be undertaken into two stages, i.e., Stage-1 & Stage-2, because of the increase in total project cost.

a. Stage-1:
- Hiyu Kecil VTS Sensor Station
- Takong Kecil VTS Sensor Station
- Batu Ampar VTS Center including VTS Sensor Station
- Tanjung Berakit VTS Sensor Station

b. Stage-2:
- Tanjung Medang VTS Sensor Station
- Tanjung Parit VTS Sensor Station
- Dumai VTS Sub-Center
- Bengkalis VTS Sub-Center

(2) Outstanding Issues identified by the Basic Design for Reconsideration in Stage-2.

The outstanding issues that was identified in the BD Study for reconsideration in Stage-2 Project is described hereunder

1) Feasibilty on VTS Sensor Station at Tanjung Parit

Based on the ocular vessel traffic survey conducted in the BD Study, the number of

vessels above 100 GT, cruising in the Tanjung Parit area is very limited. As such, it is quite difficult to justify the necessity of radar installation in the area and for this reason, the Indonesian side was strongly requested to provide the rationale for the establishment of radar facilities for this site.

2) Securing Communication link between Tanjung Parit and Dumai

Communication link between Bunkalis and Dumai could not be secured due to the absence of sites for the establishment of repleater stations. For this reason, the Indonesian side was requested to provide the basic policy for the communication system including: i) the provision of appropriate lands for the establishment of repeater stations, ii) to use of satellite communication system or, iii) others options.

3) Other Option of Data Communication Link between Tanjun Medan and Dumai

To ensure data communication between Tanjung Medang and Dumai, steel tower of more than 100m high above ground is required for the two sites, due to the absence of repeater stations. Considering however the ongoing plans to provide radar network system by Norway and other government assistance for Malacca Strait, the possible use of other system including satellite is conceived.

Additionally, the following issues are raised during this IR Study.

4) Coordination with MTSD Project IV (Marine Telecommunication System Development Project, Phase IV)

After the completion of the BD Study, the steel towers for data communications and associated equipment at Dumai and Selincing under the MTSD Project IV was envisioned to be constructed under a Loan Scheme. It is therefore essential to gather precise information so as to avoid possible duplication of construction of steel towers for the same sites.

2-2-1-2 Study on the Outstanding Issues

The details of the IR Study results aimed at resolving the above mentioned issues are described hereunder. The detailed plans reflecting the study results are described in 2-2-2 Basic Plan for Equipment and Building Facilities.

(1) Feasibility for Establishing a VTS Sensor Station at Tanjung Parit

Satisfactory reasons for the setting up of a VTS Sensor Station at Tanjung Parit are inadequate. The followings were re-discovered from the site survey conducted during the IR Study: i) The considerable distance between the TSS and the sensor stations is beyond the coverage of the radar surveillance system, ii) only few wooden boats were seen passing the front of Bengkalis Island. Based on these discovery, the IR Study Team cited their findings to the Indonesian side that while the necessity of vessel monitoring along the Malacca Strait is well understood, there is no point of establishing a radar system at Tanjung Parit considering the initial high cost. Thus, it would be more beneficial and advantageous to set up an AIS system at Tanjung Parit for the VTS monitoring of large vessels passing along the TSS. Indonesian side agreed on the proposal and therefore it was concluded that a radar system will not be provided at Tanjung Parit VTS Sensor Station.

Based on the above mentioned results, the functions and the equipment to be provided for Tanjung Parit VTS Sensor Station were re-examined in this IR Study. Since a radar system will not be provided, the capacity of data transmission will have to be decreased. Accordingly, the system and equipment for data communication links between Tanjung Parit and Dumai will also have to be re-reviewed in this study.

(2) Data Transmission Method between Tanjung Parit and Dumai

1) Background of the Study

Based on the studies and discussions with DGST, in the BD Study, data transmission was conducted by multiplex communication links system. Therefore, provision of the additional repeater stations is one of the outstanding issues of the BD Study to maintain data transmission by multiplex communication links between Tanjung Parit and Dumai. Considering the above, at the beginning of the IR Study adopted data transmission between Tanjung Parit and Dumai by multiplex communication links system, considering the availability of repeater stations at Selincing and Sepahat to be provided by DGST. However, as mentioned above, based on the discussions between DGST and the IR Study Team during the first site survey, the radar system for the VTS Sensor Station in Tanjung Parit was excluded, thereby decreasing the volume of data to be transmitted from Tanjung Parit to Dumai. Based on this consideration, the used of General Packed Radio Service (GPRS) was conceived for data transmission system using Global System for Mobile Communication (GSM) now generally being used in Indonesia for mobile phones. If data transmission using GPRS is possible, the construction of costly steel towers for multiplex communication links will be eliminated thereby reducing the initial investment cost.

2) Services Provided for GPRS Circuit

The IR Study Team conducted interviews to few local private companies providing GSM communication services. Based on the result of the interview, it was discovered that data transmission by GPRS are being provided by each company. Nevertheless circuit sharing is being practice for GSM system and priority is given to GSM communications. The bandwidth for GPRS circuit for data transmission is partly in used and is the unoccupied band of the GSM communications. The bandwidth for data transmission by GPRS is still insecure. Thus, if GSM communications is prioritized, GPRS data communications will become dormant. From the operational point of view, monitoring of the vessel traffic movements will be conducted in real time. Other than the AIS system, DGST is requested to use VHF radio system to communicate and coordinate with concerned stakeholders Port Administrators, Sea Police, Coast Guard, Rescue Team and Customs. Therefore, it is preferable to have stable AIS and VHF operations at Dumai VTS Sub-Center because there is no guarantee about the use of the GPRS transmission system. Moreover, the actual use of the GSM system between Tanjung Parit and Dumai is still not known.

3) Conclusion

Based on the above results, it is best to adopt multiplex communication link for data transmission between Tanjung Parit and Dumai because data transmission by GPRS circuit can not be ensured for the proposed VTS system operations.

(3) Data Transmission Route between Tanjung Parit and Dumai

1) Study on New Repeater Station

The Indonesian side proposed for additional candidate sites as repeater stations for Selincing and Sepahat to secure multiplex data communication Link between Tanjung Parit and Dumai before the start of the IR Study. The locations of these sites are as indicated in Fig. 2-2-1 hereunder.

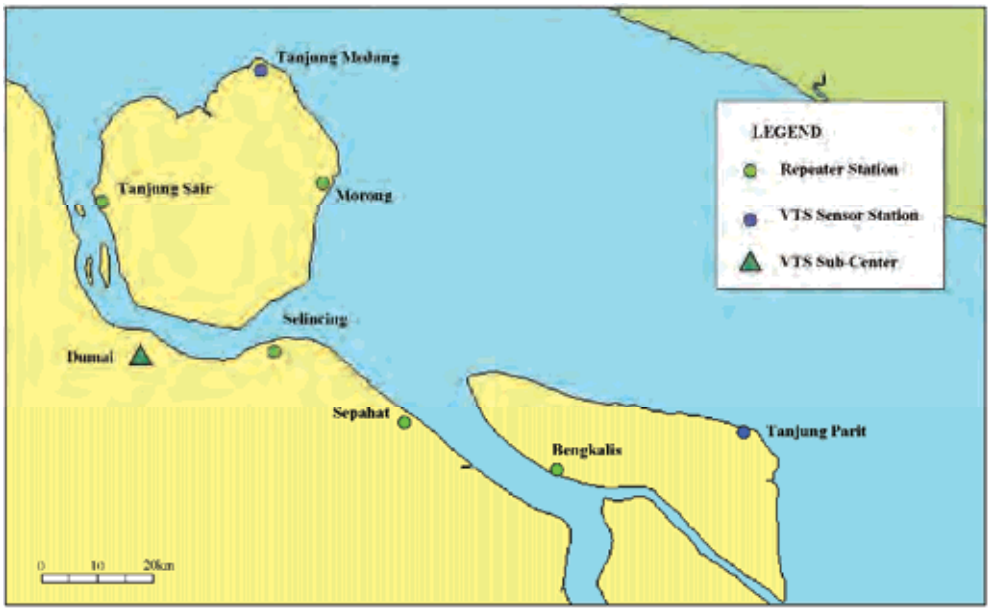


Fig. 2-2-1 Location Map of Candidate Sites of Repeater Stations

Reconnaissance survey for the sites was conducted in the IR Study and the findings are summarized as follows:

a. Selincing

The site is located 28 km away east of the construction site of Dumai VTS Sub-Centre, which is about one and a half hours by vehicle at current road condition but will be shortened if road condition is improved. Land acquisition by DGST is already completed. The area is 15m x 20m for the construction of steel tower for the relay station of the MTSD Project IV. The site is adjacent to private houses and natural grassland.

b. Sepahat

Sepahat is located about 26 km south-east of Selincing (and about 52 km from Dumai VTS Sub-Centre). The site is approachable by a 100m long path to the north from the private house at north side of the road along the sea coast within the Sepahat village. The site is grassland and about 30m from shoreline and no houses exist around. DGST selected it as a candidate site for a repeater station and budgeting for purchase, but land acquisition was not yet pursued.

Selincing and Sepahat are placed as the repeater stations since it is technically possible to acquire the multiplex data communication links between Tanjung Parit and Dumai

through these candidate sites for repeater stations. In this scheme, VTS Sub-Center at Bengkalis shall not be needed and Bengkalis shall be a site for repeater station if necessary from the technical point of view.

Data transmission by multiplex communication links between Tanjung Parit and Dumai through Bengkalis, Sepahat and Selinicng however, will require a 85m high steel tower at Selincing but a 50m high tower is planned under the MTSD Project IV. In this regard, DGST requested to the IR Study Team to consider a new data transmission route which will be not necessary to change the 50m high tower planned under the MTSD Project IV. Responding to the request, additional field survey was conducted from March 15 to 27, 2009, and it was concluded that a new repeater station is applied and not to use Bengkalis and Sepahat as repeater stations. Further details will be explained in 2) below.

2) Coordination with the Marine Telecommunication System Development (MTSD) Project (Phase IV)

After the completion of the BD Study, the MTSD Project IV through Japanese loan assistance has been in progress. During the IR Study, it was found that: i) Selincing and Dumai are the same sites identified for the MTSD Project and this VTS Stage-2 Project, and ii) the multiplex communication links including the steel tower constructions for Dumai and Selincing are also included in the MTSD Project IV.

The Implementation agency for the MTSD Project IV and this VTS Stage-2 Project is the DN of the DGST, and both projects are being implemented under Japanese assistance by loan and Grant Aid. Therefore, in order to avoid possible duplication of facilities, the sharing of facilities and equipment by both projects based on mutual understanding is strongly recommended. Further discussions and studies are made based on this premise.

Requirements to satisfy both projects considering the design, tender and contract preparation, construction schedules turn over and defects liability period among other requirements will be studied[4]. It was concluded that the works for Dumai and Selincing should be borne by MTSD Project IV to trim down the issues that will affect the implementation of the Project. The implementation of the MTSD Project IV is ongoing and is ahead than the VTS Stage-2 Project (as of December 2008) and for this reason it is best that the works for Dumai and Selincing be included in their scope of works. On the other hand, with regards to the sharing of facilities and equipment by both Projects, it is

[4] Study results are attached in Appendix 5-2.

highly desirable that MTSD Project IV is modify their plan and design of the steel tower at Dumai and Selincing to accommodate the requirements of Stage-2 Project. Amendment of the Contract Agreement with the Contractor of the MTSD Project IV is therefore necessary.

Based on the above mentioned suggestions, DN does not want to change the steel tower heights for Dumai and Selincing. They presented their own study to provide a new data transmission route that it will not be necessary to modify the tower height at Dumai and Selinicing considering a new repeater station at the north side of Bengkalis Island (tentatively called "Site A") as shown in Fig. 2-2-2. DGST requested the IR Study Team to conduct the necessary survey and study for the new repeater station and the route.

If their proposed data transmission route is available, comparison could be made with the current plan between Tanjung Parit and Dumai through Bengkalis, Sepahat and Selincing and the distance for the data transmission could be shortened with the provision of repeater stations at Site A and Selincing. Under this scheme, one site can be omitted meriting for a reduction in the construction of steel tower thereby accruing savings in construction cost. Considering the above benefit, the IR Study Team has decided to conduct additional survey and study as need arises.

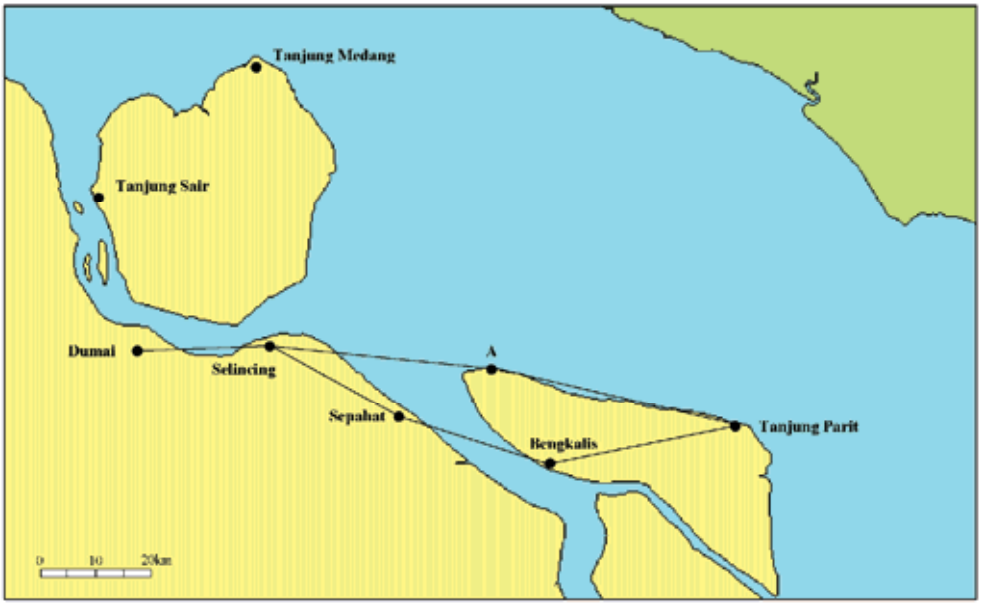


Fig. 2-2-2 Site A and New Route for Data Transmission

3) A New Repeater Station, and Data Transmission through the New Site

a. Conditions of "Site A"

DGST did not conduct any site survey and nobody visited the site. It was identified only using the map. The position was just selected where the 50m tower height at Selincing is not necessary to change to maintain the data communication links between Selincing and the Site A. DGST requested the IR Study Team to conduct the site survey and to find the suitable site.

b. Pre-study and selection of the candidate sites

According to the map and satellite images, it can be considered that the "Site A" is not accessible place. Therefore, before conducting site survey, by using the map and satellite image information, several candidate sites for site survey are selected as shown in Table 2-2-1.

Table 2-2-1 Summary of Candidate Sites for Site Survey

Site ID	Reasons for Selection
C1	The site is accessible from the nearest location to "Site A".
C2	Near C1, access appears to be easier than C1. Many houses exist in the site.
C3	The southern side of Bengkalis Island, will facilitate access to the site but data transmission may not be as good as the northern side of the island.
C4（Tg.Jati）	There is a light beacon being managed by DGST.

The positions of these sites are as shown in Fig. 2-2-3 as below.

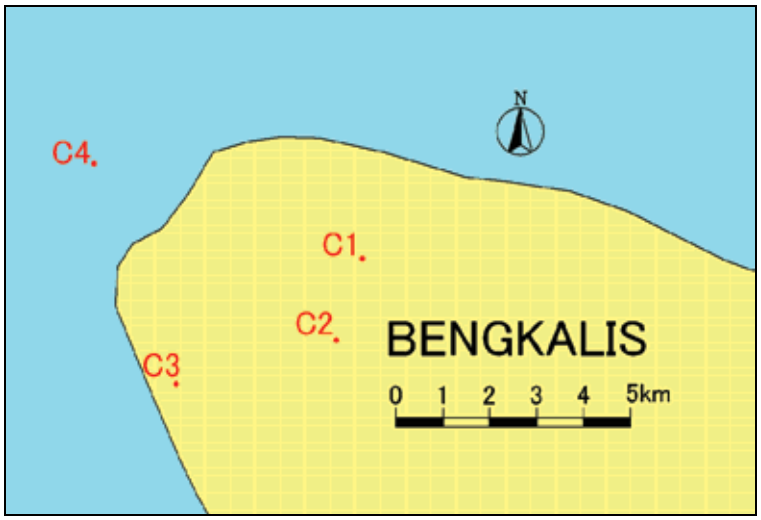


Fig. 2-2-3 Candidate Sites for Site Survey

c. Study on Preliminary Link Budget Analysis

According to the preliminary study on the link budget analysis between the sites C1 to C4 and the Selincing, it was difficult to maintain the data communication between these sites and Selincing if the tower height is 50m at Selincing. Since the ridge is close to the Selincing, if the tower height at Selincing is slightly increased, the necessary tower height can be decreased the appropriate height. Therefore, by the site survey, it was decided to find the site where the tower height at Selincing can be possible as close as 50 m and the tower height at the new site can be lower as much as possible. Availability of the site as the repeater station is determined considering to 1) site location, 2) availability of data communication with tower height, 3) accessibility to the site, 4) surface soil condition, 5) security environment, 6) natural and social environment, 7) availability of land secure, which ware surveyed and evaluated at each site.

d. Site survey and the site conditions

The site survey for C1 to C3 was conducted on land access, and C4 was conducted from the sea. The survey along the north coast of Bengkalis island was also conducted to find suitable relay station site since the north site is possible to reduce the tower height than the south side of the island. Beach landings were made whenever a suitable site was deemed to have been discovered. Fig. 2-2-4 shows the location on 10 sites that was surveyed.

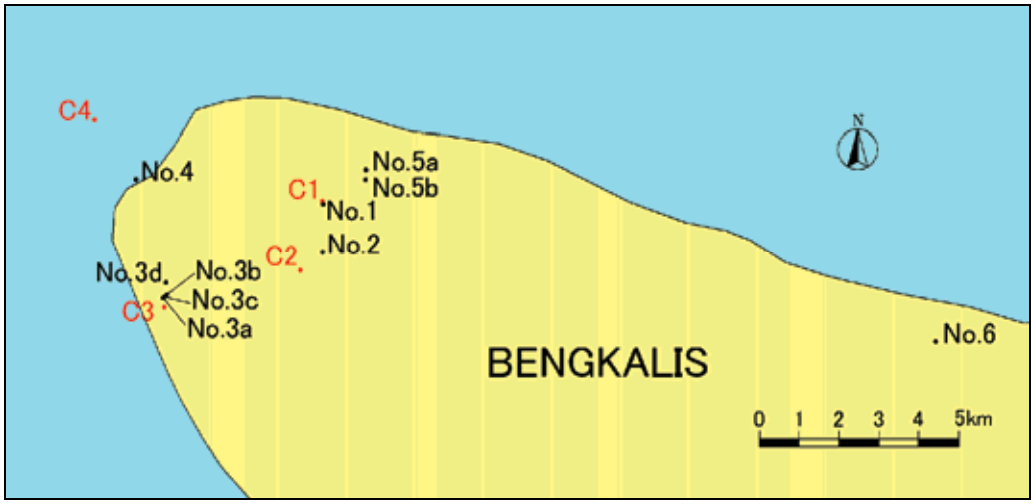


Fig. 2-2-4 Site Surveyed Locations

Based on the result of the site survey, No. 2, 3a, 3b, 3c, and 3d, was found to be suitable as locations for relay stations. Site No.6 was eventually excluded because data transmission may not be possible since it is far from Selincing although land use is possible. Table 2-2-2 shows the condition and the result of the spot investigation.

Table 2-2-2 Site Conditions and Results of the Survey for the Candidate Sites

Sites	Conditions	Results
No. 1	Access is difficult, far from civilization. Land ownership is unknown.	Not Recommended
No.2	Possible for use.	Recommended
No.3a	Same as above	Recommended
No.3b	Same as above	Recommended
No.3c	Same as above	Recommended
No.3d	Same as above	Recommended
No.4	Access is difficult. Coastline shows sign of erosions.	Not Recommended
No.5a	Access is a little difficult. Land is owned by a private company and acquisition appears to be difficult.	Not Recommended
No.5b	Same as above	Not Recommended
No.6	Land use is possible but far from Selinicng for data transmission.	Not Recommended

e. Most Desirable Candidate in Simpang Ayam (Site No.2)

Among the candidate sites that ware investigated for the multiplex transmission lines, Site No.2 appears to be the most desirable for the setting up and possible lowering of the steel tower in Selincing. The village is called Sinpang Ayam, and is accessible by

land transport from Bungkalis. The Site is flat and located at the back of a private house. While it needs clearing and leveling, it is a good location for a relay station. Based on information from the implementation agency, land acquisition is possible. As such, Sinpan Ayam is deemed as a suitable location for a repeater station because, i) the multiplex data transmission system via Tanjung Parit - Sinpang Ayam - Selincing - Dumai is possible, ii) Additionally, with this route, it is possible to set the tower height in Selincing to 50m. Sinpang Ayam was selected as a candidate site for Stage-2 development for these reasons.

4) Conclusion

Considering to the above results and discussions with DGST, data transmission between Tanjung Parit and Dumai and coordination with MTSD Project IV are concluded as follows:

a. Data Transmission Route

The route shall be Tanjung Parit - Simpang Ayam - Selincing - Dumai.

b. Coordination with the MTSD Project IV

Steel towers and related facilities including equipment in Dumai and Selincing will be provided under the MTSD Project IV. The Multiplex communication links of these sites will use available facilities and equipment to be provided by the MTSD Project IV. Antennae for data communication link for the VTS Stage-2 Project at Dumai and Selincing will be installed by the VTS Stage-2 Project at the tower to be constructed under the MSTD Project IV. The tower heights which are currently planned as 50m in Selincing and Dumai are not necessary to change, however DGST is requested to ensure the followings.

1. The tower should be strengthened for the safe installation of the antennae for the VTS Stage-2 Project.

2. The stability and strength of the tower provided by MSTD Project IV shall be responsible by DGST.

c. Further schedule of the MSTD Project IV

The Contract of MSTD Project IV between DGST and the Contractor is signed on February 17, 2009. Based on the Contract, the Contractor is currently conducting

necessary site survey until May 2009. The tower construction in the MTSD Project IV is planned to be completed by December 2009 and installation of the equipment is planned to start from January 2010.

The completion of the tower construction and starting of the installation of the equipment by MTSD Project IV is about 8 month ahead of the VTS Stage-2 Project. Therefore, if the MTSD Project IV will not delay drastically, no problem will be found in the VTS Stage-2 Project.

(4) Data Transmission between Tanjung Medang and Dumai

1) Availability of Satellite Communication Links

While the trend worldwide is the use of satellite for VTS System Network operations, based on the results of discussions with DGST, it was confirmed that: i) multiplex communication links are also the basic concept to be adopted for the VTS network system along North Sumatera Coast as per arrangement with Norway, ii) Satellite communication links will be applied only in remote areas where data transmission by multiplex communication links will pose extreme difficulties if not impossible.

Taking into account of the initial investment cost of the steel tower constructions, long term applicability against cost-effectiveness, the IR Study Team considered satellite apply to the communication link if the satellite will be common in Indonesia. However, as mentioned above reasons, it was decided that multiplex communication links will be considered in the IR Study.

2) Use of Moron Site as Repeater Station

During the basic design, the construction of 106m high steel tower is planned for Tanjung Medang and Dumai, due to the absence of appropriate repeater stations at that time. The BD Study selected Moron as one of the candidate sites for the repeater stations but the land is owned by PT. Pelindo I. Considering the difficulty of acquiring the land, the BD excluded it as a candidate site.

Based on the technical and economical points however, the IR Study reconsidered the use of Moron Site to maintain the quality of data transmissions and to reduce on initial investment costs particularly for the construction of huge steel towers. While the DGST recognized the necessity of putting up a repeater station between Tanjung Medang and Dumai, DGST explained the need to examine other sites due to the restrictions on fuel supply and maintenance of pilot station under PT PELINDO administration. During the

first IR Study Team site survey, DGST suggested other repeater station sites in Tunjung Sair at the west side of Rupat Island in lieu of Morong (Refer Fig. 2-1-1 for location).

3) Rationale of Tanjung Sair as Candidate Site for Repeater Station

Based on the first site survey, DGST decided to consider Tanjung Sair as a repeater station. Based on this consideration, the IR Study Team during their second site visit conducted additional site reconnaissance survey and studies. The details of the Study are as described hereafter.

a. Study on the Multiplex Communication Link

The multiplex communication links between Tanjung Medang and Dumai through Tanjung Sair repeater stations were closely examined and it was found that it is possible to reduce height of the steel towers at Tanung Medang and Dumai if a repeater station is established at Tanjung Sair.

b. Site Reconnaissance Survey and DGST Objectives

The IR Study Team conducted site reconnaissance surveys in three candidate sites recommended by DGST as indicated in Fig. 2-2-5.

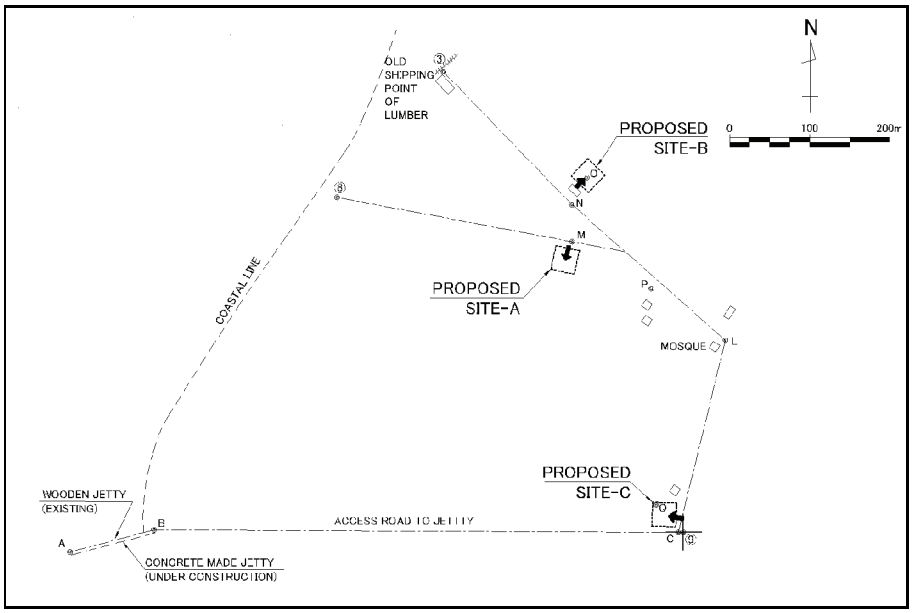


Fig. 2-2-5 Candidate Repeater Stations at Tanjung Sair

Access to the site from Dumai is only by sea. There is a jetty near the site that could

facilitate access. While no vehicles exist in Tanjung Sair and its surrounding areas, roads 3m wide are available for use of motorcycles. The areas surrounding the candidate sites are relatively flat area by facilitating data transmission by multiplex communication links.

Commercial power supply by PLN is not available at site. As such, electrical power supply system will have to be provided. DGST selected the Site-A in Fig. 2-2-5 due to the availability of land space which is currently under acquisition by the Indonesian Government.

c. Conclusion

In view of the above, it can be concluded that Tanjung Sair can be utilized as a site for a repeater station. Accordingly, data transmission between Tanjung Medang and Dumai will have to be reviewed in the IR Study considering Tanjung Sair as a site for a repeater station.

2-2-1-3 Re-Construction of the Basic Concept

(1) Scope of the Project as re-constructed under the Implementation Review Study

Considering the various outstanding issues in the BD Study as described above, the scope of works for Stage-2 Project was reviewed and listed as follows:

1) Objective Sites

- Tanjung Medang : VTS Sensor Station
- Tanjung Sair : Repeater Station
- Dumai : VTS Sub-Center
- Selincing : Repeater Station
- Simpnag Ayam : Repeater Station
- Tannugn Parit : VTS Sensor Station
  (Radar system excluded)

Objective sites are as shown in Fig. 2-2-6. As mentioned earlier, the multiplex communication links for Dumai and Selincing will use the available facilities and equipment to be provided by the MTSD Project IV.

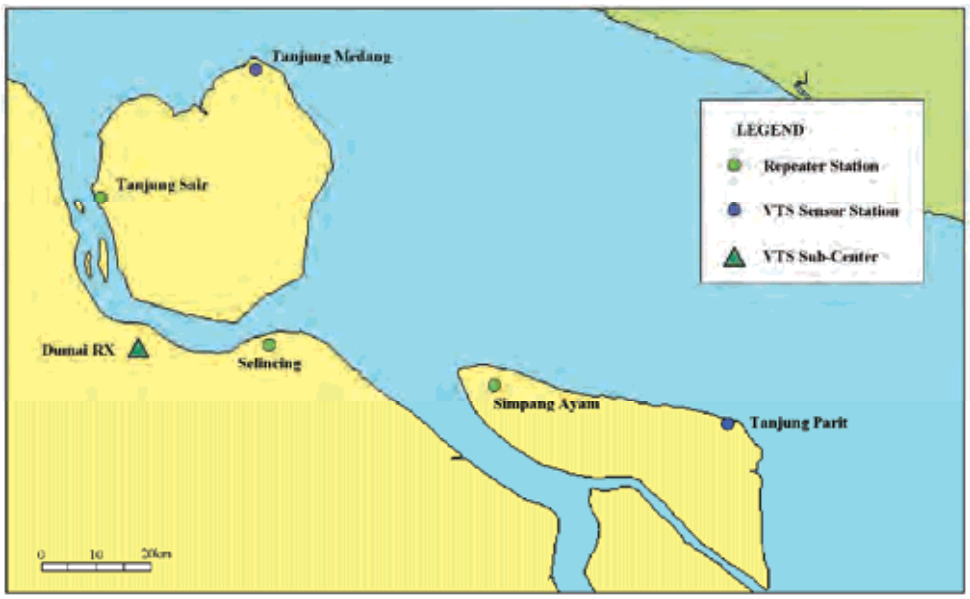


Fig. 2-2-6: Locations of Objective Sites

2) Functions of the VTS Sensor Stations

Radar system will be excluded at Tanjug Parit VTS Sensor Station. Others are provided under the same concept in the BD Study.

a. Tanjung Medang

Radar system, AIS, VHF, meteorological sensor system, CCTV

b. Tanjung Parit

AIS、VHF

3) Data Communication Links

a. Data transmission between Tanjung Parit and Dumai

Data transmission will be conducted by multiplex communication links along the Tanjung Parit – Simpnag Ayam - Selincin – Dumai route.

b. Data transmission between Tanjung Medan and Dumai

Data transmission will be conducted by multiplex communication links along the Tanjung Medang – Tanjugn Sair – Dumai route.

(2) VTS System Plan

Based on the above study, VTS system configurations are as shown in Drawing 2 in 2.2.3 Basic Design Drawings.

(3) Requirements of VTS Sensor Stations and Objective Vessels and Target Area for Surveillance

The objective of the Implementing Agency is to make full use of the VTS under the Project and to enhance safety measure by monitoring the movements of smaller vessels crossing TSS by VTS for upgrading the safety of navigation along Malaysia and Singapore Straits. Based on this premise, the objective vessels to be monitored is set at around 100DWT vessels for the main reason that inter nation and the domestic passenger-ferries in the TSS are 100DWT average. This traffic survey was observed in the busy routes of Batam - Singapore and Tanjung Pinang - Singapore

In Malacca Strait where objective area of the Stage-2 Project, there are several regular passenger-ferries between Bengkalis and Muar, between Dumai and Malaka, crossing the TSS as similarly in the Singapore Strait. Therefore, it is adequate that the objective vessel to be set at around 100 DWT as same as Stage-1 Project. However, as shown in Fig. 2-2-7, it is difficult to detect these small ships crossing the TSS by radar since the area beyond the coverage area.

Considering to the Indonesian side request would like to install the VTS Sensor Stations along Malacca Strait, the AIS system at Tanjung Pairt, and Radar, AIS and CCTV system at Tanjung Medang will be introduced to maintain the monitoring the ships mainly equipped with AIS sailing through the Strait including TSS. Radar specifications are determined as common radars recommended by IALA (International Association of Marine Aids to Navigation and Lighthouse Authorities) as same as Stage-1 Project. Available visible radius against the 100 GT steel vessels is about 15 nautical miles (about 27.8 km), and available surveillance area by the radar scanner is 15 nautical mile radius.

Radar, AIS, CCTV system and other sensor devises will introduced to Tanjung Medang are necessary equipment to monitor for the navigation safety the large ships which are sailing DW of TSS. However, an appropriate international operational agreement is definitely necessary to controlling the ships sailing TSS by the VTS. On the other hand, Dumai port is one of the important port for import and export of natural resources and also there are many small passenger-ferry calls. In future, for example, if radar system at Dumai and/or Selincing will be introduced, monitoring and controlling of the ships in front of Dumai port area, and the system may play a effective role to enhance the navigation safety near Dumai port area where

congesting the ships.

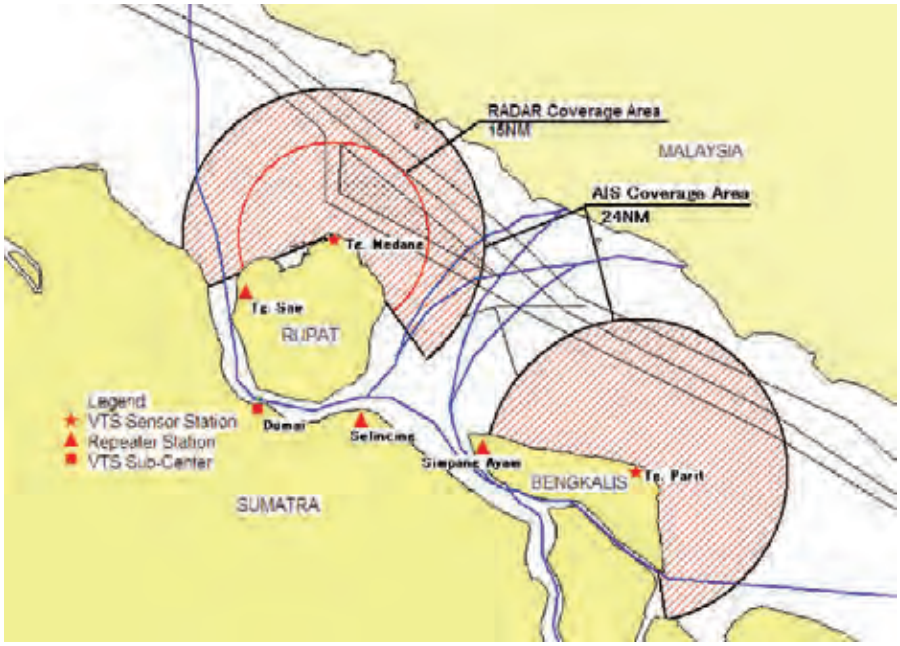


Fig. 2-2-7 Possible Monitoring Radius of VTS Sensor Stations

(4) Operational Concept of the VTS System

This is the first time for Indonesia to implement the navigation surveillance system and have no actual experience up to date. Additionally, a mutual understanding and cooperation among the three countries for the implementation of the System in Malaysia and Singapore Straits is the key to monitoring vessel traffic efficiently in an International Strait for the TSS navigation system.

Described hereunder is the operational concept of the VTS System.

1) As mentioned above, the proposed VTS System for the surveillance of the Straits is the first undertaking of the Indonesian Government. In view thereof, continuous technical cooperation for the operation and maintenance of the VTS System is considered crucial.

2) Taking into account the objective of the Project, the VTS System will be used primarily to monitor small vessels particularly those crossing the TSS which are posing danger to navigation safety of large ships passing along the TSS.

3) Singapore Straits are declared as international shipping lanes. Taking this into account, it is highly desirable that the entire VTS System be integrated and jointly operated by the three littoral states to avoid possible confusion of traffic control in the Straits. This issue could be undertaken in TTEG or other appropriate meetings with the IMO. Until such time that a tripartite agreement has been reached, operations of the VTS System will be limited only for the monitoring of the Straits at the Indonesian Side to enhance safety of navigation.

(5) Remedies against Possible Disasters to Facilities Arising from Natural Incidences

Indonesia lies in the tropics and all the sites are located adjacent to the coast. Lightning occurs frequently during the rainy season that could cause possible damage to the facilities. Taking this factor and other elements into account, the building facilities must be planned with due consideration to: i) strong sunshine, ii) heavy downpours during scours, wind gust, iii) salt air intrusion, among others.

The basic design will be carried out based on the surveys and investigations to be conducted for topography and soil. The Indonesian Building Code of Practice for wind pressure and seismic intensity will be adopted for the design of civil and building facilities instead of weather data from the meteorological station at Hang Nadim Batam and Tanjung Balai Karimun which do not provide sufficient detail as bases for the design.

(6) Socio-Economic Condition Policy

Tanjung Medang and Tanjung. Parit are provided with light houses and Dumai is Coastal Radio Station of DN. Since the facilities are being managed and operated by DN, land acquisition and construction of additional facilities in the aforesaid areas is anticipated to pose no problems.

The land at Selincin has been procured by DN. Land acquisition for Simpnag Ayam and Tanjung Sair will also be undertaken by DN, before the Project will be implemented. This action is confirmed by minutes of meeting.

(7) Procurement of Materials and Equipment

All equipment for the VTS System will be procured in Japan due to the absence of manufacturers in Indonesia. Construction materials which are available in Indonesia for civil and building works will be used to the extent applicable provided that the required function and quality are maintained.

(8) Local Construction Company

Local labour will be employed to the extent practicable for the installation, setting up, tuning and test operation of the equipment except for specialty works that will be pursued by the manufacturers.

Construction of building facilities, movement and installation of equipment will be carried out by Indonesian firms to the extent possible.

2-2-1-4 Basic Policy of Equipment Design

The plan and basic design of the equipment has been conducted based on the concept described hereunder.

(1) Basic Concept

As previously stated, Tanjung Medang and Tajung Parit will be provided with VTS Sensor Stations. AIS system will be provided for these stations to monitor the vessels which are equipped AIS system. Radar scanner installed at Tanjung Medang is for the surveillance of 100 GT steel vessels (minimum) within the radius of operation of 15 nautical miles from the VTS Sensor Station.

The concept is based on the purpose of the project to monitor the movements of small vessels crossing the TSS. In recent years, meetings for the Straits of Malacca and Singapore were held in Jakarta in 2005, Kuala Lumpur in 2006 and Singapore in 2007. In those meetings, it was agreed to establish a Co-operative Mechanism for the enhancement of safety, security and environmental protections of the Straits. The implementation of the Project is a cooperation between Indonesia and Japan for which the VTS System is expected to contribute for the navigation safety in the Straits including the TSS in the near future.

Thus, the VTS System is also designed to monitor the movements of vessels passing through the TSS. The system configuration must be user friendly and stable for long period of operations because as stated earlier, the System is the first of its kind in Indonesia for the surveillance of the Straits.

(2) Special Site Conditions

1) Consideration for Redundancy

Access to the remote sites is quite difficult. Taking into account the severe

environmental conditions, the facilities will be provided with adequate redundancy system to ensure continuity of operations in the event that one of the system components fails.

2) Electrical Power Supply

Commercial power is available only in Dumai among the candidate sites. Therefore, the provision of electrical power supply system is necessary, based on the conditions for each station as described hereunder:

a. Tanjung Medang

Three sets of engine driven generator and a standby with automatic switch interchangeability will be provided to ensure a steady power supply.

b. Tanjung Parit

Since the radar equipment is excluded from the scope of the Project, the electrical power consumptions are reduced as compared with BD Study. Thus, solar power will be introduced for the supply system.

c. Tanjung Sair and Simpang Ayam

Solar power will be introduced for electrical supply of the system, because the requirements are relatively small and will require only few kilowatts of power demand.

d. Dumai

Commercial power is available for the VTS Sub-Center at Dumai, but considering the occurrence of occasional power failure, the system will be provided with UPS and automatic power shutdown system to avoid system crush. Re-starting the operation will be facilitated by a switch after the occurrence of a failure.

e. Selincing

Commercial power is not available at the site, as such, power supply will be made through diesel engine driven generators to be provided by the MTDS Project IV.

(3) Reliability

The equipment will be provided with dual system except for a part of the antennae. The change over operation for the main and spare will be simple and will not require any special control.

(4) Operational Aspects

VHF communication radio is a mandatory device of the VTS System for communication between shore and ships. STRAITREP has allocated VHF channels for communication between ships in TSS and VTS on shore. However, to avoid congestion and duplication of ship control information the practice currently in used by Malaysia and Singapore for radio channels are allocated by STRAITREP for receiving functions only. The functions and equipment necessary for transmissions for the channels are expandable should the need arises in the future after an appropriate international operational agreement has been concluded. Other channels are designed for bi-lateral communications.

(5) Reduction in Operation Cost

Several options are available for data transmission such as multiplex data communication link, high speed exclusive satellite transmission system and low speed exclusive satellite transmission system among others. As mentioned earlier however, the use of satellite link for transmitting radar image, CCTV camera image information 3 channel voice signal is cost-wise very expensive, and for this reason, the Indonesian Government has decided the use of multiplex data communication link. As stated elsewhere in the Report, multiplex data communication link was adopted because while the initial investment cost is higher than satellite data link, the electrical cost or in this case the fuel cost for the operation of the generators for the operation of the VTS System will be much cheaper.

(6) Grade of Equipment

As stated earlier, it will be possible for this project to monitor the movements of small vessels near the Tajung Medang area and AIS equipped vessels passing through Indonesian territorial waters and TSS to enhance navigation safety of the Straits. However, the grade of the different types of electronic equipment for the VTS System will be selected in accordance with IALA recommendations V-125 and V-128[5] considering the following:

[5] IALA Recommendation V-125 on The use and presentation of symbology at a VTS Center (including AIS)

1) To enhance navigation safety of ships in the area of responsibility and in the TSS, monitoring of the large ships passing through the TSS are inevitably necessary.

2) Data obtained by the VTS System may be shared with the VTS systems of Malaysia and Singapore in future after an international agreement has been reached

2-2-1-5 Basic Policy of Building Design

(1) Desing Requirement

1) Natural Conditions

All the sites are located in the tropics near the coast. It is therefore essential to protect the facilities against strong sunlight, heavy downpours, humidity, wind gust and salty air intrusion for durability and stable operation.

2) User-Friendly System

The building facilities and the system configuration will be user-friendly to facilitate 24 hours operations. The VTS Center and Sub-Centers will be provided with closely integrated compartments taking into account minimum movements and to minimize the crossing of operators.

3) Ease of Maintenance

The design is aimed at facilitating maintenance and minimizing the running cost. Especially for the Sensor Stations, durable materials will be used considering that the sites are located in remote areas in extremely harsh environment.

Additionally, function, durability and economy are also considered and as such, the facilities are designed based on the following concept.

Edition 2, December 2004, and IALA Recommendation V-128 on Operational and Technical Performance Requirements for VTS Equipment, Edition 2.0, June 2005

(2) Design Concept

1) Arrangement of Compartments

Each compartment is planned with due consideration to efficient operation and maintenance of the VTS System equipment. Arrangement of the compartments for each building is planned based on integrated linkage of operation.

2) Reduction in Operation and Maintenance Cost

In order to reduce operation and maintenance cost, design of the facilities has been carried out considering the following:

a. Buildings facilities are designed to maximize the use of materials and utilities locally available to reduce on operation and maintenance costs.

b. Eaves as protection against sunlight, natural ventilations are designed appropriately to minimize the use of air conditioning and ventilation units.

2-2-1-6 Basic Policy of Other Facilities Design

(1) Steel Tower

The installation of radar scanner and parabola antenna for the multiplex communication link will require the erection of steel towers. The towers are designed based on the following considerations.

1) The tower design is based on the standard steel angles so that construction could be undertaken by local construction companies.

2) The height of the tower is designed to satisfy the required elevation of the radar scanner and parabola antenna to ensure maximum performance. .

3) Tower foundation design will be considered that the tower can be constructed inside the available space.

4) The foundation of the tower is designed based on the soil conditions at site. If the pile foundation is necessary, the pile material will be considered as the one which can be easily and economically obtained in local such as PC piles.

(2) Fuel Supply System

VTS Sensor Station at Tanjung Medang where commercial electrical power supplies are not available will be provided with fuel storage tanks and supply system for the diesel engine driven generators to be operated on 24 hour basis. The required facilities are designed based on the following:

1) Capacity of the fuel storage tank is planned based on the required fuel quantity for power generation and supply frequency including accessibility for each site.

2) Must be weather-proof and durable considering that the sites are located in small isolated islands and the equipment are located near shore where sea breeze is abundant.

2-2-2 Basic Plan for Equipment and Building Facilities

2-2-2-1 Items modified from the Basic Design Study

According to the brief discussions and detailed studies in Sections 2-2-1-1 and 2-2-1-2, the following are the list of medications made in the IR Study considering the outstanding issues in the BD Study.

(1) Radar System at Tanjung Parit

The radar system for Tanjung Parit was excluded from the scope of the Project. As such, the plan and components of the VTS system equipment, plan and basic design of the associated facilities are revised.

(2) FM Broad Casting System

FM broad casting system is excluded according to the request of DN.

(3) Data Transmission System

Data transmission routes were changend since new repeater stations at Tanjung Sair and Simpang Ayam are addition. Therefore, in the IR Study, technical analysis regarding to the application of multiplex communication links for the new routes for the data transmission was reexamined. Equipment plan and basic design of associated facilities such as the design of the steel towers were also reconsidered based on the results of the above mentioned studies.

(4) Coordination with the MTSD Phase IV Project

According to the discussions, coordination with the MTSD Phase IV Project and this VTS Stage-2 Project are concluded as follows.

1) Scope

a. The facilities including steel towers at Selincing and Dumai will be constructed by MTSD Project IV.
b. Equipment for communication links between Dumai and Selincing will be procured and installed by the MTSD Project IV.
c. The steel towers and equipment at Selincing and Dumai will be commonly used to maintain the data communication links between Dumai and Selincing both for the MTSD Project IV and the VTS Stage-2 Project.
d. Equipment which is required to maintain data communication links between Dumai and Tanjung Sair, and Selincing and Simpang Ayam will be procured and installed by the VTS Stage-2 Project.

Considering to the above, following items shall be born by the Indonesian side.

- Steel towers at Dumai and Selincing and communication devices for between Dumai and Selincing
- Equipment house/housing, equipment rack and electrical power supply

2) The strength of the towers at Selincing and Dumai

The Indonesian side shall assure of the necessary strength of the towers at Selincing and Dumai so that the antennae and ancillary facilities for the VTS Stage-2 Project can be accommodated to the towers.

3) Defect liability of the tower strength

The defect liability of the tower strength at Dumai and Selincing shall be born by the Indonesian side.

(5) Soft Component

Soft component was planned based on the utilization of the VTS system to be provided by Stage-1 Project.

2-2-2-2 Basic Plan for Equipment

(1) System Configuration

Data from the sensor stations in Tanjung Medang and Tanjung Parit will be transmitted to the VTS Sub-Center in Dumai for intensive monitoring.

(2) Radar System

The radius of operation of the radar systems is set at 15 nautical miles at normal conditions for the surveillance of 100 GT steel vessels minimum. The system however will be provided with a 20-mile detection capacity. Radar transmission and receiving devices are X band dual systems at 9 GHz which is allowed by Indonesian Authorities. The radar systems composed of the following apparatus

- Radar Transmission and Receiver (TRX) (Dual System)
- Antenna Scanner (Single System)
- Radar Signal Control (Dual Method)
- PPI Monitor (Maintenance Monitor, Single System)

The radar system will be remotely controlled from the VTS Sub-Center to facilitate surveillance of ship movements. The VTS Sensor Stations will also be provided with radar image observation service monitor mechanism to facilitate maintenance.

(3) VHF Marine Radio System

Safety information for ship navigation will be provided from shore to ship and ship information such as vessel name, size, type, origin and destinations, and others will be provided from ship to shore. These communications will be conducted by VHF marine radio equipment. The VHF radio facilities will be installed to all the sites to cover a wide area of the Straits as much as possible. The multi-function console will be equipped with remote controlled system to enable the operator of the VTS Sub-Center to communicate with the ships at any time.

The Ship Reporting System (STRAITREP) in Malacca and Singapore Straits has already been established. VHF radio channel are allocated to ships accessing through the TSS. Ships entering the STRAITREP operation area are mandated to report to the VTS Centers through VHF channels as listed in Table 2-2-3 hereunder.

Table 2-2-3 VHF Channels for STRAITREP

Sector	Information Addresses	VHF Channel	Country in Charge
1	Klang VTS	CH 66	Malaysia
2		CH 88	
3		CH 84	
4		CH 61	
5		CH 88	
6	Johor VTS	CH 88	
7	Singapore VTS	CH 73	Singapore
8		CH 14	
9		CH 10	

VHF communication radio is absolutely necessary for the VTS System for communication between shore and ships. STRAITREP has allocated VHF channels for communication between ships navigating in the TSS and the shore. However, to avoid congestion and duplication of ship control information currently being used by Malaysia and Singapore, the radio channels allocated by STRAITREP are designed for receiving functions only. The functions and equipment necessary for transmissions in these channels are expandable should the need arises in future when an appropriate international operational agreement has been concluded among the adjoining states. The system is designed so that communications between ships and shore are conducted by channels not allocated by the STRAITREP with Ch 16 as adopted internationally.

In conclusion, the VHS system are composed of VHF receiving devices for monitoring the channels of which are allocated by STRAITREP while bi-lateral radio communication devices will be adopting CH 16 and other channels, and spare VHF radio communication equipment.

The list of VHF channel allocation for each site is shown in Table 2-2-4 hereunder.

Table 2-2-4 Channel Plan of VHF for each Sensor Station

<table>
<tr><td>Operation Purpose</td><td colspan="3">Channel Code</td><td>Function</td></tr>
<tr><td>Call Channel</td><td colspan="3">CH 16</td><td>Relaying and Receiving Possible</td></tr>
<tr><td rowspan="3">STRAITREP

For Monitoring of the Channel</td><td>Sensor Station</td><td>STRAITREP Sector Name</td><td>Reporting Channel</td><td rowspan="3">Receiving Only</td></tr>
<tr><td>Tg. Medang</td><td>Sector 3</td><td>CH84</td></tr>
<tr><td>Tg. Parit</td><td>Sector 4
Sector 5</td><td>CH 61
CH 88</td></tr>
<tr><td>Operating Channel</td><td colspan="3">Separate Allocation at Every Site</td><td>Relaying and Receiving Possible</td></tr>
</table>

(4) Data Communication System

Data communication link will be made through 7GHz band frequency multiplex radio communication link, subject to availability. A parabolic antenna will be installed on the steel tower to be constructed for this purpose. Long distance relaying and communication at sea using the latest technology on space diversity will be considered to ensure reliability of the system.

Table 2-2-5 shows the sites and distances to be provided with multiplex communication link. Table 2-2-6 shows the estimated height of the parabolic antennae to ensure stable communication link.

Table 2-2-5 Required Data Transmission Distance for Multiplex Communication Link

Communication Section	Communication Distance (km)
Tanjugn Medang – Tanjung Sair	37.9
Tanjung Sair – Dumai	28.5
Dumai – Selincing	27.8
Selincing – Simpang Ayam	41.2
Simpang Ayam – Tanjung Parit	43.5

Table 2-2-6 Estimated Required Heights of Parabolic Antennae

Site			Tg. Medang	Tg. Sair		Dumai		Selincing		Simpang Ayam		Tg. Parit
Function			VTS Sensor Station	Repeater Station		VTS Sub- Center		Repeater Station		Repeater Station		VTS Sensor Station
Required Height	Main	EL (m)	70	85	57	54	53.5	51	52	83	83	82
	SD	EL (m)	63	78	47	44	48.5	46	42	73	73	72

E.L.: Above mean sea level.

Data communication system between Selincing and Dumai, will be relayed and received through the communication system to be provided by the MTSD Project IV, by connecting LAN access to each site.

Data gathered on radar image, vessel pursuit data, AIS, weather information, among others at Dumai VTS Sub-Center will be transmitted to Batu Ampar VTS Center through interconnection link using internet line such as VPN Circuit. This communication link between Dumai and Batu Ampar will be provided by the Indonesian Government.

(5) AIS system

The AIS System will be utilized to receive information on vessel movements in Malacca and Singapore Straits. The system will also be used for relaying service information to vessels to enhance safety of navigation. The information as relayed will be saved in the AIS Server System of the VTS Sub-Center. The AIS information will finally be displayed on the multi-function console by radar echo information for the surveillance and management of vessel traffic in the subject area. The transponder shall be dual system for quick recovery function in times of trouble. The base system for the AIS will be provided in accordance with the latest international standard as listed hereunder:

- IMO MSC 74(69) Annex3, ITU-R M.1371-1,
- IALA Technical Clarifications on Recommendation ITU-R M 1371-1
- IALA Recommendation A-123
- IALA Recommendation A-124

(6) CCTV System

The narrowest waterway of the Malacca Strait is between Tanjung Medang and Tanjung Tuan in Malaysia. While VLCC is required to navigate through the DW route where the water depth is more than 25m, the presence of shallow spots close to the TSS navigation route makes cruising quite treacherous. Moreover, the DW route which is proximate to Rupat Island is only about three nautical miles from Tanjung Medang. Therefore, the occurrence of a disaster in this part

of the Strait will severely affect Indonesia. For this reason, a CCTV camera will be provided in Tanjung Medang for the surveillance of large, small and suspicious vessels for safety of navigation.

The camera images gathered from the station by CCTV camera will be transmitted by multiplex communication link to Dumai VTS Sub-Center for simultaneous monitoring. The CCTV system will be operated at day times in principle at the multi-function console of the VTS Sub-Center. Surveillance is possible at any time through PC video imaging. Automatic tracking and zooming functions will also be provided.

(7) Record and Playback System for Vessel Traffic Information

The System will be provided with record and playback functions of data taken by the radars, AIS and voice communication via VHF maritime radio. The system will be used to review the records taken during an accident, observe the movement of suspicious vessels, review of radar and AIS data on ship movements and review of VHF communication data. For as long as the data gathered has no damage, information storing could be compressed in a hard disk. The record time is one month and will automatically erase when the prescribed time is reached. As the need arises, the system will be provided with a back up function to store important data through DVD-RAM medium. Under the system the data to be recorded will comprise of the following: i) video signal imaging, ii) radar pursuit data, iii) AIS pursuit data, iv) AIS transmitted / received messages, v) warning data, vi) VHF communication voice, ix) Others.

Data replay will be multiple displayed by electronic sea charts together with radar and AIS records including radar pursuit data, AIS pursuit data, VHF voice messages and others. Screen updating will be possible thorough synchronization of the image and the replay speed.

(8) Tracking System

Tanjung Medang and Tanjung Parit, a total of 2 sites on the side of the Malacca Strait will be provided with tracking system. The target track obtained by the radar system at Tanjung Medang and individual AIS data will be assembled to create single data for the surveillance of the Strait.

(9) Multi-function Console

A multi-function console will be provided for Dumai VTS Sub-Center for the surveillance of vessel navigation through the so called man-machine interface. The console will be provided with a display monitor to put on view the video image transmitted from each of the radar stations, synthesized AIS information showing the ship location as well as direction and speed.

The system is also capable of displaying the time of passage, type of vessel, weather information, CCTV imaging among others to grasp the overall condition in the area under surveillance

One unit of multi-function console will be installed at Batu Ampar VTS Center for monitoring of the information obtained at VTS Sub-Center Dumai. Data transmission by internet link will be provided by DGST at their own expense.

All symbols to be shown on the screen will be in accordance with IALA and IMO standard. The display will also be provided with the needed information and indication system necessary for appropriate daily operation. To facilitate maintenance of the system, the console will be provided with remote controlled functions for the monitoring of the conditions of the equipment and devices in the sites, wireless VHF facility CCTV camera among others for maintenance of the system.

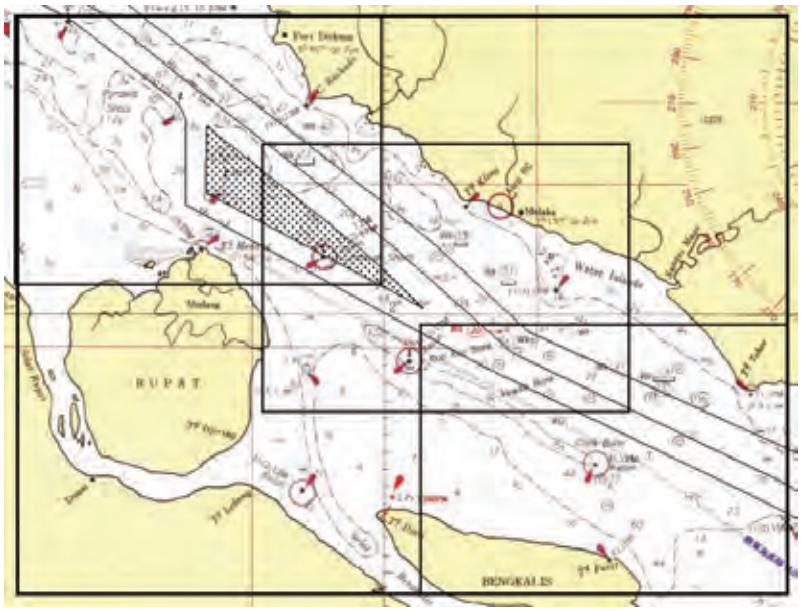
1) The system monitoring capability is describe as follows:

Radar and AIS information obtained in Tanjung Medang and AIS information obtained in Tanjung Parit will be indicated on the console at Dumai VTS Sub-Center. Each site is capable of monitoring the pursuit of 500 vessels. The console is capable of monitoring the pursuit of 1500 vessels.

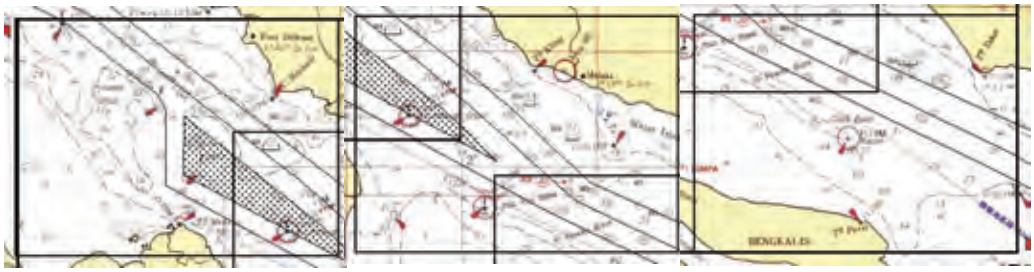
2) Screen Display and Function

The console will be provided with three sets of graphics monitor, center processing device, key board and mouse, among others and will function as follows:

- Surveillance of the entire area will be indicated on one monitor to be divided into several images for display on several monitor screens. As needed, the area to be monitored will be displayed continously in three monitor displays as shown in Fig. 2-2-8 hereunder.



A) Displayed on One Monitor Image



B) Maps Displayed on Three Monitor Image

Fig. 2-2-8 Sample Display Image

- At the option of the operator, vessel information, weather data, display of each VTS Station and radar image among others could be turned on by a switch.
- The unit will also be provided with VHF wireless communication operation device for communications with vessels.

(10) Vessel Information Data Base

The management surveillance system needs to be provided with vessel information data base to enable confirmation of vessel nationality, type and owner among others through radar, AIS and VHF radio communication devices. The base data could be procured initially from Lloyd but the record needs to be updated to include the region's history for accuracy of surveillance.

(11) Weather Observation System

For safety of navigation, the unit for Tanjung Medang will be provided with data logger interface mechanism for the gathering of essential weather information for dissemination by VHF and AIS to all vessels cruising in the Straits. The observation items will include wind speed, wind direction, temperature, humidity and air pressure.

The data observed and collected will be forwarded to Dumai VTS Sub-Center through data communication link for display on the console screen.

(12) Resource Management System

The facility will be provided with resource management system to confirm the condition of the equipment for maintenance support purposes. Online observation of the operation of the system during normal operation will make it possible to determine control errors and early detection of possible breakdowns. This system will be provided for Dumai VTS Sub-Center.

(13) FM Transmitting Devices (On-time Broadcasting System)

Most of the small vessels operating in Malacca and Singapore Straits are not equipped with VHF transmitting/receiving devices. For this reason, communications in the event of a disaster is not possible. This issue needs to be addressed for the enhancement of traffic safety. Considering the above, the VTS System for this Project was planned to be provided with FM transmitting devices for the dissemination of essential information to all vessels operating in the Straits. Dissemination devices were to be provided for Tanjung Medang, and control devices were to be installed for VTS Sub-Center at Dumai.

However, according to the discussions and request by the Indonesian side for the IR Study, the provision of the devices are cancelled.

(14) Others

1) Web Server System

A Web Server System will be provided for the gathering of vessel traffic information obtained by the VTS System for possible dissemination of information through internet circuit as necessary. The provision of internet circuit for exclusive use will be borne by the Indonesian Government who will also be responsible for information sharing through the internet.

2) Air Conditioning Units

Considering that the sites are located in the tropics in remote areas along the sea shores, the precision electronic equipments must be provided with air conditioning units as protection against high temperature, high humidity and salty air intrusion to maintain a stable and reliable operation.

For durability and reliability, the air conditioning units must be rust resistant and must consume less power. The cooling system will be determined based on the heat value relative to cooling function to augment its reliability. Split type of air conditioning units with protection against weather elements and possible theft will be provided at Tajung Medang. For Tanjung Parit, since the radar equipment will not be installed, exhaust fan instead will be provided.

Since the VTS Sensor Stations are located in remote areas, fuel supply would be difficult. Therefore, the air conditioning units will be selected taking into account the energy-saving type. For the VTS Sub-Centers, UPS and back up generators will be provided to maintain continuous operations in case of power is failure.

Air conditioner will not be proved for repeater stations. The equipment available to use without air-conditioner will be selected.

3) Surveillance Camera for Repeater Statioins

Since no operators will stay at repeater stations, IP type surveillance camera with water proof housing will be installed at the tower. The camera images can be monitored at Dumai.

2-2-2-3 Electrical Supply Facility

Electrical supply facilities will be provided according to the public power supply conditions and power consumptions at each site. The details are as follows.

(1) VTS Sensor Stations

1) Tanjung Medan

There is no available commercial power supply in the area and as such high quality generator should be provided to ensure that it will operate round the clock to maintain the safety of navigation. The generators will be operated alternatively at every 6 hours.

For safety of operation, the generator that is out of order should be disconnected.

A generator will be operated alternatively for the designated time. The use of UPS is recommended as backup in the event of sudden power failure. This will ensure safety of operation during power fluctuation.

2) Tanjung Parit

Due to the elimination of the Radar System from Tanjung Parit Sensor Station, electrical power consumption is reduced than that of Tanjung Medan Sensor Station. Therefore solar-powered batteries will be used for the operation to reduce on cost.

(2) Repeater Station

1) Tanjung Sair and Simpang Ayam

Solar charge batteries good for 5 days of operation will be adopted as the main power supply generation system. A generator will also be provided as emergency backup considering the worse scenario condition. The system will be provided with a device to automatic start the generator when needed. A notice will be sent automatically to Dumai VTS Sub-Center when the generator started.

2) Selincing

The functions of the repeater station in Selincing are the same as that of Tanjung Sair and Simpang Ayam. However, electrical power will be supplied by diesel engine driven generator to be installed by the MTSD Project IV. Therefore, the provision of generator and associated power supply devices is not included in the scope of works of this VTS Stage-2 Project.

(3) Dumai VTS Sub-Center

Public power supply by PLN in Dumai City is available. However, one to few hours electrical power supply failures frequently occur and the power voltage are not stable. Therefore, one set of generator will be provided as a back up. To arrest voltage fluctuation and lighting surge, insulated transformer and automatic voltage regulator will be provided to ensure the reliability of the power supply system. Considering instantaneous power failure during the switching of power supply source from PLN to Generator or Generator to PLN, UPS system will also be provided. In the event of trouble, the system will automatically shut down. During the shut down period, power will automatically be supplied by UPS devices.

2-2-2-4 Basic Plan of Building Facilities

(1) Dumai VTS Sub-Center

1) Site Layout

The southern side of the existing facilities in Dumai Coastal Radio Station consist of two office buildings, staff house and volleyball court. The northern side is occupied with associated facilities including steel towers and utilities such as generator building, PLN facility, power supply cable and septic tank. The proposed VTS Sub-Center System will be operated in close coordination with the existing radio station and based on this premise, both facilities must be connected. Accordingly, the volleyball court at the southern side of the station will have to be relocated to the west side for the construction of the new VTS Sub-Center Building.

2) Architectural Design

a. General

As mentioned above, the VTS Sub-Center is planned and designed to facilitate maintenance of various precision equipment of the VTS System. Considering the importance of the facility, the building will be constructed of fire and earthquake resistant reinforced concrete structure. The roofing with wooden truss support is sloped to be in harmony with other existing buildings. The main entrance will face the doorway of the existing administration office building for a balanced layout.

b. Floor Plan

The operation room is adjacent to the manager's office with glass partition to allow close supervision of staffs. To control entry of official visits, the administration area is located adjacent to the entrance hall. The lavatories are located near the existing office building to enable common use of the facility. A space surrounded with perforated hollow blocks is provided at the south side of the building for the operations room and compressors of the air-conditioning units.

Table 2-2-7 hereunder shows the required space which was determined based on the topography of the site and discussions with concerned Indonesian Officials. Drawing 9 shows the plan, section and the elevation of the proposed VTS Sub-Center.

Table 2-2-7 Floor Area Schedule for Dumai VTS Sub-Center

										Total Floor Area
1st Floor	OPERATION ROOM	MANAGER ROOM	STAFF ROOM	ENGINEERS' ROOM	NAP ROOM	UPS ROOM	STOCK ROOM	TOILET	CORRIDOR	207.36 m2
Floor Area	51.84 m2	18.00 m2	12.96 m2	18.00 m2	18.00 m2	12.96 m2	12.96 m2	12.96 m2	49.68 m2	

(2) Equipment Building

1) Site Locations

Buildings to contain the equipments will be constructed in Tanjung Medang. Since radar system and diesel engine generators are excluded in the scope of the Project, equipment will be installed in the unit house. Equipment building will therefore not be provided for Tanjung Parit.

2) Site Layout

The equipment building is located as closely as possible to the steel tower where the radar and the antennae are installed to facilitate interconnection.

3) Architectural Design

a. General

The building to contain the VTS System was designed to facilitate maintenance. Considering the importance of the facility, reinforced concrete structure was conceived to be fire and seismic resistant. The roof with wooden truss support is sloped to facilitate water drainage in times of heavy downpour.

b. Floor Plan

The equipment building consists of two compartments, i.e., the equipment room and the UPS room. The equipment room will be air conditioned to protect the radar facilities against high temperature and humidity.

Table 2-2-8 below shows the floor area schedule which was determined based on the site survey and discussions with concerned Indonesian Officials. Drawing 10 shows the plan, section and elevation of the equipment building.

Table 2-2-8 Floor Area Schedule for Equipment Building

			Total Floor Area
1st Floor	EQUIPMENT ROOM	UPS ROOM	42.25 m2
Floor Area	22.75 m2	19.50 m2	

(3) Generator Building（Types A and B）

1) Site Locations

Generator House Type A (55 ㎡) : Tanjung Medang
Generator House Type B (45 ㎡) : Dumai

2) Site Layout

The generator house is planned as closely as possible to the equipment building to shorten wiring connections. The design has considered the location of the exhaust and suppression of noise as measure against pollution.

3) Architectural Design

a. General

The generator house was designed to facilitate operation and maintenance of the equipment. The house is located in an area to facilitate access for maintenance. The house will be constructed of reinforced concrete to be fire and corrosion resistant. The roof with wooden truss support is sloped to facilitate water drainage in times of heavy downpour.

b. Floor Plan

The house has no compartment and will contain the generator sets, fuel tank, isolated transformer (IST) and automatic voltage regulator (AVR) among others. The location of openings was made with due consideration of protecting the facilities from salty air intrusion.

Table 2-2-9 shows the floor area schedule which was determined based on the site survey and discussions with concerned Indonesian Officials. Drawing 10 shows the

plan, section and elevation of the generator house.

Table 2-2-9 Floor Area Schedule for Generator House

Generator Building -A		Total Floor Area
1st Floor	Generator Room	55.00 m2
Floor Area	55.00 m2	

Generator Building -B		Total Floor Area
1st Floor	Generator Room	45.00 m2
Floor Area	45.00 m2	

2-2-2-5 Other Facilities

(1) Steel Tower for Radar and Communications

Steel tower will be erected to mount the radar scanner and parabola antennae for the data communication links. The tower will be constructed of steel angles commonly used in Indonesia so that fabrication and erection of the tower could be undertaken by local companies. The tower heights are determined to ensure performance of the radar scanner and parabola antennae. Table 2-2-10 shows the schedule of heights of the steel towers to be erected for each site.

Table 2-2-10 Tabulation of Required Height of Radar Towers

Site	Level/Elevation					Tower Height
	Ground Level (E.L.) m	Radar Scanner (E.L.) m	Parabolic Antenna (Upper) (E.L.) m	Parabolic Antenna (Lower) (E.L.) m	Tower Top (E.L.) m	From Graound Level m
Tg. Medang	2.5	76.5	70.0	63.0	75.5	73.0
Tg. Sair	2.5	-	85.0	78.0	87.5	85.0
Dumai	4.0	-	54.0	44.0	54.0	50.0
Selincing	2.0	-	52.0	42.0	52.0	50.0
Simpang Ayam	3.0	-	83.0	73.0	87.5	84.5
Tg. Parit	2.0	-	82.0	72.0	89.5	87.5

Note: 1: EL means elevation above sea level.
2: Elevation of radar scanner is approximate.
3: Elevation of parabolic antenna is indicated at center level.

Foundation type is determined according to the soil conditions at each site. All of objective sites for Stage-2 are very soft sub-soil conditions, therefore, pile foundation type shall be adopted.

(2) Fuel Supply Facilities at Tanjung Medang

The VTS Sensor Station at Tajung Medang will be provided with generator sets for power supply due to the absence of commercial power supply. Some 2,000 liters of fuel supply per month is required for 24 hours continuous operation of the generators. In the case of the existing lighthouses, fuel is supplied once in 3 months by a vessel owned by DN. Based on information from DGST, the frequency of supply will not vary even with the completion of the Project. Therefore, based on this consideration, the capacity of the fuel storage tanks for the sites is set for 3 months of operation.

2-2-2-6 Outline of the Equipment and Facilities to be Provided

The list of equipment and facilities for the proposed VTS System are summarized in Tables 2-2-11 and 2-2-12 below.

Table 2-2-11 Summary of Equipment

Equipment	1 Tanjung Medang	2 Tanjung Sair	3 Dumai	4 Selincing	5 Simpang Ayam	6 Tanjung Parit
Equipment for VTS Sensor and Repeater Stations						
Radar System	○					
VHF Marine Radio System	○					○
AIS Base Station System (AIS System)	○					○
CCTV Camera Equipment (CCTV System)	○					
Area Surveillance Camera		○			○	
Meteorological Sensor Unit with Data Logger	○					
Air Conditioner for Radar Sensor Station	○					
Diesel Engine Generator	○					
Solar Power Generator		○			○	○
Housing Unit (with accessories)		○			○	○
Equipment for VTS Sub-Center						
Tracking System			○			
Multi-function Console with VHF Radio Communication Unit			○[1)]			
Data Base for Vessel Information			○			
Record and Playback System for Vessel Traffic			○			
AIS Server System (AIS System)			○			
CCTV Video Display Equipment (CCTV System)			○			
Meteorological Monitor Console			○			
Resource Management System			○			
Printer System (Monochrome and Color)			○			
Connecting Devices for Internet Communication between Dumai and Batu			○[2)]			
Equipment for VTS Sub-Center, Sensor and Repeater Stations						
Equipment Desk and Others			○			
Multiplex Radio Equipment (Data Communication System)	○	○	○[3)]	○[3)]	○	○

1) 2) One another unit will be installed at Batu Ampar VTS Center
3) Equipment installed by MTSD Project IV will be used for data Transmission between Dumai and Selincing.

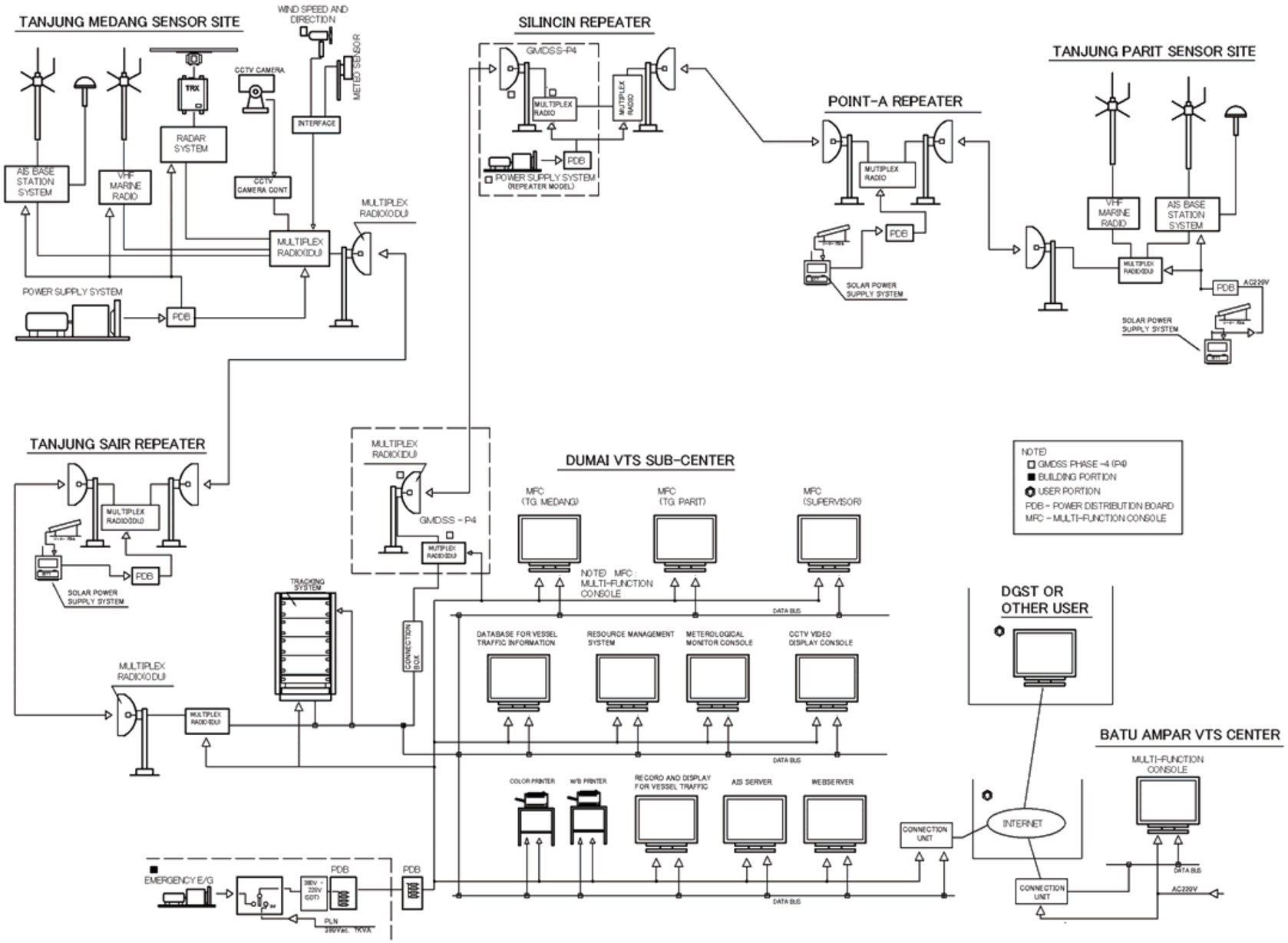
Table 2-2-12 Summary of Facilities

Facilities	Unit	Quantity	1 Tanjung Medang	2 Tanjung Sair	3 Dumai	4 Selincing	5 Simpang Ayam	6 Tanjung Parit
VTS Sub-Center	Unit	1			1			
	m^2	207.4			207.36			
Equipment Building	Unit	1	1					
	m^2	42.25	42.25					
Generator Building	Unit	2	1		1			
	m^2	100	55.00		45.00			
Air Conditioners (for VTS Sub-Center)	Unit	1			1			
Diesel Engine Generator (Emergency Backup)	Unit	1			1			
	Nos.				1			
Fuel Tank (Outdoor)	Unit	2	1		1			
	m^3		6.0		2.0			
Water Reservoir	Set	1			1			
	m^3				1.0			
Septic Tank	Set	1			1			
	m^3				4.0			
Steel Tower for Radar and Communications	Unit	3	1	1			1	1
	m		72.50	84.50	-	-	84.00	86.50

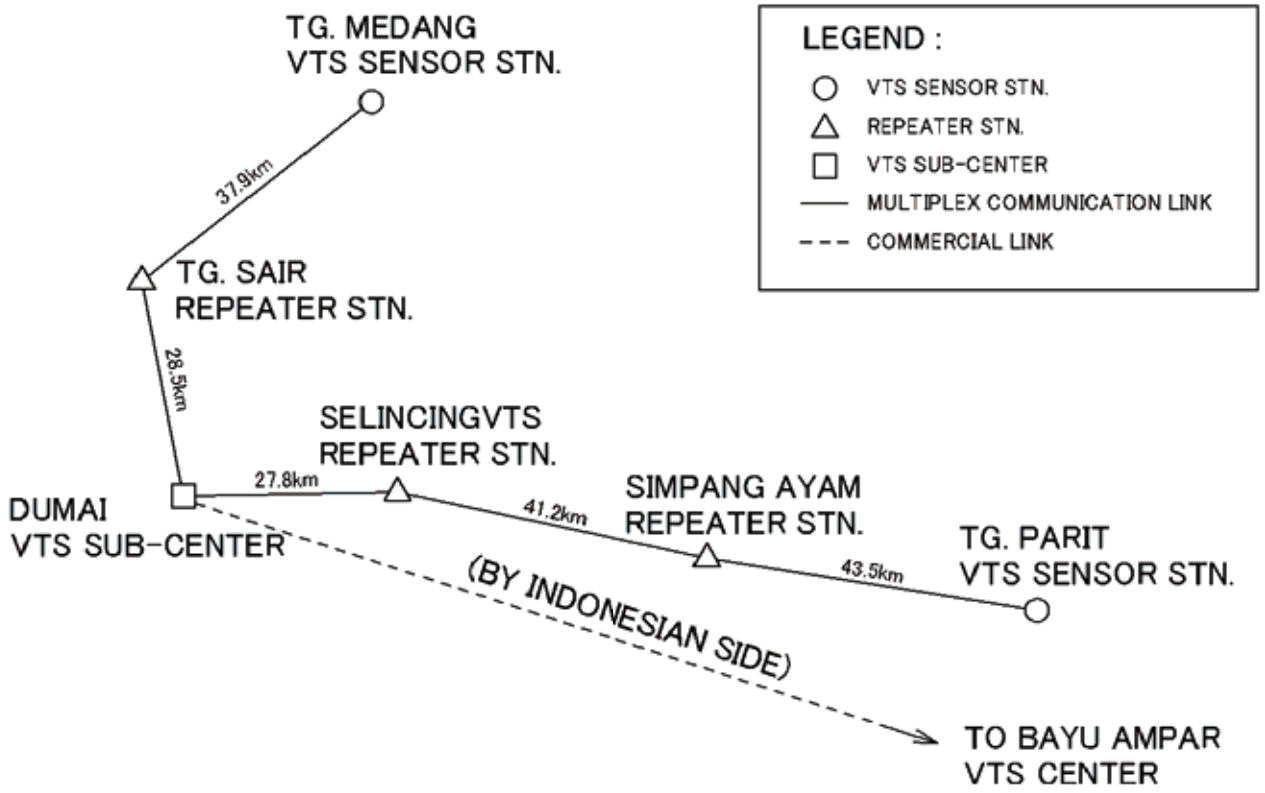
2-2-3 Basic Design Drawings

The list of Basic Design Drawings is tabulated as follows:

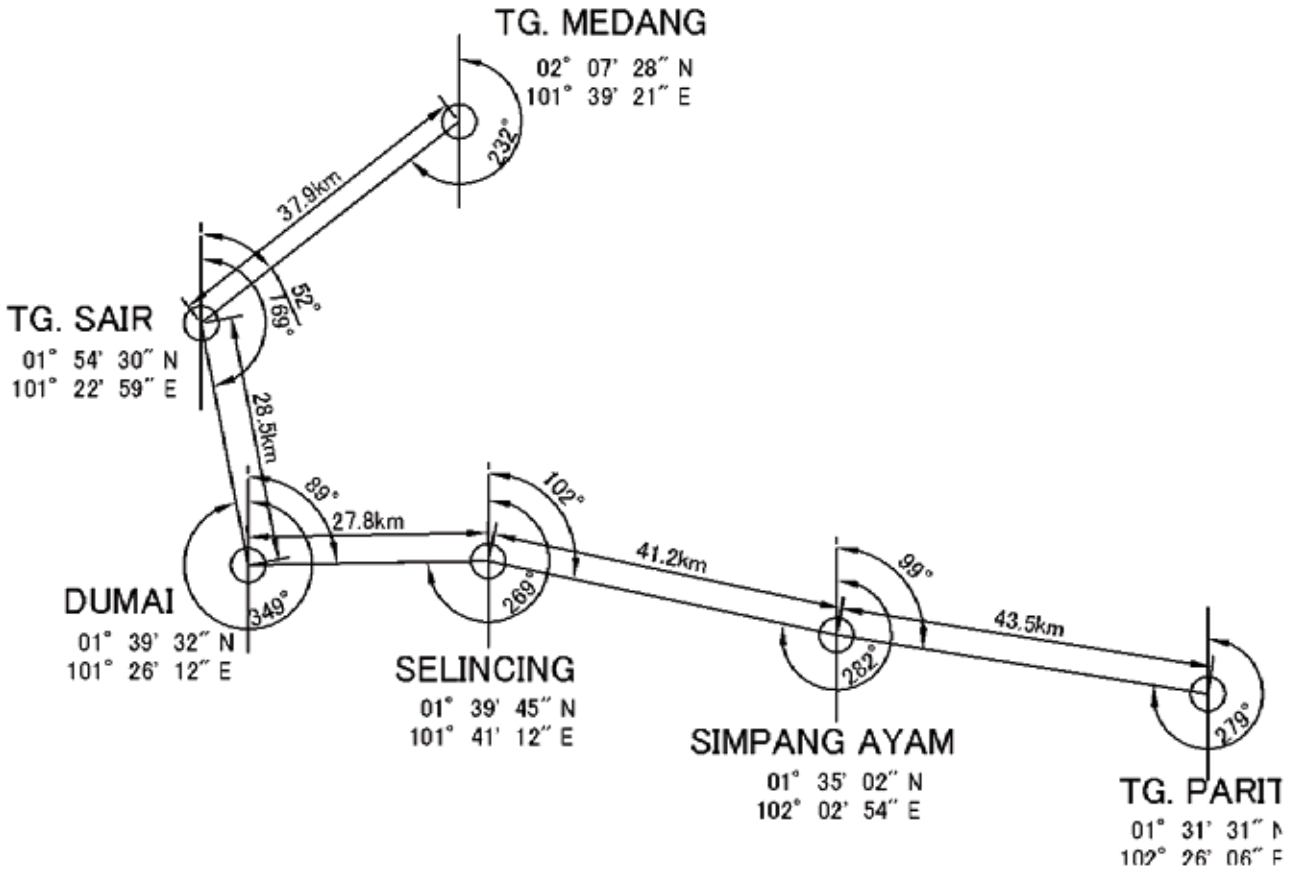
Drawing 1	Block Diagram of VTS System
Drawing 2	VTS System Configuration
Drawing 3	Circuit Configurations
Drawing 4	Plot Plan of Facilities (1) Tanjung Medang
Drawing 5	Plot Plan of Facilities (2) Tanjung Sair
Drawing 6	Plot Plan of Facilities (3) Dumai
Drawing 7	Plot Plan of Facilities (4) Simpang Ayams
Drawing 8	Plot Plan of Facilities (5) Tanjung Parit
Drawing 9	Plan, Elevation and Section of Dumai VTS Sub-Center
Drawing 10	Plan, Elevation and Section of Equipment and Generator Building
Drawing 11	Steel Tower Elevations



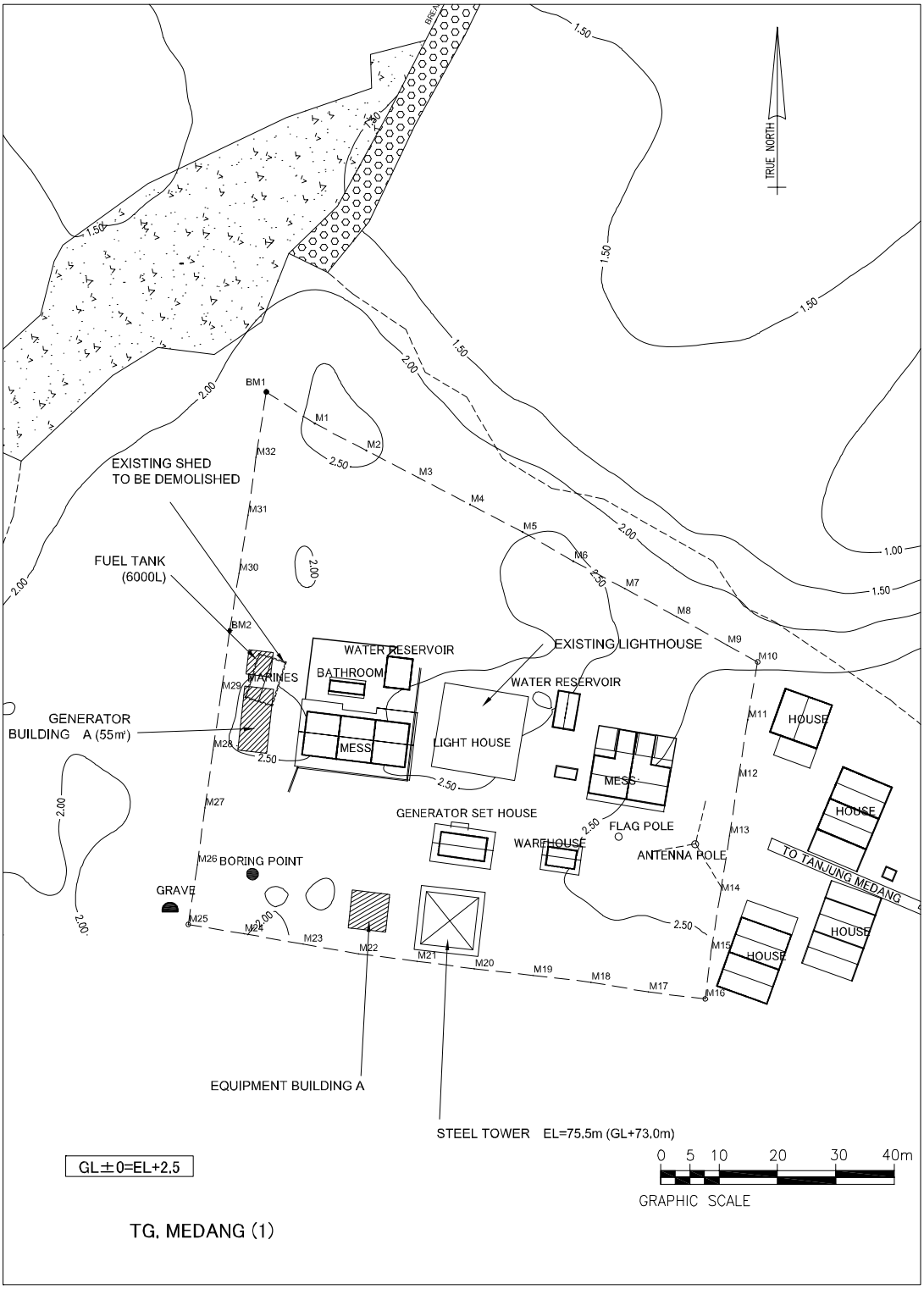
Drawing 1 Block Diagram of VTS System (Reference Only)



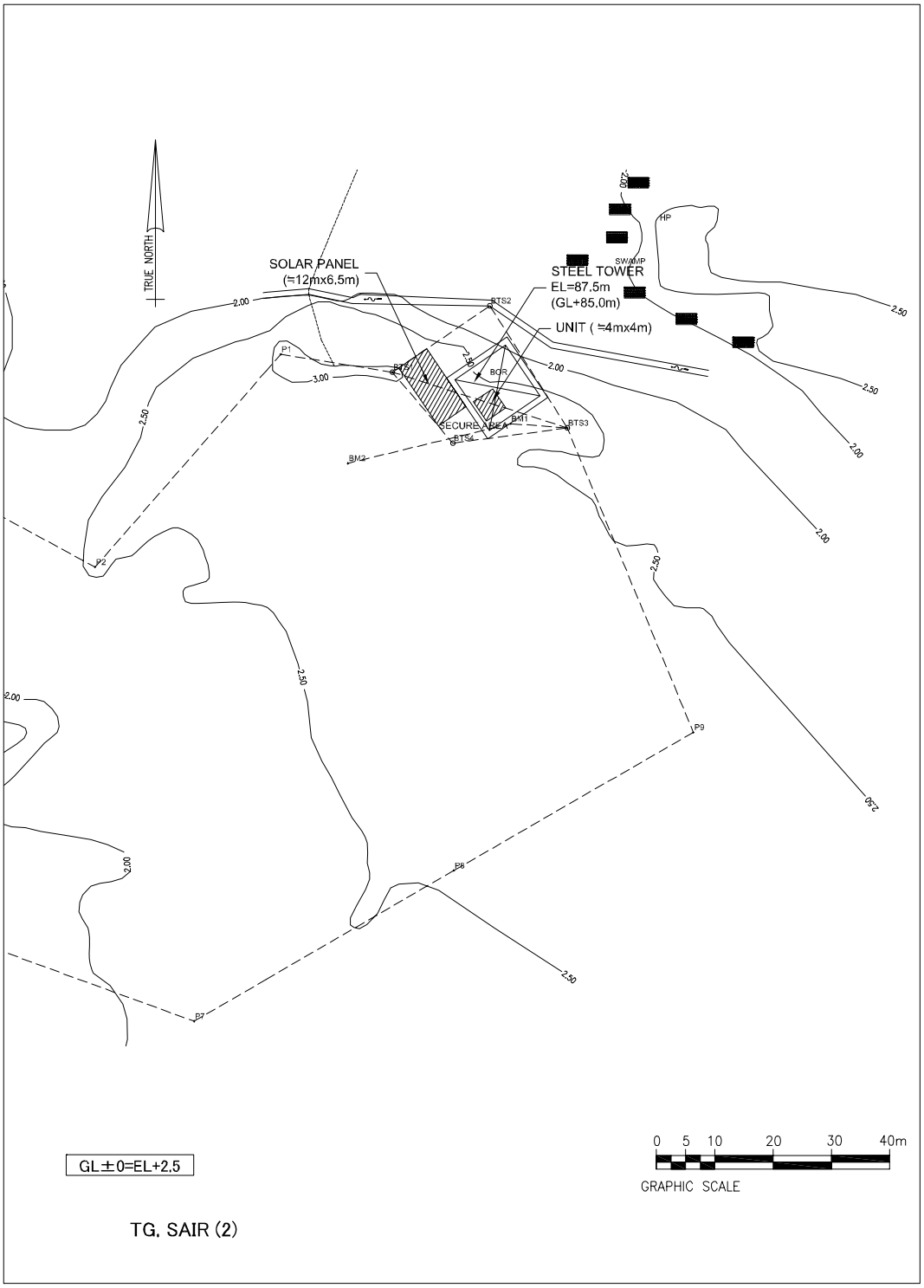
Drawing 2 VTS System Configuration



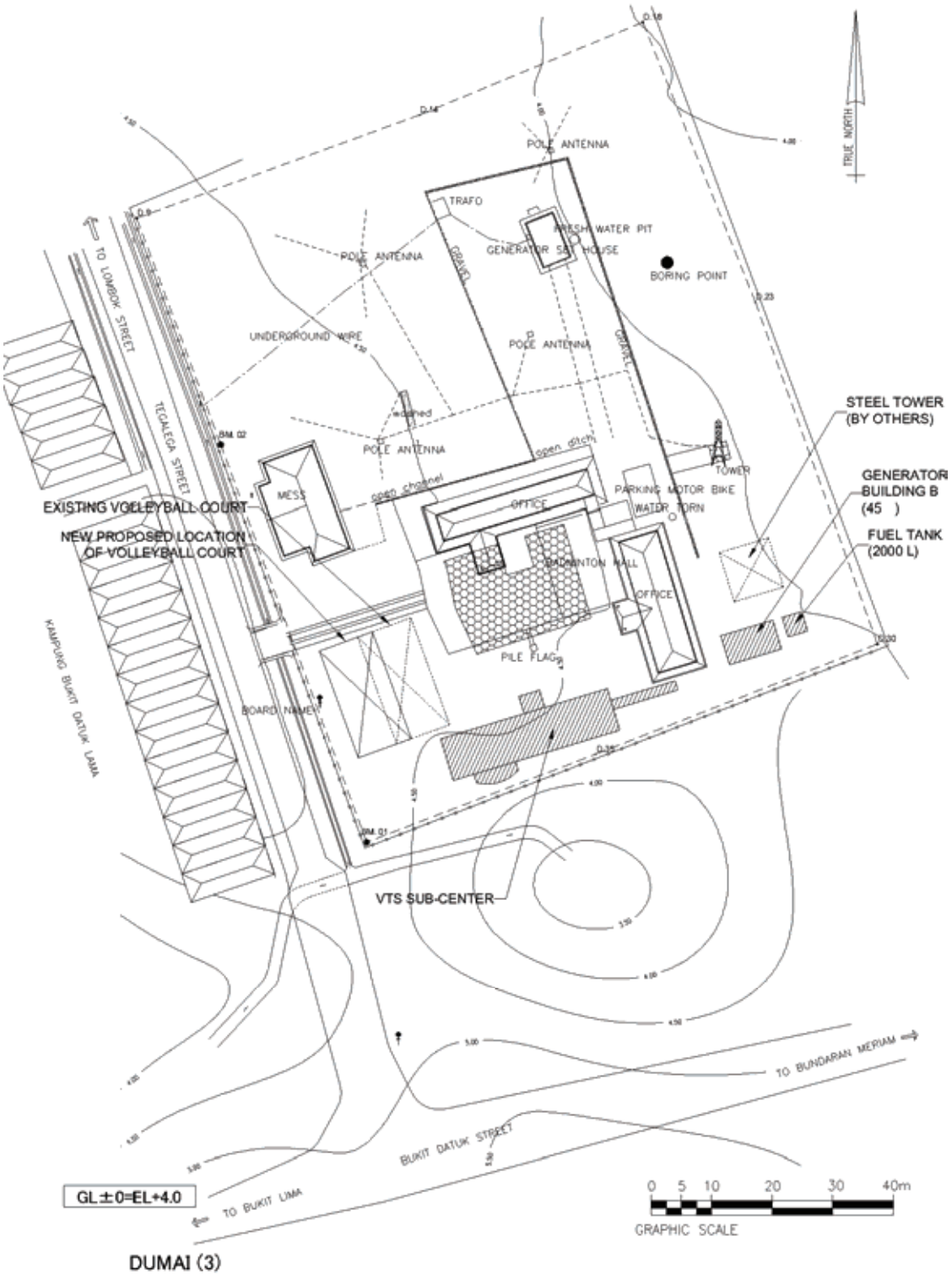
Drawing 3 Circuit Configuration



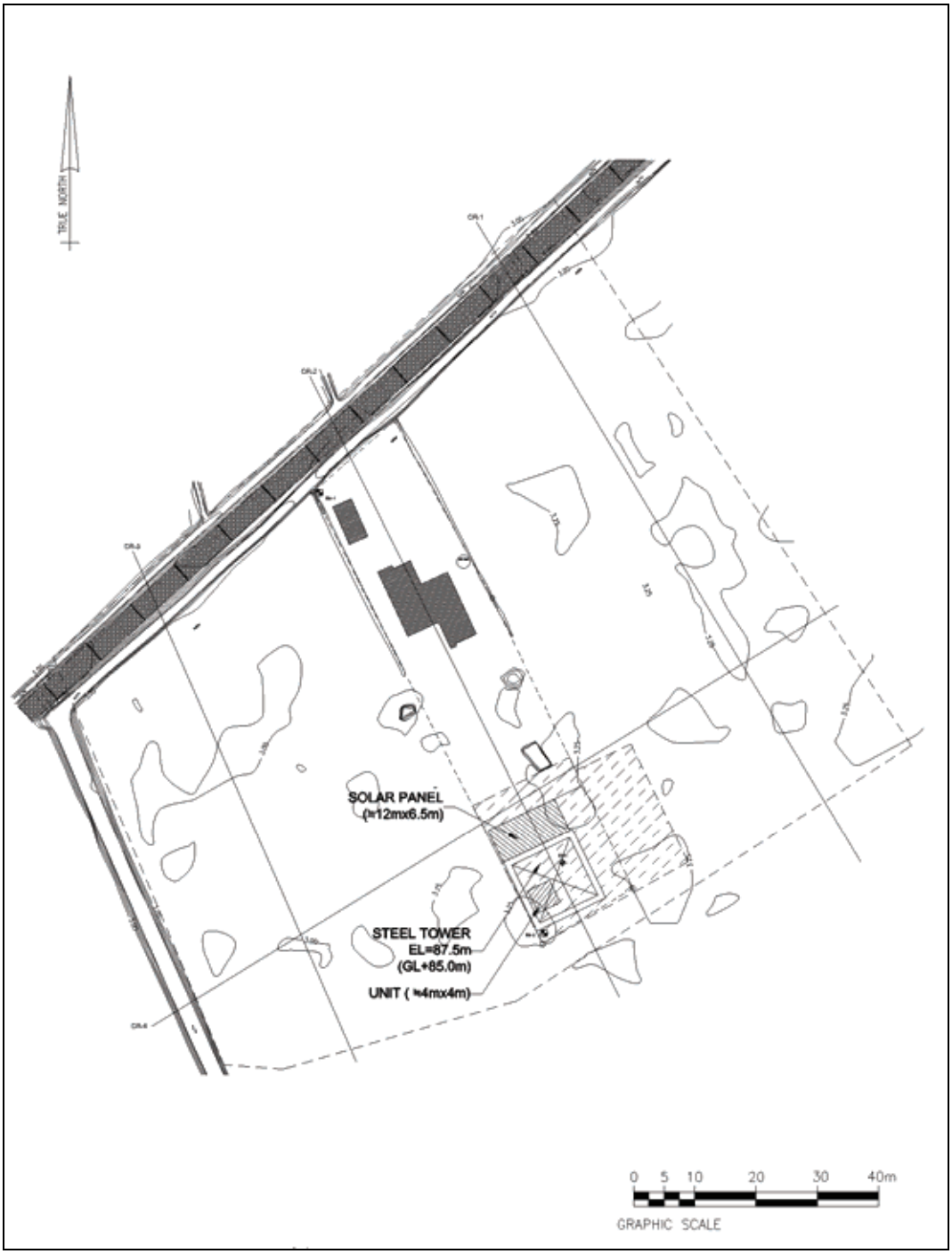
Drawing 4 Plot Plan of Facilities (1) Tanjung Medan



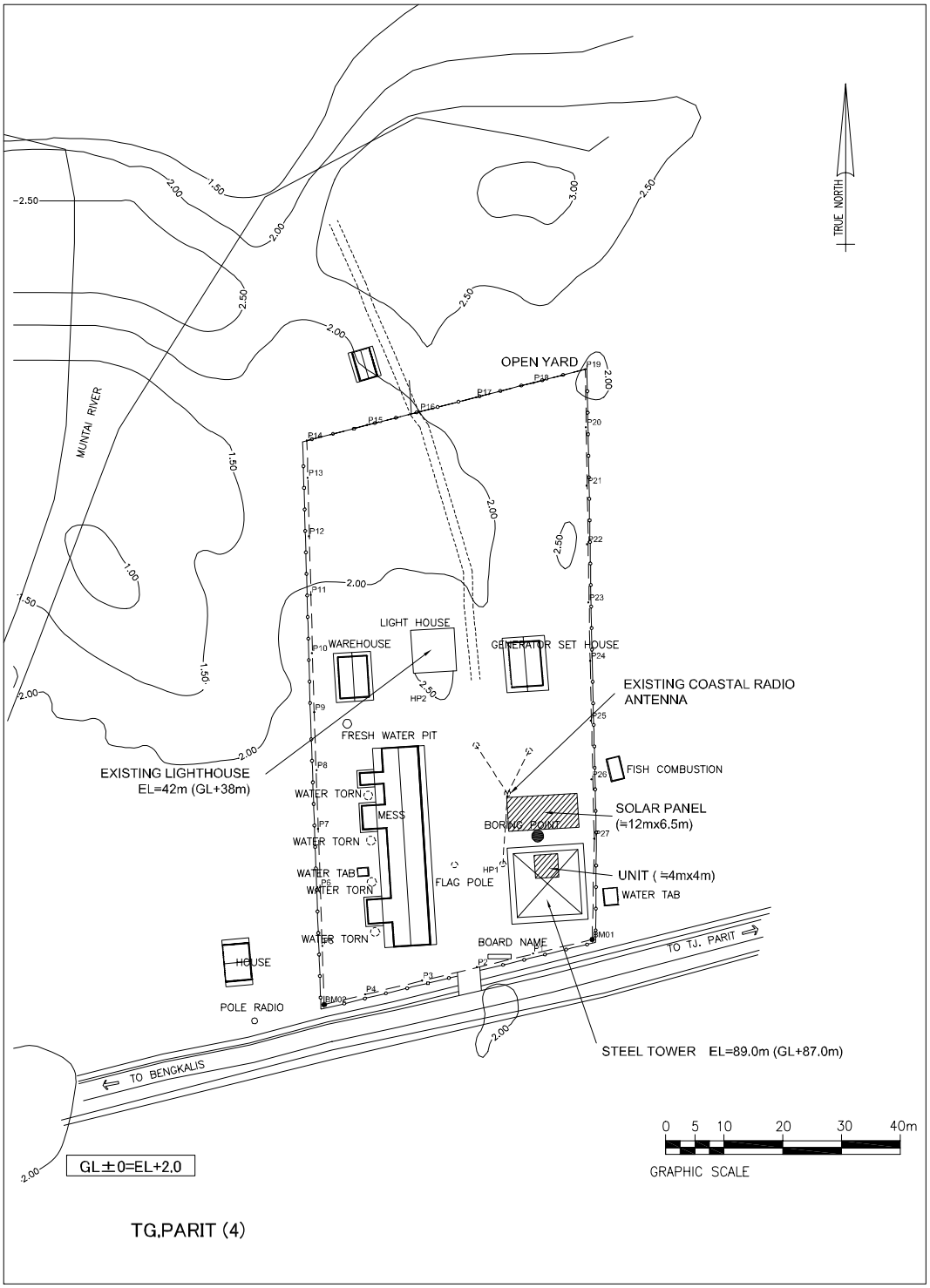
Drawing 5 Plot Plan of Facilities (2) Tanjung Sair



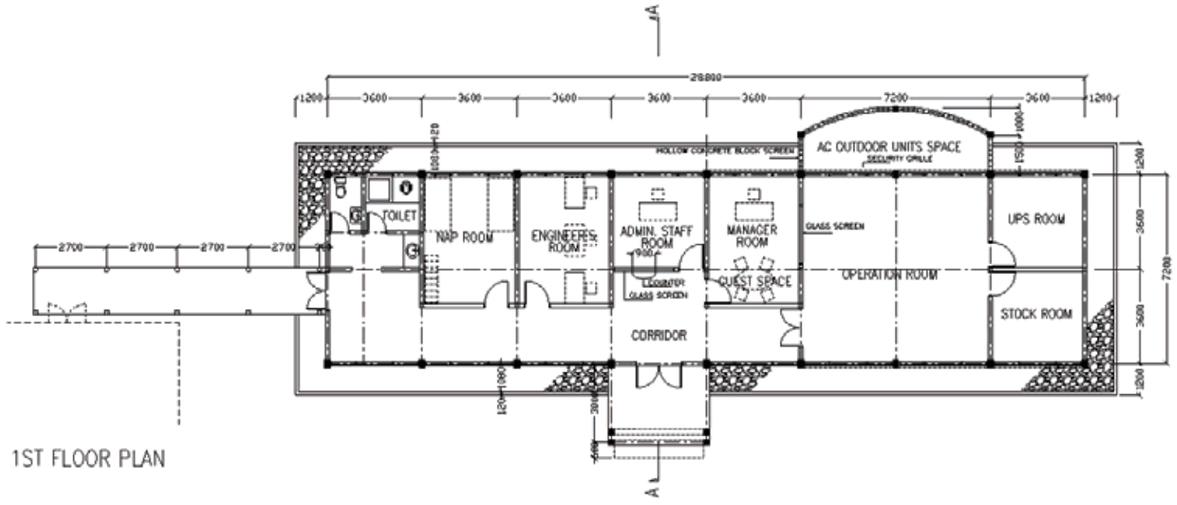
Drawing 6 Plot Plan of Facilities (3) Dumai



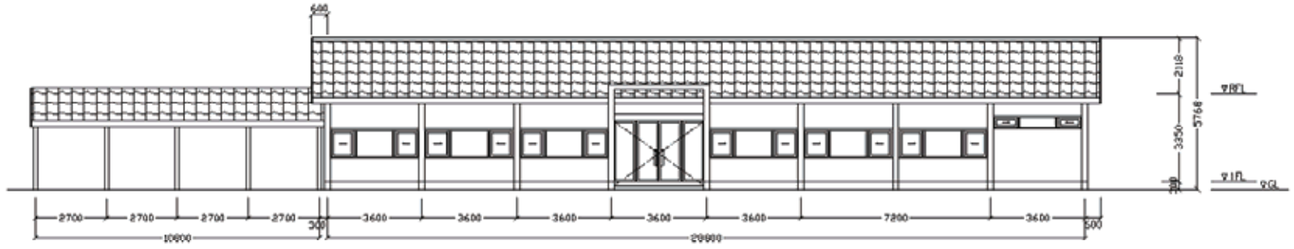
Drawing 7 Plot Plan of Facilities (4) Simpang Ayam



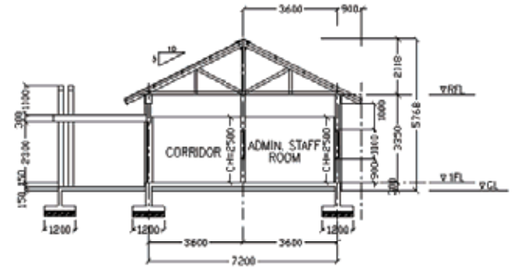
Drawing 8 Plot Plan of Facilities (5) Tanjung Parit



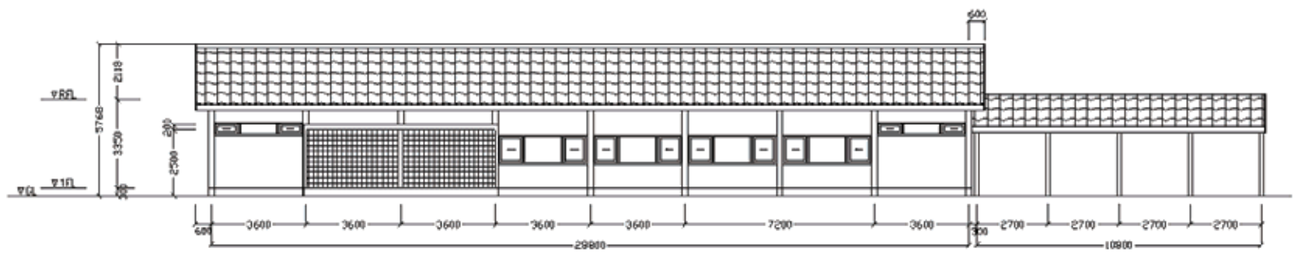
1ST FLOOR PLAN



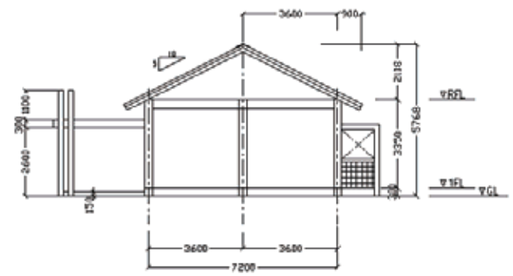
NORTH ELEVATION



A–A SECTION



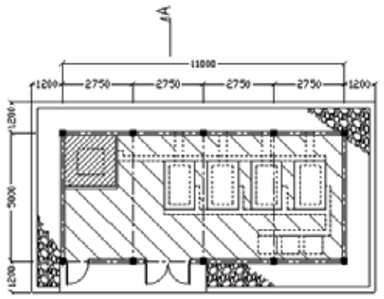
SOUTH ELEVATION



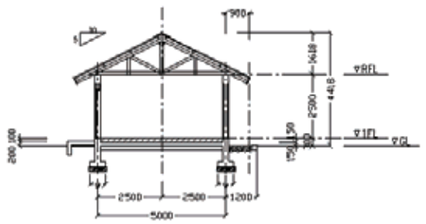
WEST ELEVATION

Drawing 9 Plan, Elevation and Section of Dumai VTS Sub-Center

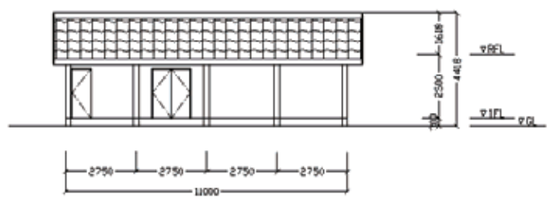
GENERATOR BUILDING (TYPE-A)



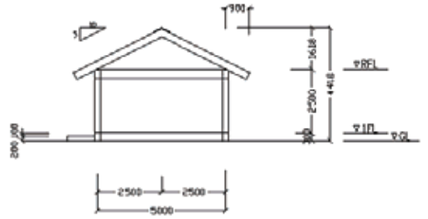
FLOOR PLAN



A-A SECTION



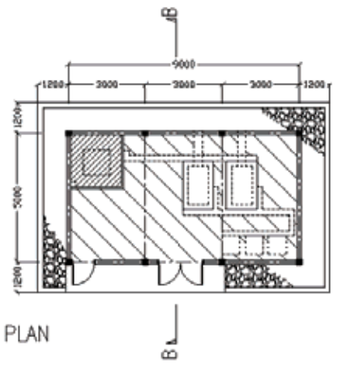
FRONT ELEVATION



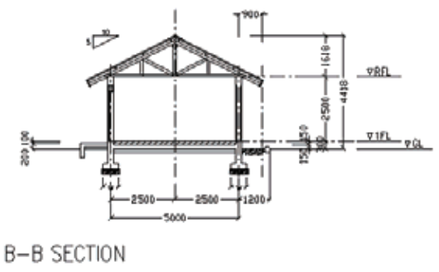
SIDE ELEVATION

NOTES:
W : WIDTH OF FOUNDATION FOOTING
W = 800 for TG. PARIT, BENGKALIS and DUMAI
W = 600 for HIYU KECIL, TAKONG KECIL, TG. BERAKIT and TG. MEDANG

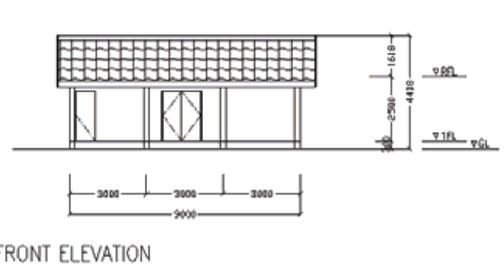
GENERATOR BUILDING (TYPE-B)



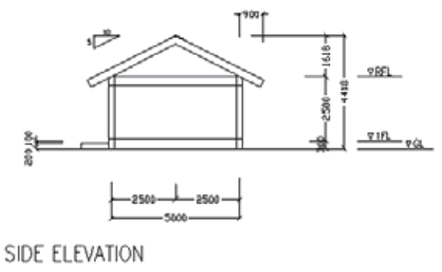
FLOOR PLAN



B-B SECTION

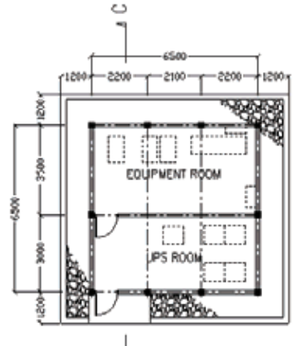


FRONT ELEVATION

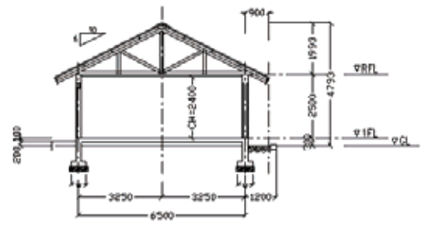


SIDE ELEVATION

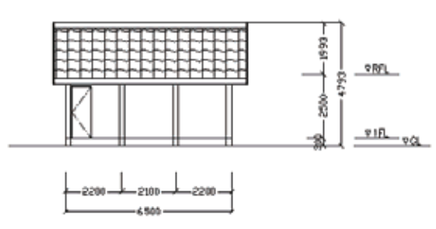
EQUIPMENT BUILDING



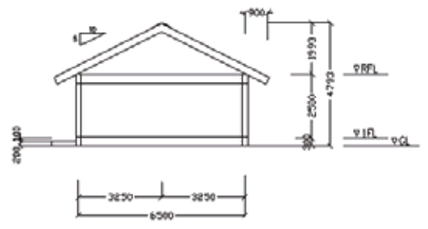
FLOOR PLAN



C-C SECTION

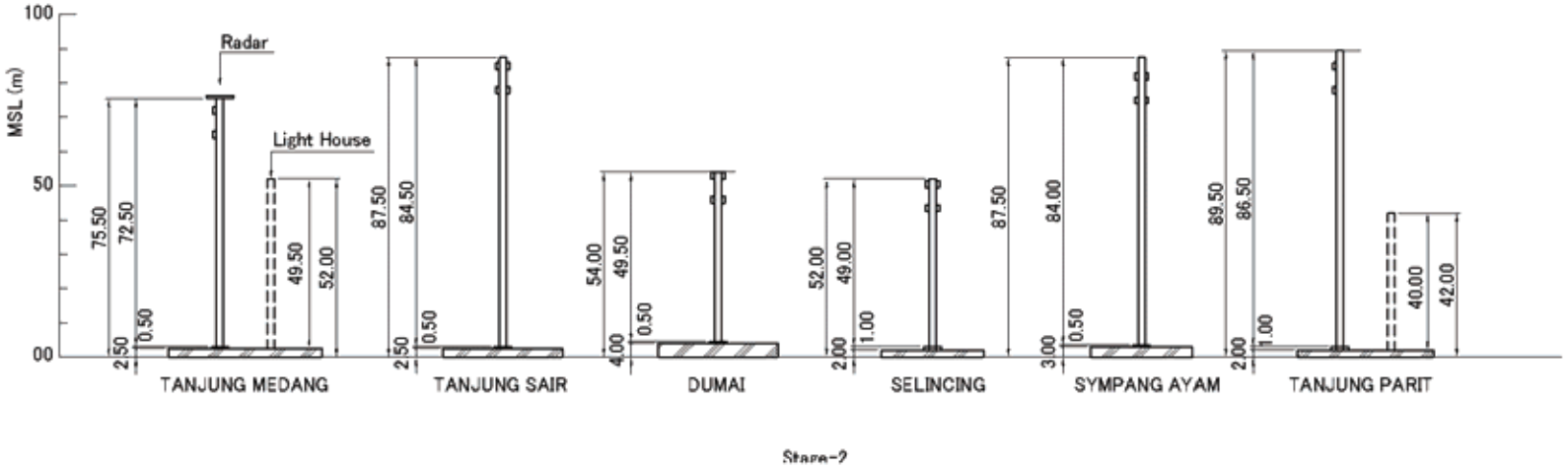


FRONT ELEVATION



SIDE ELEVATION

Drawing 10 Plan, Elevation and Section of Equipment and Generator Building



Drawing. 11 Steel Tower Elevations

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

Due to the absence of VTS equipment manufacturers in Indonesia, the facilities were initially conceived to be procured either in Japan, Europe or North America including Canada. The result of the quotations taken from manufacturers in Europe and America however, indicated that Japanese products are cheaper. To enhance competition, quotations were taken from more than three Japanese manufacturers. Based on the foregoing, a decision was made to procure the equipment in Japan. Selection of the most responsive bidder for the procurement of equipment will be based on the following: i) compliance with the specifications ii) ease of maintenance and iii) after sales service particularly on availability of technical support and spare parts.

The VTS System for the Project will composed of some custom-made equipment which requires specialty expertise by the manufacturers for the installation, setting up, tuning and test operation. Except however for the specialty works required to be carried out by the manufacturers, all works particularly for marine, civil, building works among others could be undertaken locally to the extent possible.

Construction materials such as cement, aggregates, steel bars, roof materials, window frames and doors among others which are available in Indonesia nationwide will be used to the extent practicable for the construction of civil and building works. The steel tower will be fabricated and erected locally due to the availability of materials and expertise.

2-2-4-2 Implementation Conditions

Among the six sites, Tanjung Medang, Tanjung Sair and Tanjung Parit are located in remote areas or isolated islands. Special attention is therefore needed for hauling/delivery of materials and construction as described hereunder.

Access to the Tanjung Medang and Tanjung Sair are possible only through the sea from Dumai. Electrical power supply and fresh water supply are still not available. An existing jetty near the project site at Tanjung Sair may be possible to use for equipment and material handling to the site. However, due to the absence of infrastructures at Tanjung Medang, the construction of a temporary cargo handling facility will be necessary for the transportation of materials and

equipment.

Access by land from Bengkalis to Tanjung Parit is possible but the road is narrow with poor surface pavement. A wooden bridge also exists along the way and passage of light vehicles is being done alternately. Passage of heavy vehicles through the said bridge is not possible. Same with Tanjung Medang, electrical and fresh water supply are still not available in Tanjung Parit. Due to poor land access as mentioned above, transportation of material and equipment will be undertaken by sea. In this case, the construction of a temporary cargo handling facility will be necessary.

2-2-4-3 Scope of Works

The following scope of works will be borne by the Indonesian Government.

- Removal (or replacement) of existing vallay ball court in Dumai Coastal Radio Station
- Provision of openings for connection of the existing office building with the VTS Sub-Center building
- Tapping of commercial power supply for Dumai and Bengkalis

The Japanese side will provide the interface for data communication between Batu Ampar and Dumai while the Indonesian side will implement the interconnection link.

In addition to the above, Indonesian side shall provide the following facilities and equipment by MTSD Project IV.

- Steel towers at Dumai and Selincing and communication devices for between Dumai and Selincing
- Equipment house/housing, equipment rack and electrical power supply

Furthermore, Indonesian side shall ensure the land preparation for repeater stations at Tanjung Sair and Simpang Ayam.

2-2-4-4 Consultant Supervision

(1) Procurement Management Plan

Procurement management will be carried out by the experts for the i) radar and AIS System and related equipment, ii) multi-function console and associated software and iii) communication system. Consultancy services during manufacture of VTS components will comprise of production inspections, witnessing periodical tests, witnessing test on final completion, checking of individual equipment and system for compliance with the specifications and confirmation of console indicators as to function and compliance with the specifications.

Resident engineers will be deployed to the sites during the installation of equipments. The above-mentioned experts will also be deployed to conduct i) inspections of equipment during arrival at site and, ii) final inspection after the installation of the whole system has been completed.

(2) Construction Management Plan

A Japanese resident engineer will be deployed from the start of construction up to final completion for the supervision of works and quality control of materials. Local engineers will assist in the construction supervision considering that constructions will be carried in four isolated sites simultaneously. In addition to the above, building, structural, steel tower, electrical and mechanical Japanese engineers will be deployed at the commencement of works for periodical inspections for quality work assurance and inspections on completion of works.

2-2-4-5 Quality Control Plan

(1) Equipment

The following inspections are planned to be conducted during the manufacture of the equipment and installation:

1) Factory Inspections

To check and monitor the factory progress of manufacturing, mid term and final inspections will be conduced upon completion. The scope of services for mid term

inspections will include the following: i) to settle unclear and doubtful issues during manufacture, ii) to check the progress of fabrication and, iii) to check items which are required for effective final inspections. Final inspection will be conducted in Japan prior to delivery of products. This includes: i) compliance of individual equipment with the specifications, ii) compliance of the console indication and functions of each equipment with the specifications. The inspection will be conducted both for the whole system and individual main equipment.

2) Inspections Prior to Shipment

A third party will be engaged for the verification and quantity check of all the equipment prior to shipment.

3) Field Inspections

When the individual equipment is installed and connected at site, it will be subjected to midterm field inspections in the presence of the Consultants. The scope of the mid term field inspections to be conducted by the manufacturer will comprise of verification for performance as to compliance with the specifications for the individual equipment and for the system as a whole.

Mid term inspections will be conducted when equipment installations have started at site and after minute adjustments and fine tunings have been completed.

4) Turn Over of System to the Owner

The Owner will carry out a trial operation run of the system to verify system functions and performances compliance with the specifications. After the verification, all records of the mid term inspections for all sites will be compiled for concurrence by all parties concerned for acceptance of the Owner. Thereafter, the whole facilities/system will be turned over to the Indonesian Government for operation.

(2) Facilities

The following tests will be carried out for materials to be incorporated for the works:

1) Aggregate Test

Test will be carried out for specimens to determine the acceptability of the quarry prior to approval. Spot checking of delivered materials will be conducted and as necessary test will be undertaken on: i) specific gravity, ii) water absorption ratio, iii) Los Angeles test, iv) Alkali aggregate reaction, among others.

2) Tensile Strength Test/ Mill Certificates

Tensile strength test of reinforcing bars will be carried out in addition to submission of mill certificates prior to approval for use.

3) Slump Test

Slump test will be conducted prior to placing concrete per batches at all sites.

4) Concrete Compression Test

Concrete compression test will be conducted in the laboratory of the supplier for ready mixed concrete for Dumai. Test of concrete specimens for the other sites will be conducted in Dumai. Sampling is planned to be conducted at every 150m3 concrete casting or at least one time per day. Three pieces of test specimens will be prepared each for 7 days and 28 days strength test. These test pieces will be transported to Dumai before the date for compression test.

5) Tensile Strength Test for Angular Steel and Steel Plate for the Radar Tower

Tensile strength test of steel materials for the steel tower will be carried out prior to use of the material in the factory. Material quality will be controlled by the mill certificates submitted by the supplier.

2-2-4-6 Procurement Plan for Materials and Equipment

(1) Spare Parts and Consumables

Japanese manufacturers normally have overseas branches and/or service agencies worldwide

including Indonesia to facilitate immediate repairs in the unlikely event of breakdown. Spare parts which need to be regularly replaced will be provided as part of the Project. The spare parts to be included in the Project will be good for one year of operations as recommended by the manufacturer.

Stationeries including ink and papers are excluded from the scope of the Project except initial preparation.

(2) Delivery of Materials and Equipment

Equipment procured from Japan will be delivered to the respective sites through Tg. Priok for customs clearance. The equipment will be transported to Dumai Port from Tg. Priok. Transportation from Dumai to the sites will depend on the mode of transport available at the time of transfer. Barges or LCTs will be used for equipment transport to Tanjung Medang and Tanjung Parit.

Construction materials including aggregates, cement, building materials among others will be procured in Dumai. Steel materials for the tower will be procured from Jakarta using the transportation route as that for the equipment.

2-2-4-7 Operational Guidance Plan

(1) Guidance for Operation

Guidance for operation and maintenance are indispensable for the efficient operation of the VTS System more so that the system is the first of its kind in Indonesia for the surveillance of the Straits.

The guidance for VTS operations will be prepared by the manufacturer under the supervision of the Consultants. All guidance materials will be provided by the manufacturer. Instructors will be Indonesian engineers that participated in the tuning and test operations. Table 2-2-13 hereunder shows the guidance program and the number of staffs to be trained.

Table 2-2-13 Guidance for Operations Program and Staffing Schedule

Location	VTS Sub-Center
Trainee (Expected)	5 personnel Each
Contents	
1. Outline of the system	○
2. Start and stop method of the console system	○
3. Operation of the radar console	○
4. Operation of AIS	○
5. Operation of VHF	○
6. Play back operation	○
7. Operation of vessel data base	○
8. Operation of resource management	○
9. System trouble measures	○

(2) Guidance for Maintenance

Table 2-2-14 hereunder shows the guidance program and staffs to be trained. The guidance will be conducted by Indonesian engineers of the manufacturer under the supervision of Japanese Consultants that conducted the adjustment and fine tuning of the system.

Table 2-2-14 Guidance for Maintenance Program and Staffing Schedule

Location	VTS Sub-Center	Site
Trainee (Expected)	5	3 each
Contents		
1. Outline of the system	○	○
2. Start and stop method	○	○
3. Conditions of system operation	○	
4. Basic Operation of the VTS System	○	
5. Maintenance of power source	○	○
6. Measures during power breakdown	○	○
7. Maintenance for the micro wave transmission system	○	○
8. Maintenance for the radar transmitter and receiver		○
9. Maintenance for the VHF transmitter and receiver		○
10. Maintenance for the AIS base station		○
11. Maintenance for the CCTV camera		○
12. Server Maintenance	○	
13. Structure of the software system	○	
14. Maintenance for vessel data base	○	
15. Operation of the WEB system	○	

2-2-4-8 Soft Component (Technical Assistance) Plan

To achieve the objective of the project for the monitoring of the straits and to ensure and enhance traffic safety, the technical support should focus on the training of Indonesian staffs for the operation and maintenance of the VTS System in addition to the guidance for operation and maintenance. As mentioned several times earlier, the system which is the first of its kind in Indonesia for the surveillance of the straits will require fully trained staffs for the efficient operation and maintenance of the VTS facilities.

Training for operations and maintenance of the system is scheduled for Stage-2 Project as soft component by using the equipment installed by the Stage-1 Project. The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) has developed a model course for VTS operators, namely IALA Model Course V-103/1 Vessel Traffic Services Operators Basic Training, that is intended to provide with specific guidance on the training of VTS operators. For the purpose of the Soft Component and to provide a common base for the adequate VTS operation, the training has specifically been incorporated in the framework of the Soft Component and will be conducted in line with the aforementioned IALA model course.

The Soft Component is planned based on the following considerations:

- To provide the basic knowledge of VTS; understanding of system compositions, capability and limitation of functions, and utilization/application of VTS tools.
- To provide the basic knowledge of watchkeeping responsibility and routine/emergency procedures.
- To provide the basic knowledge of shipping traffic, regulations, topography and geography, marine traffic characteristics and nautical knowledge such as marine charts and aids to navigation facilities.
- To provide practical skill of VTS operation and equipment maintenance techniques.

Soft component details are attached in the Appendix. Technical cooperation for the operation and maintenance of the facilities is also highly desirable.

2-2-4-9 Implementation Schedule

The schedule for implementation is shown in Fig. 2-2-9.

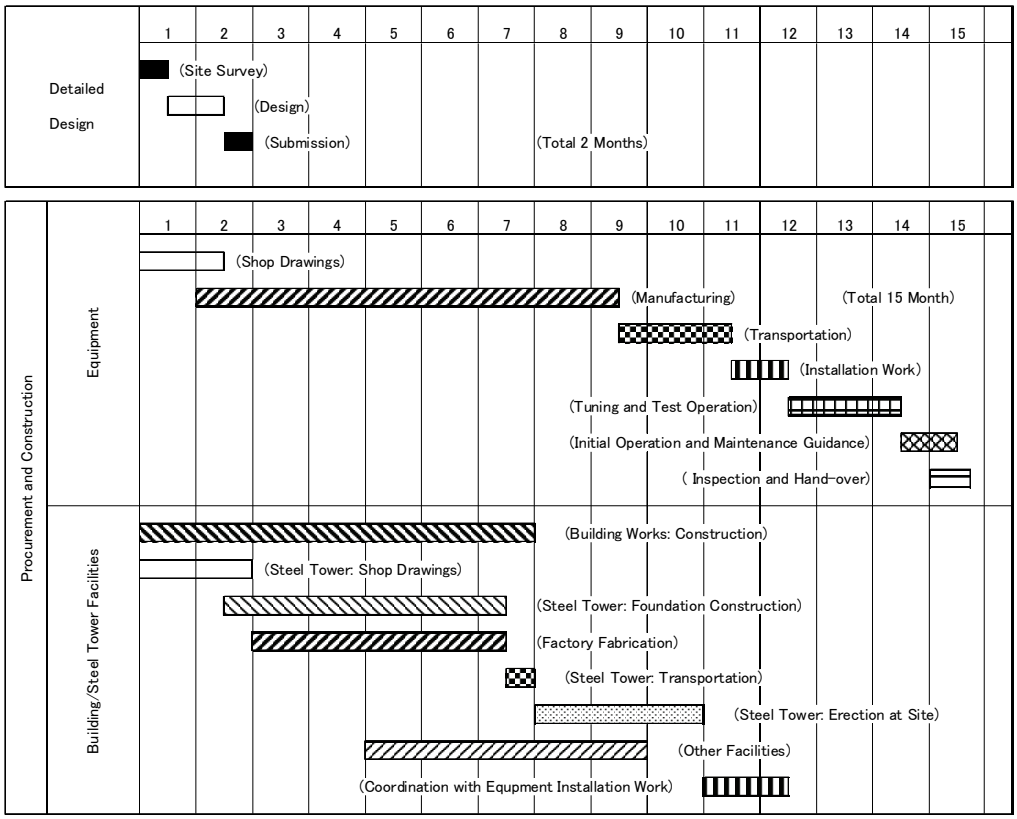


Fig. 2-2-9 Implementation Schedule for Stage-2

2-3 Obligations of Recipient Country

The full cooperation of the Indonesian Government is being sought for the following tasks for the smooth implementation of this Grant Aid Project:

- Taxes and duties exemption
- Facilitation of project activities
- Provision of banking arrangement
- Authorization for Payments

Procurement and installation of the equipment and, construction of facilities will be conducted by the Japanese side, but the cooperation of the Indonesian side is needed for the smooth implementation of the Project particularly on the following:

- Land preparation for Tanjung Sair and Simpang Ayam for the repeater stations
- Issuance of permits to enter the construction sites and construct
- Arrangement in obtaining the following licenses:
    - wireless communication for radar image transmission
    - multiplex radio for data communication
    - VHF radio communication
- Issuance of permit to construct the temporary facilities especially for the temporary jetties for material handling (Especially in Tanjung Medang and Tanjung Parit).
- Tapping of commercial power supply for the VTS Sub-Center in Dumai
- Relocation of the volley ball court in Dumai
- Provision of openings for connection of the existing office building with the VTS Sub-Center building in Dumai
- Provision of high speed circuit (internet connections) between Dumai and Batu Ampar

In addition to the above, according to the discussions with MTSD Project IV, following facilities and equipment shall be proved by Indonesian side.

- Steel towers at Dumai and Selincing and communication devises for between Dumai and Selincing
- Equipment house/housing, equipment rack and electrical power supply.

2-4 Project Operation Plan

2-4-1 Maintenance Structure

(1) Area of Responsibility

According to DN, the Dumai Navigation District Office (Distrik Navigasi Dumai) will be tasked for the operation and management of the VTS System for Stage-2 Project.

(2) Staffing schedule

Table 2-4-1 and 2-4-2 hereunder show the staffing schedule of DN for the VTS operations.

Table 2-4-1 Staffing Schedule for the Operation
(VTS Sub-Center and Sensor Station)

Position	VTS	
	Sub-Center	Sensor Station
Project Manager	1	-
Deputy Project Manager	1	-
Clerk	1	-
Computer Engineer	1	-
VTS Management	5	-
VTS Operator	5	-
Electrical Engineer	2	1
Technical Assistant	2	2
Total	18	3

Table 2-4-2 Staffing Schedule by Sites

Site	Number of Staff
Tanjung Medang	3
Tanjung Sair	-
Dumai	18
Selinicng	-
Simpang Ayam	-
Tanjung Parit	3
Total	24

2-4-2 Maintenance Method

DN is under preparation of the VTS operation staff and organization, however, a basic understanding of the system is required for the staffs in charge with the preparation of the operation and maintenance manuals, systems and regulations.

For maintenance of the equipment, it is highly recommended to make appropriate agreement with the VTS manufacturer(s). Details of the agreement shall be decided by DGST however, for example, i) periodical maintenance may be one or two times per year by manufacturer's engineers, ii) exchange of consumable parts, ii) replacement of damaged parts, iv) immediate actions when trouble, v) operation supports etc. are recommended. Particularly, it is important that periodical maintenance by manufacturer to avoid stop operations due to trouble, because the system is used for vessel traffic safety for Malacca and Singapore Straits.

Taking this into account the support and concrete advices from experienced personnel is necessary for the VTS operation.

According to DN, fuel and other required consumables for the VTS operation will be supplied once in 3 months based on the operation frequency for the existing lighthouse. Continuous supply of fuel, consumer goods, spare parts, daily necessities and water for the staffs at the sites will be considered to ensure an efficient VTS System operations and maintenance. For this to be realized, the establishment of regulations and manuals for fuel and consumer goods supply operations must be prepared based on supply frequency and number of staffs to deployed for the operations.

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

(1) Cost to be borne by the Recipient Country

- Relocation of the volley ball court located in the yard of Dumai
- Provision of an opening of the existing office building for connection with the new VTS Sub-Center building
- Acquisition of high speed circuit between Dumai and Batu Ampar
- Furniture in the Buildings and others

- Bank commissions
- Transportation and accommodation costs for DGST staff for Soft Component

The cost for the above works is estimated at about Rp.688.0 million.

(2) Bases of the Cost Estimates

1)	Base date	December 2008
2)	Exchange Rate	1 US Dollar＝105.71 Yen 1 Rp.＝0.0122 Yen
3)	Construction period	See Implementation Schedule
4)	Others	The project will be implemented in accordance with the procedures of grant aid projects of the Japanese Government.

2-5-2 Operation and Maintenance Cost

The maintenance cost for the VTS System after completion of Stage-2 is estimated at Rp. 5.07 Billion (¥ 61.86 Million). The cost is exclusive of salaries of staffs for the operation of the VTS System and expenses for the maintenance agreement which is recommended to make agreement between DGST and Manufacture(s) for the VTS system maintenance. The annual budget of DN at Rp. 963.23 Billion (¥ 11.75 Billion) in 2008, for salaries of staff are reduced to Rp.781.37 Billion (¥ 9.53 Billion), and the estimated operation costs for Stage-2 will account about 0.65 % of the annual budget of Rp. 781.37 Billion exclusive of staff salaries. Maintenance of the steel tower by paint application at 10 year interval is estimated at Rp. 5.67 Billion (¥ 69.17 Million) for the sites for Stage-2 development.

2-6 Other Relevant Issues

(1) Land Acquisition of Tanjung Sair and Simpang Ayam

Land acquisition for candidate repeater stations at Tanjung Sair and Simpang Ayam shall be ensured by DGST before implementation of the Project.

(2) Formalities to be undertaken for Japanese Grant Aid Project Programs

The proposed project through official grant aid of the Japanese Government is the first

undertaking of DN. As part of the preparatory works for the implementation of the project, the cooperation from the Indonesian side is needed for the i) contract signing for the Consultant and the Supplier, ii) B/A (Banking Arrangement), iii) A/P (Authorization to Pay) among other formalities and others as required.

(3) Coordination with MTSD Project Phase IV

As stated earlier, coordination with the MTSD Phase IV Project shall be as follows:

- The facilities including steel towers at Selincing and Dumai will be constrcted by MTSD Project IV
- Equipment for communication links between Dumai and Selincing will be procured and installed by the MTSD Prject IV.
- The steel towers and equipment will be commonly used to maintain the data communication links between Dumai and Selincing both for the MTSD Project IV and this VTS Stage-2 Project.
- Equipment which is required to maintan data communication links between dumai and Tanjung Sair, and Selinicng and Simpang Ayam will be procured and installed by the VTS Stage-2 Project.
- Equipment house, rack and power supplie facilities will be provided by the MTSD Project IV..

Necessary strength of the steel tower at Selincing and Dumai shall assure the Indonesian side that antenae which are necessary to install additionall under the VTS Stage-2 Project at Selincing and Dumai. Furthermore, when implementing of the VTS Stage-2 Project, the construction of the steel towers and provisions of equipment and other facilities under the MTSD Project IV shall be completed.

(4) Demarcation of AIS with MEH Project

The AIS system for Hiyu Kecil and Tanjung Medang will be installed as part of the MEH project which planned the installations simultaneously. The AIS system for Hiyu Kecil and Tanjung Medang will be installed as part of the MEH project which planned the installations simultaneously. To ensure smooth implementation of the works, the Indonesian Government's cooperation is being sought for the coordination of the implementation between the two related projects. It was scheduled procurement works under MEH Project was started from June 2008,

however, since April 2008, the MEH Project was not processed since DGST and World Bank are currently under discussions about the Tender Method. According to the above mentioned situation, AIS system for Hiyu Kecil under the Stage-1 Project will be provided as original plan. In Stage-2 Project, if there are any progress in the MEH Project, AIS system for Tanjung Medang will be provided based on the original plan of the Project.

Chapter 3 Project Evaluation and Recommendations

Chapter 3 Project Evaluation and Recommendations

3-1 Project Effect

(1) Expected Benefits

The implementation of the Project is expected to generate the following benefits:

Table 3-1-1 Project Benefits

Current Problems	Countermeasure with the Project	Direct Effect and Extent of Improvement (Quantifiable Benefits)	Indirect Effect and Extent of Improvement
1. Monitoring of marine traffic in the Straits can not be conducted due to the absence of VTS System.	- Establishment of VTS System in Malacca Strait (2 VTS Sensor Stns, 1 VTS Sub-Center)	Traffic surveillance for objective area through VTS System is possible. ((i) Ship monitoring conditions through VTS operation, (ii) monitoring of aggregate traffic operation hours by VTS System)	The VTS System will contribute to the following: - ship navigation safety in the Strait - reducing the risks of marine accidents - increasing the rescue rates of lives and assets - decreasing illegal ships and activities in the Strait - law enforcement against illegal ships and activities in the Strait - improving of legal systems required for ship control and training of ship control operators
(i) Monitoring of ship movement in Malacca and Singapore Straits is not possible.	- Installation of Radar Scanner at Tg. Medang, and Multi-function consoles at VTS Sub-Center in Malacca Strait	Ship movement surveillance for monitoring area is possible through radar scanner and monitoring console. （Monitoring of number of ships）	
(ii) Ship information can not be monitored due to the absence of AIS	- Installation of AIS Base Station at VTS Sensor Stns in Malacca Strait and installation of AIS Server System at VTS Sub-Center	Receipt of ship information and ship monitoring passing through the surveillance area by AIS is possible. (Number of monitored ships received by AIS information)	
2. Service information particularly weather dissemination for safety of navigations is not possible.	- Installation of meteorological sensor at Tg. Medang VTS Sensor Stn in Malacca Strait - Installation of VHF marine radio system and AIS system	Dissemination of service information including meteorological data collection from VTS Sensor Stations to the ships is possible in the surveillance area through VHF and/or AIS communication. (Number of information disseminated)	
3. Sufficient communication is not possible for ship positions and other necessary information for rescue operations during the occurrence of accident	- Establishment of VTS System in Malacca Strait (Installation of Radar, Multi-function Console, VHF marine radio system)	Provisions of service information to related guard and rescue organizations for joint rescue cooperation in times of accidents. (Number of cooperation frequencies with the related guard and rescue organizations using VTS System)	

3-2 Recommendations

The VTS System is envisioned to contribute to the safety of navigation in the Straits. To achieve the objective, the following is strongly recommended.

(1) Operation and Maintenance

For maintenance of the equipment, it is highly recommended to make agreement with the VTS manufacturer(s) as described before. Especially the VTS system procured under this Project will be contributed for navigation safety in Malacca and Singapore Straits, therefore, any trouble shall be avoided as much as possible to conduct appropriate maintenances. Indonesia side shall recognize that any suspension of the VTS operations due to trouble will be induced not only threats of the navigation safety of the vessels in the Strants but also, i) loose the confidence of VTS operation skills of Indonesia, ii) criticism for the outcome by the Japanese Grant Aid cooperation. Indonesian side is strongly requested to continue their own effort to conduct proper operation and maintenance of the equipment including necessary budget allocations for "proper use of the equipment" in conformity with the policy of the Japan's Grant Aid Project.

In addition to the above, it can be pointed out the following items as subjects for proper operations of the VTS system.

1) Enhancing the basic understanding of operators and administrators for the operation of the VTS System,

2) Training of staffs for the efficient operation of the VTS System,

3) Training of staffs for inspection, trouble shooting and maintenance of the VTS System,

4) Establishment of operation and maintenance organization, preparation of operation and maintenance rules, manuals and, establishment of logistics system for fuel and consumer goods supply to each site for efficient VTS System operation,

5) Preparation of training program for operators and supervisors for the operation of the VTS System,

6) Establishment of pertinent laws for ship traffic in territorial waters of Indonesia,

7) Coordination with other related organization in Indonesia including BAKORKAMLA.

(2) Cooperation and coordination with the littoral States and International Organizations

Malacca and Singapore Straits are international straits and any duly foreign registered vessel can pass through the Straits. Therefore, VTS operations for the Straits are necessary to be supported with appropriate agreement and collaboration among the littoral states and International Organizations including the IMO. Until such time that an agreement has been reached, operations of the VTS System shall be limited only for the monitoring of the Straits at the Indonesian Side.

The main purpose of the VTS System to be provided by this Project is for the surveillance of small vessels crossing the TSS which are posing hazard to safety of traffic particularly for very large vessels navigating along the TSS main routes. Under this concept, for the time being, the operations of the VTS System will be limited only for the monitoring of the Straits at the Indonesian Side. However, Indonesia may soon be jointing its colleagues (Malaysia and Singapore) which have already been operating their own VTS. Considering the limited space in the Straits, the individual operation of VTS System will most likely create possible confusion in the surveillance of the Straits if joint operation is not pursued. The MEH project is also currently coordinating with littoral states and IMO in enhancing the safety navigations and environmental protections in the Straits.

Measures to enhance traffic safety, protection of marine environment in support to the search and rescue missions and oil pollution protection programs are topics of discussions in Tripartite Technical Experts Group (TTEG) meeting by the littoral states. Indonesian Government's initiative to promote effective VTS System operations through appropriate tripartite discussions, coordination and cooperation are highly desirable for concurrence by International Organizations.