No.

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

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR DEVELOPMENT
OF
VESSEL TRAFFIC SERVICE
IN MALACCA AND SINGAPORE STRAITS
IN
INDONESIA

February 2008

JAPAN INTERNATIONAL COOPERATION AGENCY

PACIFIC CONSULTANTS INTERNATIONAL

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 a basic design study on the The Project for Development of Vessel Traffic Service in Malacca and Singapore Straits and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Indonesia a study team from February 12 to March 10, 2007, April 24 to May 23, 2007 and July 26 to September 1, 2007.

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. Then, a mission was sent to Indonesia in order to discuss a draft basic design, 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.

February, 2008

Masafumi Kuroki
Vice-President
Japan International Cooperation Agency

February, 2008

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Development of Vessel Traffic Service in Malacca and Singapore Straits in the Republic of Indonesia.

This study was conducted by the Consortium of Pacific Consultants International and Japan Aids to Navigation Association, under a contract to JICA, during the period from January 2007 to February 2008. 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,
Basic Design Study Team on
The Project for Development of
Vessel Traffic Service in
Malacca and Singapore Straits
The Consortium of
Pacific Consultants International 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 cargo 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 in 1998. The STRAITREP calls for ships to report to the Vessel Traffic Service (VTS) Center upon entry to the operational area of responsibility of either Malaysia or Singapore.

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 Protections 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 series of site inspections and discussions with the Directorate General of Sea Transportation (DGST) of the Ministry of Transportation, and other concerned agencies from February 12 to March 10, 2007, April 24 to May 23, 2007 and July 26 to September 1, 2007, for the assessment of site conditions and clarification and verification of the intent of the request of the Indonesian Government. Based on the result of the verification on the scope of the request, the JICA Study Team conducted the site surveys and investigation for topography, soil, traffic, and maintenance and administration system. Likewise, equipment and facility plan studies were conducted. After the team returned to Japan, the basic design study was prepared and complied with the draft basic design report. From December 9 to December 14, 2007, the basic design explanation team was dispatched to Indonesia to explain the draft basic design report and the contents of the Project.

2 Outline of the Study Results and Contents of the Project

Through the study, the components of the Project were selected based on the following premises:

(1) Scope of the Project

1) Basic Design Study was carried out for all sites as listed hereunder.

2) Due to cost increase, the Project will be implemented in two stages as described hereunder.

State-1:

- Hiyu Kecil VTS Sensor Station
- Takong Kecil VTS Sensor Station
- Batu Ampar VTS Center and VTS Sensor Station
- Tanjung Berakit VTS Sensor Station

State-2:

- Tanjung Medang VTS Sensor Station
- Tanjung Parit VTS Sensor Station
- Dumai VTS Sub-Center
- Bengkalis VTS Sub-Center

However, the necessity for establishing a VTS Sensor Station in Tanjung Parit has yet to be clarified. Currently, relaying of data to Dumai from Tanjung Parit by multiplex communication links is not possible yet due to the absence of Repeater Stations. For this reason, a VTS Sub-Center is planned for Bengkalis for the monitoring of data from Tanjung Parit. Further studies and revisions will have to be made on the matter for possible inclusion in the scope of works of Stage-2.

(2) Outline of the Basic Design

The table below shows the outline of the basic design study.

1) Main Equipment to be Procured

Equipment	Unit	Quantity	Stage-1				Stage-2			
			1	2	3	4	5	6	7	8
			Hiyu Kecil	Takong Kecil	Batu Ampar	Tanjung Berakit	Tanjung Medang	Tanjung Parit	Bengkalis	Dumai
Radar System	Unit	6	1	1	1	1	1	1		
VHF Marine Radio System	Unit	5	1		1	1	1	1		
AIS Base Station System	Unit	5	1		1	1	1	1		
CCTV Camera System	Unit	2		1			1			
Meteorological Sensor Unit	Unit	3	1			1	1			
Multi-function Console with VHF Radio Communication Unit	Unit	10			6				2	2
Tracking System	Unit	3			1				1	1
Data Base for Vessel Information	Unit	3			1				1	1
AIS Server System (AIS System)	Unit	3			1				1	1
CCTV Video Display Equipment (CCTV System)	Unit	2			1					1
Meteorological Monitor Console	Unit	2			1					1
Record and Playback System for Vessel Traffic	Unit	3			1				1	1
Resource Management System	Unit	3			1				1	1
FM Transmitting Devices	Unit	2			1					1
Multiplex Radio Equipment (Data Communication System)	Unit	10	1	2	2	1	1	1	1	1

2) Scale of the Facilities

a Buildings

(Stage-1)

Building	Structure Type	Function	Total Floor Area
VTS Center (Batu Ampar)	Reinforced Concrete, Four stories high	Operation room, Engineer room, UPS room, Staff room, meeting room, pump room, napping room, toilet etc.	414.00m^2
Equipment Building (Hiyu Kecil, Takong Keil, Tanjung Berakit)	Reinforced concrete, one story	Machine room, UPS room	42.25m^2
Generator House (Type A) (Hiyu Kecil, Takong Kecil, Tanjung Berakit)	Reinforced concrete, one story	Generator room	55.00m^2

(Stage-2)

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

Stage-1:

- Hiyu Kecili : 38m
- Takong Kecil : 49m
- Batu Ampar : 40m
- Tanjung Berakit : 73m

Stage-2

- Tanjung Medang : 106m
- Tanjung Parit : 78m
- Bengkalis : 75m
- Dumai : 106m

3 Implementation Schedule and Project Cost

The implementation schedule of the Project is about 33 months for detailed designs, construction of building facilities and equipment procurement including manufacturing, transportation and installation for Stage-1 and Stage-2. The cost of the Project provided to the Indonesian Government is roughly estimated at Rp. 263 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, AIS and/or FM radio communication 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 enhancement 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 and communications among the littoral states 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.

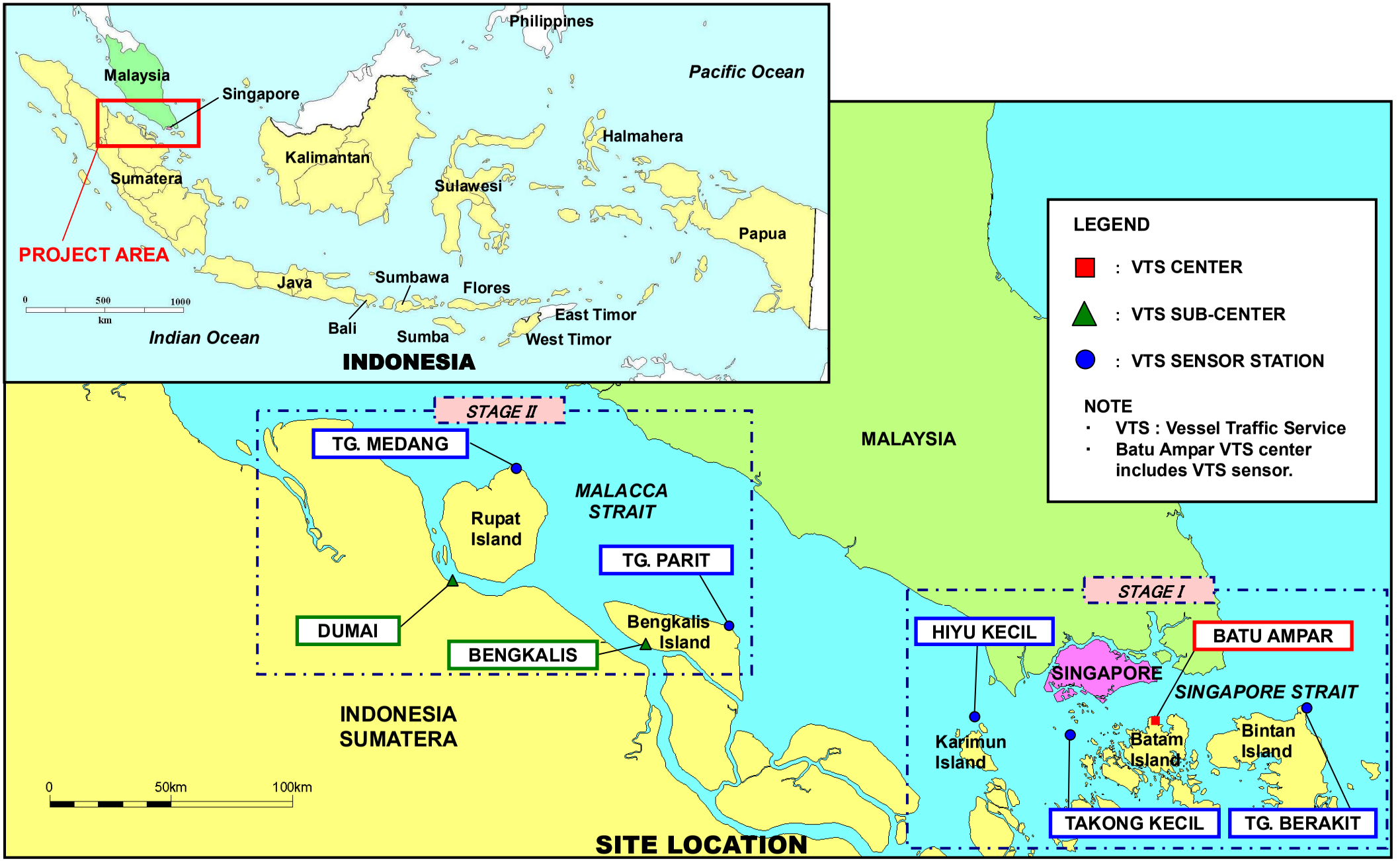
2) Cooperation and coordination with the littoral States and International Organizations

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


Philippines
Pacific Ocean
Malaysia
Singapore
Halmahera
Kalimantan
Sumatera
Sulawesi
Papua
PROJECT AREA
Java
Sumbawa
Flores
East Timor
Bali
Sumba
West Timor
Indian Ocean
INDONESIA
0 500 1000
km
LEGEND
: VTS CENTER
: VTS SUB-CENTER
: VTS SENSOR STATION
NOTE
· VTS : Vessel Traffic Service
· Batu Ampar VTS center includes VTS sensor.
STAGE II
TG. MEDANG
MALACCA STRAIT
Rupat Island
TG. PARIT
DUMAI
Bengkalis Island
BENGKALIS
INDONESIA SUMATERA
MALAYSIA
STAGE I
HIYU KECIL
BATU AMPAR
SINGAPORE
SINGAPORE STRAIT
Karimun Island
Batam Island
Bintan Island
TAKONG KECIL
TG. BERAKIT
0 50km 100km
SITE LOCATION

Batu Ampar VTS Center

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
	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

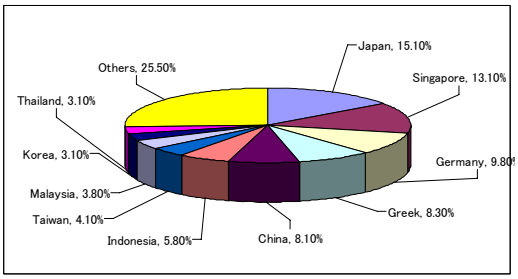
Table 1-1-1 shows the volume of traffic which passed through the TSS for the period covering 2001 to 2006. As can be seen, in 2006 more than 60,000 ships have passed through the TSS which is about 180 ships/day average. Tanker vessels and container ships occupied about 30 % respectively of the total traffic volume.

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

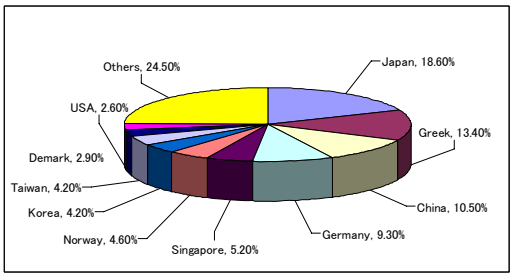
Type of Ships	2,001	2,002	2,003	2,004	2,005	2,006
VLCC	3,303	3,301	3,487	3,477	3,788	3,851
Other Tankers	14,276	14,591	15,667	16,403	14,759	14,784
LNG/LPG Tankers	3,086	3,141	3,277	3,343	3,099	3,297
Sub-total of Tankers	20,665	21,033	22,431	23,223	21,646	21,932
Container Ships	20,101	20,091	19,575	20,187	20,818	22,615
Others	18,548	18,910	20,328	20,226	20,157	21,102
Total Nuber of Ships (100%)	59,314	60,034	62,334	63,636	62,621	65,649
Average Ships per Day	163	164	171	174	172	180
Rate of Tanker	34.8%	35.0%	36.0%	36.5%	34.6%	33.4%
Rate of Container Ships	33.9%	33.5%	31.4%	31.7%	33.2%	34.4%

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

In 2006, the Ministry of Land, Infrastructure, Transport 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. 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.

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 and Makassar 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 of the Study Team. The locations are depicted in Fig. 1-2-1 hereafter

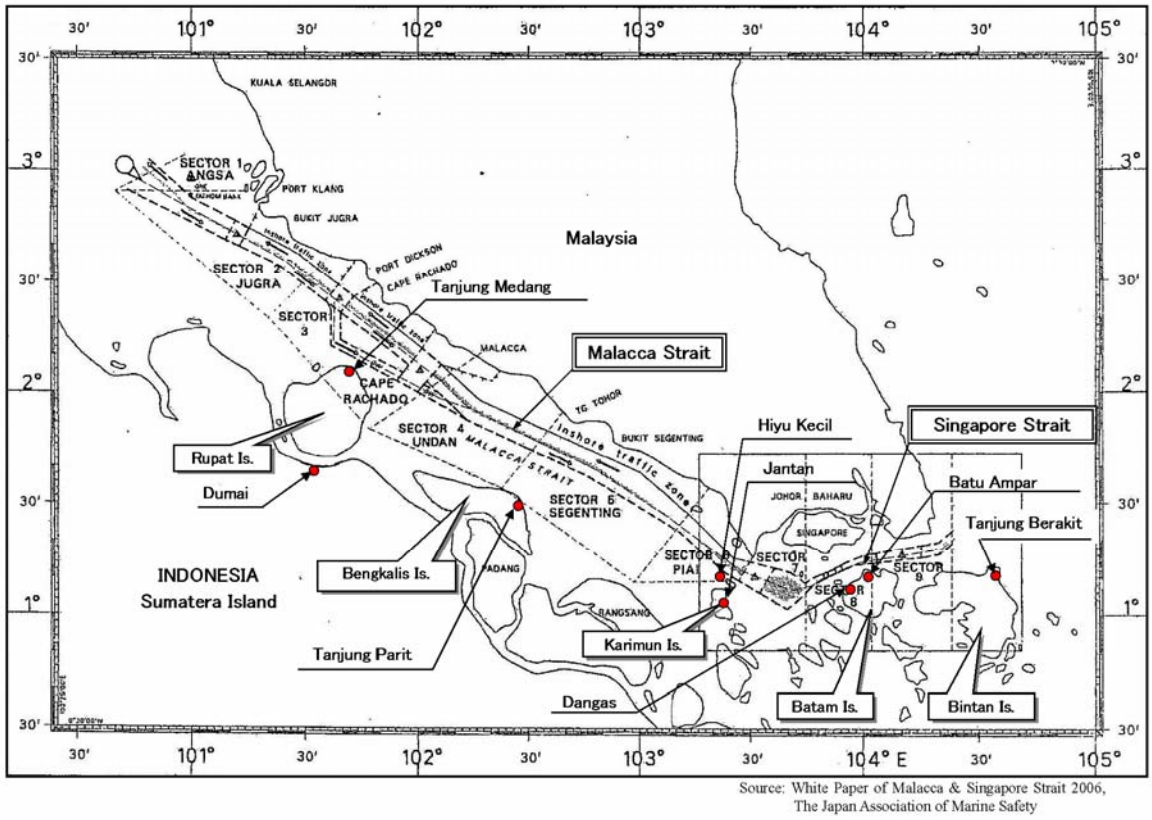
1) VTS Sensor Stations[2]:

(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



Source: White Paper of Malacca & Singapore Strait 2006, The Japan Association of Marine Safety

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

[2] These five sites are described as "VTS" in the "Report on Discussion signed on February 19, 2007". Sensor equipment such as radar scanner, AIS (Automatic Identification System) and others may be installed as additional for these sites, while monitoring operations will be conducted in other sites. These sites are defined as "VTS Sensor Stations" in this Report. Monitoring sites are termed in this Report as "VTS Center" and/or "VTS Sub-Center".

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 technical assistance, and sunken ships and shoals were discovered. 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	2005 (Completed)	Disaster Prevention Ship Project
	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	2006	Provision of Patrol Ships for Anti-Piracy, Anti-Maritime Terrorism, and Non-Proliferation Project
	2003 to 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) Hiyu Kecil

Hiyu Kecil Island is about 6.5 air km north of Karimun Besar Island with a size of about 250m wide in the north-south direction and about 100m wide in the east west direction. The highest peak is approx. 30 m above sea level with rocky topography. A lighthouse constructed by Netherlands in 1888 exists in the Island and is being operated by Directorate of Navigation. Other facilities include a generator house, watch tower of the Navy for surveillance of the Strait, houses for employees of DN, water reservoir and others. Electrical power for the operation of the lighthouse is supplied by generators.

The island is accessible only by sea and has no infrastructure development except for small boats' jetty for the handling of Directorate of Navigation Staffs' goods and basic necessity. Based on ocular inspection, the jetty may not be capable of accommodating large vessels for construction purposes. Movements in the island are possible only by foot. Electrical power for the operation of the light house is supplied by diesel generators owned and operated by DN due to the absence of PLN power supply. Public water supply facilities are likewise not available. As such, rain water is collected for the daily necessities. There is no land line but mobile phone is usable.

2) Takong Kecil

The island is located in Phillip Channel (Selat Phillip), one of the most treacherous spots in the Straits for ship navigations. The island has a circumference of about 350m with an elevation of approx. 16m above sea level. A lighthouse operated by DN exists in the Island. There are no inhabitants except for the employees and families of the lighthouse staffs. Fishermen living in the vicinity of Takong Kecil which are using the Island as base of their fishing expeditions built about 10 shanties in the north-west corner of the island. Access to Takong Kecil is available only by sea and has no infrastructure development. The existing jetty is constructed of reinforced concrete for small boats for the handling of basic necessities for DN employees in the island. As stated earlier, the jetty may not be capable of accommodating large vessels for construction purposes. Infrastructure conditions in the island are almost similar with Hiyu Kecil.

3) Batu Ampar

The Coastal Radio Station is located at Batu Ampar. A radio building, generator house, substation, 3 sets of steel tower for VHF communications and employees' quarters exist in the premises of the station. The proposed VTS Center will be located inside the premises of the Radio Station. The road conditions are relatively good except for the access to/from the national road which is narrow and close to residential houses thus making it unsafe for construction use. PLN provides commercial power and water supply is provided by PDAM. Power supply is relatively stable and power failure seldom occurs.

4) Tanjung Berakit

A lighthouse operated by DN is located in Tanjung Berakit. The station is provided with a generator house, radio communication room, warehouse, living quarters, water reservoir; among others. Road and inland transportation is available but the road is rather narrow. The existing lighthouse which is constructed of steel is corroded. Electricity is supplied by generator but during the site inspections in February 2007, commercial power cable installation have been completed in a village near the proposed site. Water supply on the other hand is not yet developed.

5) 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.

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.

7) Bengkalis

The Coastal Radio Station which is operated by DN is located in a coast in Bengkalis City. Office buildings and living quarters for DN's employees are located inside the site premises. Commercial power is supplied by PLN at every other day. For this reason, electrical supply for the operation of the station is augmented with generator. Access to the site is relatively good.

8) 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.

1-4-2 Natural Conditions

Indonesia is the world's largest archipelago with more than 18,000 islands. Its total land area at 189.08 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 1300 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 ^{o}C.

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 basic design studies. Soil profiles for each site based on soil investigation, laboratory test and SPT (Standard Penetration Test) are summarized as follows:

(1) Hiyu Kecil

The island appears to be resting on bedrock as evident by the exposed weathered rocks. Laboratory test results of specimens for compressive strength are used for the detail designs.

(2) Takong Kecil

Clay with mixture of gravely sand stratum with N-value of less than 10 is found from the ground surface up to about 4m depth. Clayey layer with N-value of about 15 is found at about 5m to 11m depths except for the 9m depth. Gravely layer with N-value of more than 30 is found at 12m depth and more than 50 at 14m depth. Softer layer with N-value of about 20 appears to exist at 15m to 16m depths and thereafter increases to 50. The stratum with N-value of more than 50 may be considered as the bearing layer for detail design purposes.

(3) Batu Ampar

Soft silty sand layer with N-value of less than 10 is found from the surface to about 5m depth.

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

The layer with N-value of more than 10 also exists from 5m to 10m depth. Gravely layer with N-value of more than 50 exists at about 9m to 10m depths.

(4) Tanjung Berakit

Clay layer exist from a depth of 1m up to 11m depth with varying N-values of about 20 to 30. The N-value is about 40 from 12m depth. The N-value is more than 50 from 16m depth and below.

(5) Tanjung Medang

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.

(6) Tanjung Parit

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) Bengkalis

Thick soft clay layer with N-value of less than 10 exists from the surface up to a depth of about 41m depth. N-value is increased gradually from 41m and clayey layer with N- value of around 30 is found at 52m depth.

(8) Dumai

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.

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.

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 identified in this Study effort.

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 locations. 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. The establishment of VTS System for Malacca and Singapore Straits is accorded with high priority and hence is considered as a vital project of the Indonesian Government.

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.

(2) Outline of the Project

To accomplish the objective, six VTS Sensor Stations (4 in Singapore Strait and 2 in Malacca Strait), one VTS Center and one VTS Sub-Center are planned for this Project. The VTS System will comprise of radar images, AIS information and other data from each of the VTS Sensor Stations for relay to the VTS Center and/or VTS Sub-Centers through multiplex links for intensive monitoring. Traffic monitoring in the Malacca and Singapore Straits are currently being conducted by nine radar stations 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 can not be monitored by the existing VTS System. The information on vessel movement using the VTS System to be provided for this Project is expected to contribute to enhance safety of traffic in the Malacca and Singapore Straits.

The project sites, system configurations, equipment procurement and construction of the facilities plans are described hereafter.

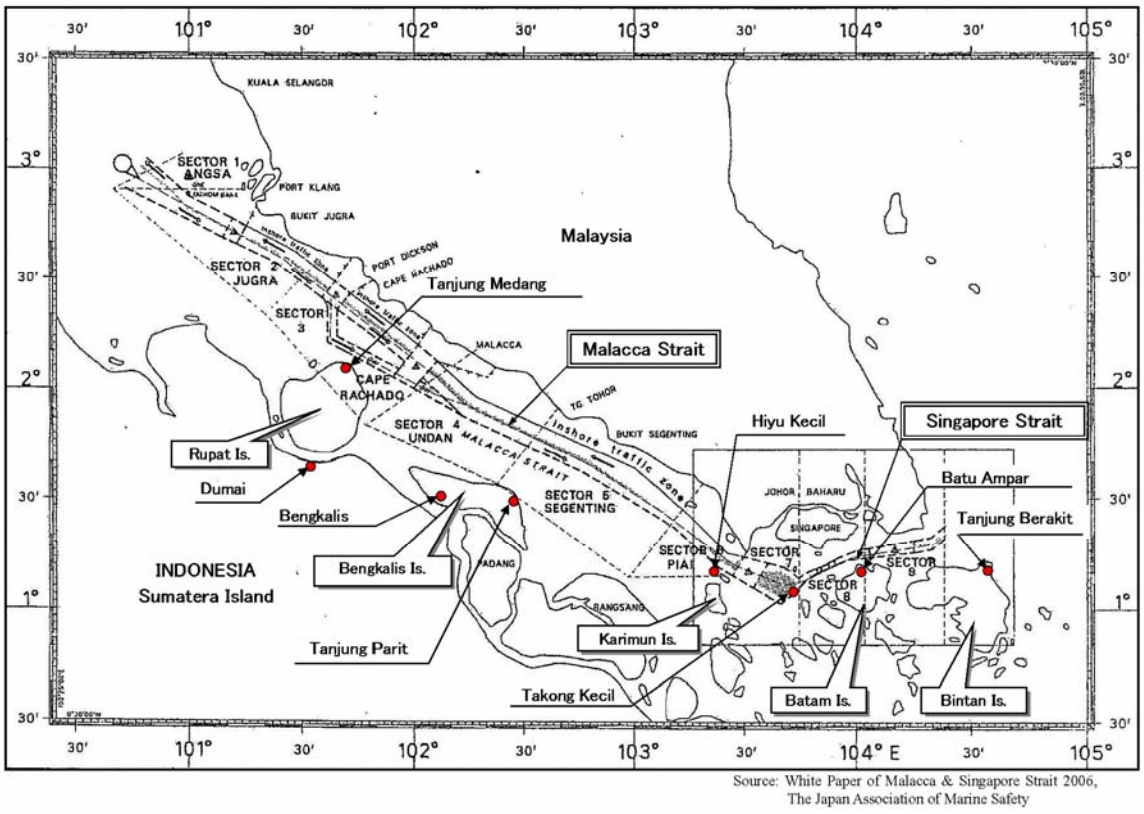
1) Project Sites

In response to the application of the Indonesian Government, a Basic Design Study Team (hereinafter called “the Study Team”) was deployed 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 the Project. Fig. 2-1-1 hereunder shows the site locations.

a. Candidate sites for the establishment of VTS Sensor Stations: The six candidate sites for the establishment of Stations at, Hiyu Kecil, Takong Kecil, Batu Ampar, Tanjung Berakit, Tanjung Medang and Tanjung Parit.

b. One VTS Center to be located in Batu Ampar

c. Two VTS Sub-Centers to be located in Dumai and Bengkalis



Source: White Paper of Malacca & Singapore Strait 2006, The Japan Association of Marine Safety

Fig. 2-1-1 Project Sites

2) VTS System Plan

Radar scanners will be installed in four radar stations along the Singapore Strait in Hiyu Kecil, Takong Kecil, Batu Ampar and Tanjung Berakit. Data to be obtained from these radar stations will be transmitted to the VTS Center in Batu Ampar for intensive monitoring. A VTS Center and VTS Sensor Station will be provided in Batu Ampar.

Radar scanners will be installed along Malacca Strait in Tanjung Medang and Tanjung Parit. Data to be obtained from these Sensor Stations were initially planned for transmission to Dumai VTS Sub-Center for monitoring. However, unfortunately, due to unavailability of appropriate sites for Repeater Stations, the multiplex link between Tanjung Parit and Dumai will not be possible. For this reason, the establishment of a VTS Sub-Center in Bengkalis was planned alternatively for the monitoring of data from

Tanjung Parit. Data transmission from Bengkalis to Dumai could be realized in the future when the Indonesian Government establishes relay station(s) in appropriate site(s).

While data transfer through satellite circuit is possible as a remedial solution with much less initial investment cost, the Indonesian Government decided the use of multiplex data transfer because the usage fee of satellite circuit is currently expensive.

Fig. 2-1-2 shows the VTS System configuration. The system details including the equipment to be installed are described hereafter.

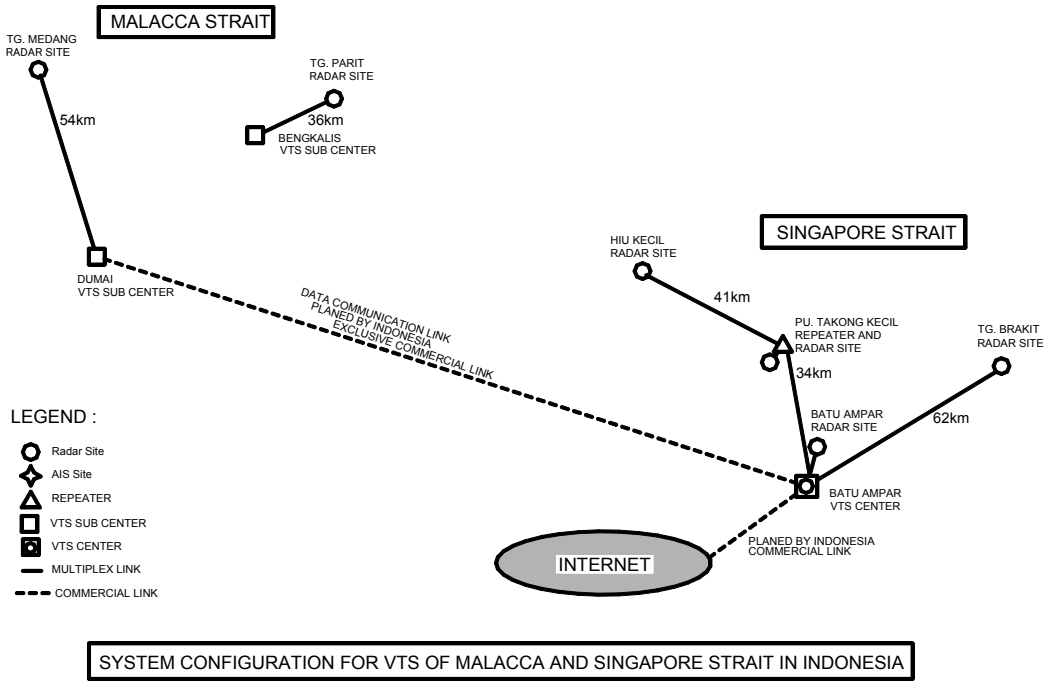


Fig. 2-1-2 VTS System Concept

(3) Outline of the Equipment and Facilities to be Provided

The list of equipment and facilities for the proposed VTS System are summarized in Tables 2-1-1 and 2-1-2 below.

Table 2-1-1 Summary of Equipment

Equipment	Unit	Quantity	Stage-1				Stage-2			
			1	2	3	4	5	6	7	8
			Hiyu Kecil	Takong Kecil	Batu Ampar	Tanjung Berakit	Tanjung Medang	Tanjung Parit	Bengkalis	Dumai
Radar System	Set	6	1	1	1	1	1	1		
VHF Marine Radio System	Set	5	1		1	1	1	1		
AIS Base Station System (AIS System)	Set	5	1		1	1	1	1		
CCTV Camera Equipment (CCTV System)	Set	2		1			1			
Meteorological Sensor Unit with Data Logger	Set	3	1			1	1			
Tracking System	Set	3			1				1	1
Multi-function Console with VHF Radio Communication Unit	Set	10			6				2	2
Printer System (Monochrome and Color)	Set	3			1				1	1
Data Base for Vessel Information	Set	3			1				1	1
AIS Server System (AIS System)	Set	3			1				1	1
CCTV Video Display Equipment (CCTV System)	Set	2			1					1
Meteorological Monitor Console	Set	2			1					1
Record and Playback System for Vessel Traffic	Set	3			1				1	1
Resource Management System	Set	3			1				1	1
FM Transmitting Devices	Set	2			1					1
Multiplex Radio Equipment (Data Communication System)	Set	10	1	2	2	1	1	1	1	1
Web Server System	Set				1					
Connecting Devices for Internet Communication for Dumai-Batu Ampar	Set	2			1					1
Equipment Desk and Others	Set	8	1	1	1	1	1	1	1	1
Takong Kecil Light House	Set	1		1						
Tanjung Berakit Light House	Set	1				1				
Air Conditioner for Radar Sensor Station	Set	10	2	2		2	2	2		
Diesel Engine Generator	Set	5	1	1		1	1	1		
	Kva & Unit		15 KVA x 4	15 KVA x 4		15 KVA x 4	15 KVA x 4	15 KVA x 4		

Table 2-1-2 Summary of Facilities

Facilities	Unit	Quantity	Stage-1				Stage-2			
			1	2	3	4	5	6	7	8
			Hiyu Kecil	Takong Kecil	Batu Ampar	Tanjung Berakit	Tanjung Medang	Tanjung Parit	Bengkalis	Dumai
VTS Center	Unit	1			1					
	m^2	414			414.00					
VTS Sub-Center	Unit	1								1
	m^2	207.4								207.36
Equipment Building	Unit	5	1	1		1	1	1		
	m^2	211.3	42.25	42.25		42.25	42.25	42.25		
Generator Building	Unit	7	1	1		1	1	1	1	1
	m^2	365	55.00	55.00		55.00	55.00	55.00	45.00	45.00
Air Conditioners (for VTS Center and Sub-Center)	Unit	3			1				1	1
Diesel Engine Generator (Emergency Backup)	Unit	3			1				1	1
	Kva, Units				60 KVA x 1				15 KVA x 2	45 KVA x 1
Fuel Tank (Outdoor)	Unit	8	1	1	1	1	1	1	1	1
	m^3		6.0	6.0	2.0	6.0	6.0	6.0	2.0	2.0
Fuel Supply System	Unit	2	1	1						
	m^3		1.0	1.0						
Water Reservoir	Set	2			1					1
	m^3				1.5					1.0
Septic Tank	Set	2			1					1
	m^3				8.0					4.0
Steel Tower for Radar and Communications	Unit	8	1	1	1	1	1	1	1	1
	m		38.00	49.00	30.00	73.00	106.00	78.00	75.00	106.00

2-2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

2-2-1-1 Basic Concept

(1) Scope of Assistance

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 along 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 identified by providing three VTS Sensor Stations along Singapore Strait to be located in Hiyu Kecil, Takong Kecil and Batu Ampar after thorough discussions with concerned Indonesian Officials during the 2nd site visit of the Study Team. The Indonesian Side, however, strongly requested for the implementation of all the proposed sites, and for this reason no agreement was reached on the scope of cooperation to be made at this instant. Considering however the request of the Indonesian Government, relevant agencies of the Japanese side conducted several discussions to find ways and means to consider the other sites (other than the aforesaid three sites in Singapore Strait) and based on this consideration, additional vessel traffic survey were carried out for Tanjung Berakit and Tanjung Parit to clarify the necessity of establishing VTS Sensor Stations for two sites.

Site evaluations have been conducted in the following manner. Firstly, based on the request by the Indonesian Government, suitable sites were selected for possible Japanese Grant Aid considering land ownership, suitability of the site, absence of obstructions. Secondly, a study was conducted to determine the relations between the objective vessels and the available surveillance area by radar scanner to be provided with VTS in this project. Thirdly, a study was made on the importance/necessity of the location as VTS Sensor Station considering the physical conditions in the area and traffic conditions. The details of the studies are described hereunder.

1) Evaluation of the sites as VTS Sensor and Repeater Stations

The evaluation was conducted based on the following procedures.

a. Determination of the candidate sites through maps coupled with discussions

The sites requested by the Indonesian Government to be provided with VTS, are firstly subjected to examination by use of topographic maps and sea charts. Seven proposed sites are considered five of which are VTS Sensor Stations, one Repeater Station and a VTS Center and VTS Sub-Center. The fourteen candidate sites were selected initially based on available maps and sea charts and further confirmed through site surveys. The candidate sites for which site surveys were carried out are summarized in Table 2-2-1 below while the locations are indicated in Fig. 2-2-1.

Table 2-2-1 List of Candidate Sites

Location	Planned Facilities	Existing Facilities	Remarks
Tg. Medang	VTS Sensor Station	Lighthouse	GOI Request
Morong	Repeater Station	PELINDO Pilot Station	Additional map survey
Dumai	VTS Sub-Center	Office of Navigation District	GOI Request
Bengkalis	Repeater Station	Coastal Radio Station	Additional map survey
Tg. Parit	VTS Sensor Station	Lighthouse	GOI Request
Tg. Berakit	VTS Sensor Station	Lighthouse	GOI Request
Tg. Tondang	VTS Sensor Station or Repeater Station	Beacon	Additional map survey
Batu Ampar	VTS Center and Sensor Station	Coastal Radio Station	GOI Request
Dangas	Repeater Station	PT. Telkom Repeater Station	GOI Request
Dangas	VTS Sensor Station	Custom Radar Station	Existing at site*)
Bukit Tumiyang	Repeater Station	PT. Telkom Repeater Station	Considered through discussions
Jantan	VTS Sensor Station	Custom Radar Station	GOI Request
Bukit Pongkar	Repeater Station	PT. Telkom Repeater Station	Considered through discussions
Hiyu Kecil	VTS Sensor Station	Lighthouse	GOI Request

*) Not operational Customs owned Radar Sensor Station was found to exist during the site visit. Survey for possible additional sites pursuant to GOI request was conducted.

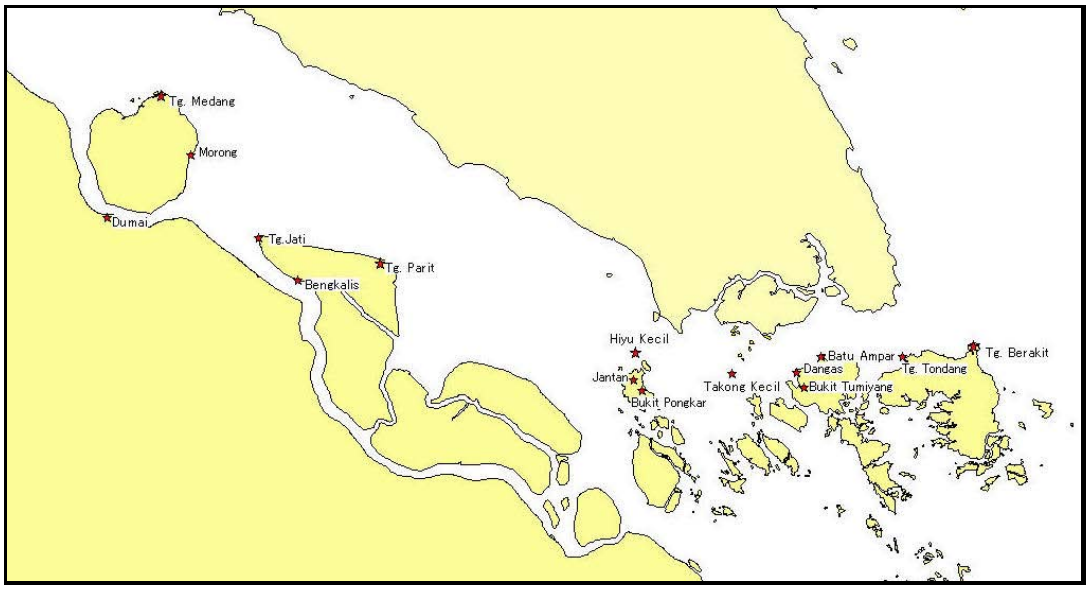


Fig. 2-2-1 Location of Candidate Sites

b. Site evaluations

The site survey focus on suitability of the proposed site, land space availability for facility construction, accessibility to the sites, availability of electrical power and water supply facilities, land ownership among other criteria as summarized in the table hereunder. Based on the survey results, the suitability of each site for construction of VTS Sensor Stations, VTS Center or Sub-Center and Repeater Stations was examined and evaluated. The survey and evaluation results are summarized in Tables 2-2-2 to 2-2-4.

Table 2-2-2 Evaluation of Candidate Sites for VTS Sensor Stations

Site	Suitability as Radar Sensor Station	Construction Aspects	Land Ownership	Prospect
Tg. Medang	Good	Good	OK	High
Tg. Parit	Good	Good	OK	High
Tg. Berakit	Good	Good	OK	High
Tg. Tondang	Good	No Space	Private Company	Low
Batu Ampar	Good (yet to be studied further)	Good	OK	High
Dangas	Good	Good	Customs	Low
Jantan	Good	Good (subject to further studies)	Customs	Low
Hiyu Kecil	Good	Fair (Limited Space)	OK	High

Table 2-2-3 Evaluation of Candidate Sites for Repeater Stations

Site	Suitability as Repeater Station	Construction Aspects	Land Ownership	Prospect
Morong	Good	Limited Space	PELINDO I	Low
Bengkalis	Good	Good	OK	High
Tg. Tondang	For further studies	No Space	Private company	Low
Dangas	For further studies	for further studies	Telkom	Low
Bukit Tumiyang	For further studies	for further studies	Telkom	Low
Bukit Pongkar	For further studies	for further studies	Telkom	Low

Table 2-2-4 Evaluation of Candidate Sites for VTS Center/Sub-Center

Site	Conditions of Infrastructure	Construction Aspects	Land Ownership	Prospect
Batu Ampar	Good	Good	OK	High
Dumai	Good	Good	OK	High
Bengkalis**)	Good	Good (Available to use existing facilities)	OK	High

**) When the above survey was conducted, Bengkalis was the only site considered for Repeater Station. However, based on the further studies, it was found that the multiplex links are needed to be able to link between Tanjung Parit and Dumai. Therefore, Bengkalis was considered as candidate site for a VTS Sub-Center.

Takong Kecil was not yet included during the site survey conducted for the first visit. This site was requested to be included by the counterpart as Repeater Station between Hiyu Kecil and Batu Ampar as replacement of Bukit Pongkar originally planned as Repeater Station. Based on the site survey and discussion among the Study team, the counterpart decided to delete Bukit Pongkar in Karimun island as a site for Repeater Station, considering that ownership of the land belong to others. Based on the result of the site survey and studies, Takong Kecil was chosen as a site for VTS Sensor and Repeater Station.

c. Candidate sites

On the basis of the foregoing study, the list of candidate sites identified for the establishment of VTS System is listed as follows:

1. VTS Sensor Stations:

   Five sites will be located in Tanjung Berakit, Batu Ampar, Hiyu Kecil, Tanjung Medang, Tanjung Parit, and Batu Ampar in accordance with the request, and Takon Kecil.

2. Repeater Stations:

   Bengkalis, Takong Kecil

3. VTS Center:

   Batu Ampar as request

4. VTS Sub-Center:

   Dumai as request and Bengkalis

2) Radar Specifications, Objective Vessels and Target Area for Surveillance

The objective of the VTS System under this project is to monitor the crossings of small

vessels of the TSS to enhance navigation safety in the Straits. Small vessels about 100 GT average comprising of international and domestic passenger shipping lines traversing between Dumai and Malacca, Bengkalis and Muar, Tanjung Pinang and Singapore, and Batam and Singapore; crossing the TSS regularly and frequently are the primary targets of the surveillance system. Therefore, it was selected 100 GT steel vessels shall be objective vessels to determination of the radar specifications. Common radars recommended by IALA (International Association of Marine Aids to Navigation), available visible radius against the 100 GT steel vessels are about 15 nautical miles (about 27.8 km). Therefore, available surveillance area by the radar scanner is selected 15 nautical mile radius.

The relations between the available surveillance area at each VTS Sensor Station and the shipping routes of the passenger lines are as shown in Fig. 2-2-2. Further studies are conducted based on the Fig. 2-2-2.

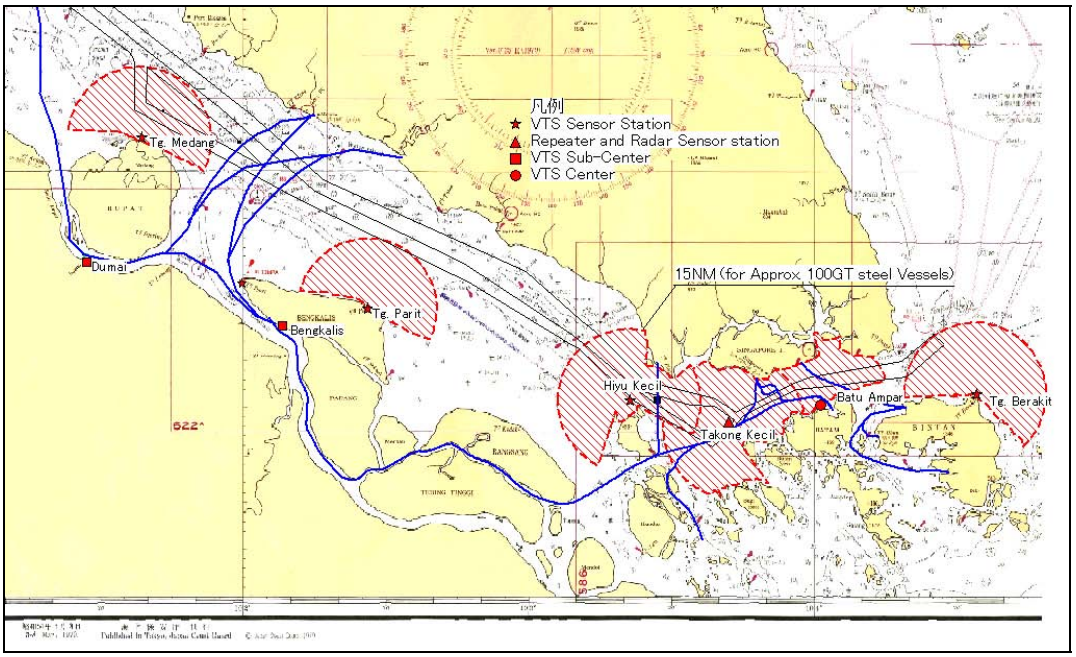


Fig. 2-2-2 VTS Radar System Radius of Operation

3) Site Conditions and its Importance

To establish the scope of the Project, the study considered the importance of each site

based on the evaluation results as listed above. The results are summarized as follows:

a. Three sites in Singapore Strait side, i.e., Hiyu Kecil, Batu Ampar and Takon Kecil

The traffic between Hiyu Kecil and Batu Ampar is known as the most congested in the Straits. Many types of vessels cross the TSS frequently including international passenger shipping lines between Singapore/Malaysia and Indonesia as shown in Fig.2-2-2. Compared with Malacca Strait in the north-east area of Hiyu Kecil, the geography in the Singapore Strait is narrow and shallow particularly in the vicinity of Phillip Channel (Selat Phillip) in the south-east side of Takong Kecil to Batu Berhanti which is the most treacherous part of the navigation channels in Malacca and Singapore Straits. For this reason, the provisions of these sites with VTS Sensor Stations are considered as essential for the enhancement of traffic safety.

A Deep Water (DW) Route is available in the eastern route of Phillip Channel for the access of VLCC (200,000 DWT and above tankers) and deep draft vessels. But the narrowest part of the Channel is located in and around the vicinity of Takong Kecil Island. DGST envisioned to establish a Relay Station thereat, however, if the radar scanner can be provided at Takong Kecil, surveillance of this very important water area from Hiyu Kecil to Batu Ampar can be available. Therefore, it was determined the Takong Kecil is selected as the VTS Sensor Station.

b. Tanjung Medang

Compared with the three sites in the Singapore side of the Strait, the volume of vessels passing through the TSS near Tanjung Medang, Tanjung Parit and Tanjung Berakit is light.

The area between Tanjung Medang and Tanjung Tuan in Malaysia, however, is the narrowest part of the Malacca Strait, and the DW Route for deep draft vessels and VLCCs, which is located eastward of the TSS is dotted with shoals particularly along the offshore of Tanjung Tuan. Moreover, the location of the DW Route is only three miles from Tanjung Medang. Installation of a VTS Sensor Station in Tanjung Medang, will merit for the monitoring of the DW Route thereat. Taking these advantages into account, the installation of a radar scanner at Tanjung Medang was determined necessary.

c. Tanjung Berakit

The vessel traffic survey[4] (ocular daylight traffic survey) conducted for Tanjung Berakit shows that about 5 to 10 vessels larger than 10,000 DWT are passing outside the TSS zone per day. The area which is near the Horsburgh Lighthouse is the entrance/exit to and from the TSS in the Singapore Strait. Based on this consideration, the site is deemed as an important location for the monitoring of ship movements in the area.

d. Tanjung Parit

The ocular daylight traffic survey carried out for Tanjung Parit shows that few vessels larger than 100 GT and many wooden fishing boats possibly less than 20 GT are plying in the area. According to these survey results, it is considered that the numbers of the ships larger than 100 GT which are the target ships for surveillance are the minimum near Tanjung Parit among the entire candidate VTS Sensor Stations. As stated earlier, multiplex link between Tanjung Parit and Dumai is not possible since appropriate Repeater Station(s) could not be obtained. Taking into account of these conditions, it is difficult to find the reasons for necessity of the VTS Sensor Stations at Tanjung Parit.

4) Scope of the Cooperation

On the basis of the foregoing studies, the Project will be implemented as follows:

a. Basic design study has been carried out for all eight sites of the VTS System.

b. The project however will be implemented in two stages as described hereunder due to the increase in cost.

1. Stage-1:

- Hiyu Kecil VTS Sensor Station

[4] Vessel traffic survey results are in Appendix 5-4.

- Takong Kecil VTS Sensor Station
- Batu Ampar VTS Center including VTS Sensor Station
- Tanjung Berakit VTS Sensor Station

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

c. Basis for the implementation of Tanjung Parit and Bengkalis in Stage-2 are as follows:

1. The rationale of establishing a VTS Sensor Station at Tanjung Parit, considering the light vessel traffic survey results thereat,

2. Preparation of a realistic schedule for the establishment of radar image transmitting facilities from Tanjung Parit to Dumai VTS Sub-Center.

The Japanese side has not fully recognized the rationale of establishing a VTS Sensor Station in Tanjung Parit unless it is substantiated with the aforesaid grounds. As mentioned earlier, transmission of radar image from Tanjung Medang to Dumai is still not currently possible to enable effective monitoring of Malacca Strait at Dumai. In light of the two foregoing issues, supporting justifications will be needed for the proposed establishments of a VTS Sensor Station in Tanjung Parit and a VTS Sub-Center in Bengkalis.

However, in the draft report explanation, the Indonesian side strongly requested the Study Team to provide a VTS Sensor Station in Tanjung Parit due to the following: i) Indonesia has plans to establish a VTS System to cover the east coastal area of Sumatra Island as well as assistance from other donor countries, ii) Installation of a VTS Sensor Station at Tanjung Parit will be a deterrent to ships likely to cross the TSS near Tanjung Parit considering the relatively shorter distance between Indonesia and Malaysia.

In addition to the foregoing, the Indonesian side expressed the following: i) The establishment of a VTS Sub-Center in Bengkalis is not advisable due to the difficulty in

allocating sufficient operation staff to Bengkalis, ii) monitoring of information of Tanjung Parit shall be conducted in Dumai VTS Sub-Center, iii) the land in Silincing was already purchased for the GMDSS project[5], and as such the land is available for the installation of Repeater Stations for this project.

Based on the above reasons, the Indonesian side has reiterated its request to the Study Team that data transmission from Tanjung Parit to Dumai shall be maintained, and that monitoring shall be undertaken in Dumai VTS Sub-Center instead of the proposed VTS Sub-Center in Bengkalis.

The Study Team understood the above considerations but explained that in order to maintain data transmission by multiplex communication links between Tanjung Parit to Dumai, additional sites are necessary for Repeater Stations from Bengkalis to Silincing, because of the far distance.

Based on the above considerations, should the Indonesian side secure the land for Repeater Stations from Bengkalis to Silincing, there is a possibility to conduct review of the basic design study of the VTS System in Stage-2.

5) Reasons for Site Allocations into Two Stages

The reasons for allocating Stage-1 and Stage-2 for project implementation are described as follows:

The three VTS Sensor Stations in Singapore Strait, i.e., Hiyu Kecil, Takong Kecil and Batu Ampar, will cater for the difficulty in ship navigation due to the high density of traffic in a narrow channel. Development of the facilities in these areas is given first priority.

To establish a system for monitoring Singapore Strait, the installation of a VTS Sensor Station in Tanjung Berakit will have to be developed in Stage-1 together with the above-mentioned three Stations. Other consideration includes the uniformity/

[5] Marin Telecommunication System Development Project (Phase IV) (Refer to Table 1-3-1), GMDSS (Global Maritime Distress and Safety System) and AIS system are developing under this Project.

standardization and efficiency of the equipment and system.

The availability of Repeater Stations between Tanjung Parit and Dumai, will make it possible to transmit information through multiplex communication link. However, sufficient sites are not available between Bengkalis and Dumai for the erection of Repeater Stations, which makes transfer of data from Tanjung Parit to Dumai impossible. For this reason a VTS Sub-Center is planned to be established in Bengkalis to monitor the data from Tanjung Parit. The development of these sites is included in Stage-2, considering the provision of other alternative Repeater Stations or utilization of satellite data transmission system by Indonesian Government. Should this scheme be pursued, it possible to review of the Basic Design Study so that the development of these facilities could be included in Stage-2.

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

3) As stated earlier, Malacca and 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.

(3) 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.

(4) Policy for Socio-Economic Condition

Hiyu Kecil, Takong Kecil, Tanjung Berakit, Tanjung Medang and Tanjung Parit are provided with light houses while the coasts along Batu Ampar, Dumai and Bengkalis are provided with radio stations. 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 steel towers to be erected for Takong Kecil and Tanjung Berakit for the radar and communication links will be higher than the lantern of the existing light house. As a result, light emissions from the lantern will be obstructed during construction of the steel tower. As remedial measure, the erection of a temporary structure maybe necessary for the installation of a lantern for the navigation aid of vessels during construction of the steel tower. A complementary lamp with the same flashing will be installed on the steel tower when construction of the structure has been completed.

(5) 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.

(6) 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 pursued by the manufacturers.

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

2-2-1-2 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, radar scanners with radius of operation of 15 nautical miles will be installed in Hiyu Kecil, Takong Kecil, Batu Ampar, Tanjung Berakit, Tanjung Medang and Tanjung Parit for a total of six, for the surveillance of 100 GT steel vessels (minimum).

This is determined because of the purpose of the project is to monitor the small vessels which is crossing the TSS. However, in recent years, the meeting on the Straits of Malacca and Singapore was held at Jakarta in 2005, at Kuala Lumpur in 2006 and at Singapore in 2007, and in the meeting it was agreed about the Co-operative Mechanism for enhancement of safety, security and environmental protections in the Straits. Of this Project is cooperated between Indonesia and Japan, however, the VTS System established in the project is expected to contribute for navigation safety in the Straits including TSS in near future.

Therefore, the VTS System is designed also considering to conduct monitor the vessels which are passing through the TSS.

Furthermore, the 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) 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) Commercial power is not available in the remote sites. With this in consideration, three sets of engine driven generator including a standby with automatic switch interchangeability will be provided to ensure a steady power supply.

3) Commercial power is available for the VTS Center and Sub-Center 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 failure.

(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 and 4 to 5 channel voice signal is cost-wise very expensive, and for this reason, the Indonesian Government has decided the used 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, the objective of the VTS System under this project is to monitor the movements of small vessels crossing the 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[6] considering the following:

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

2-2-1-3 Basic Policy of Building Design

(1) Design Policy

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

[6] IALA Recommendation V-125 on The use and presentation of symbology at a VTS Center (including AIS) Edition 2, December 2004, and IALA Recommendation V-128 on Operational and Technical Performance Requirements for VTS Equipment, Edition 2.0, June 2005

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 the facilities are designed based on the following concept.

(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 use to the extent practicable materials and utilities locally available to reduce on cost and facilitate maintenance.

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

2-2-1-4 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 standard based on common 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 needed to ensure the required functions.

3) The foundation of the tower is designed based on the soil conditions at site. However, special site conditions are also considered in the design, as for example, the difficulty in mobilizing heavy construction equipment to the sites due to limited land space and access particularly for Hiyu Kecil and Takong Kecil.

(2) Fuel Supply System

VTS Sensor Stations where commercial electrical power supplies are not available will be provided with fuel storage tanks and supply system for the diesel engine generator to be operated on 24 hours 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 island and the equipment are located near shore.

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

2-2-2-1 Basic Plan for Equipment

(1) System Configuration

As described in Chapter 2, radar scanners will be installed in six VTS Sensor Stations. Scanned data from the four sensor stations in Hiyu Kecil, Takong Kecil, Batu Ampar and Tanjung Berakit will be transmitted to the VTS Center in Batu Ampar for intensive monitoring. Similarly, radar image obtained in Tanjung Medang and Tanjung Parit will be transmitted to Dumai and Bengkalis respectively. As mentioned in Chapter 2, data obtained from these two Sensor Stations along the Malacca Strait can not be monitored intensively in Dumai, due to the absence of data communication link between Tanjung Parit and Dumai. Therefore, as alternative option, an additional VTS Sub-Center is planned for the monitoring the data from Tanjung Parit. The concept of the VTS System is shown in Fig. 2-1-2.

(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 Center to facilitate surveillance of ship movements. The sites will also be provided with radar image observation service monitor mechanism to facilitate maintenance.

(3) VHF Marine Radio System

Safety information for ship navigation safety 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 at all the sites except Takong Kecil 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 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 2-2-5 hereunder.

Table 2-2-5 VHF Channel for STRAITREP

Sector	Reporting End VTS Center	VHF CH No.	Country
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 2-2-6 hereunder.

Table 2-2-6 VHF Channel Allocation

Purpose	CH Code			Remarks
Calling Channel	CH 16			Relaying/Receiving Possible
STRAITREP Monitoring Channel	Site	STRAITREP Sector	Reporting Channel	Exclusively for Receiving
	Tg. Medang	Sector 3	CH84	
	Tg. Parit	Sector 5	CH88	
	Hiyu Kecil	Sector 6&7	CH88&73	
	Batu Ampar	Sector 8&9	CH14 & 10	
	Tg. Berakit	Sector 9	CH 10	
Operating Channel	Separate Allocation at Every Site			Relaying/Receiving Possible

(4) Data Communication System

Data communication link will be made through 7.5GHz or 5 GHz 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 2-2-7 shows the sites and distances to be provided with multiplex communication link. Table 2-2-8 shows the estimated height of the parabolic antennae to ensure stable communication link.

Table 2-2-7 Required Data Transmission Distance for Multiplex Communication Link

Communication Section	Communication Distance (km)
Hiyu Kecil – Takong Kecil	41
Takong Kecil- Batu Ampar	34
Tanjung Berakit – Batu Ampar	62
Tanjung Medang - Dumai	54
Tanjung Parit - Bengkalis	36

Table 2-2-8 Estimated Required Height of Parabolic Antennae

Location	Required Height E.L. (m)	
	Upper Side	Lower Side
Hiyu Kecil	62	49
Takong Kecil	61	48
Batu Ampar	106	93
Tanjung Berakit	106	93
Tanjung Medang	108	95
Dumai	108	95
Tanjung Parit	76	63
Bengkalis	76	63

Note: E.L.: Elevation above sea level

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 exclusive 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 Center / 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

CCTV system will be provided for Takong Kecil and Tanjung Medang in consideration of the

following:

1) Takong Kecil

In the area near Takong Kecil, the navigation route at the western corridor is greatly varying and a DW route exists at the eastern side. Indonesian domestic passenger shipping lines frequently access the area and for this reason, the provision of a CCTV camera is necessary to allow visual surveillance of traffic.

2) Tanjung Medang

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

The camera images gathered from each station by CCTV camera will be transmitted by multiplex communication link to Batu Ampar VTS Center or Dumai VTS Sub-Center for simultaneous monitoring. The CCTV system will be operated at day and night times at the multi-function console of the VTS Center/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 (8channels), ix) Others.

Data replay will be illustrated 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

Hiyu Kecil, Takong Kecil, Batu Ampar and Tanjung Berakit, a total of 4 sites on the side of the Singapore Strait will be provided with tracking system. The target track obtained by the individual radar system and AIS data will be assembled to create single data for the surveillance of the Strait.

On the other hand, as stated earlier the multiplex communication links between Bengkalis and Dumai can not be provided due to the absence of sites. For this reason, the monitoring equipment to be installed in Bengkalis for Tanjung Parit and Dumai for Tanjung Medang will be operated as stand alone system for radar imaging and AIS information gathering image synthesizer only, not operate as radar imaging synthesizer with adjoining stations. Same devices however, will be installed for Batu Ampar, Dumai and Bengkalis, to reduce on procurement cost. In this connection cost increase will be incurred if different system specifications are used.

(9) Multi-function Console

A multi-function console will be provided for Batu Ampar VTS Center and Dumai/Bengkalis VTS Sub-Centers 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.

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 to for maintenance of the system.

The system monitoring capability is describe as follows:

1) Batu Ampar VTS Center (4 Stations in Singapore Straits)

The surveillance by radar and AIS in Hiyu Kecil, Takong Kecil, Batu Ampar and Tanjung Berakit on the Singapore Side of the Strait will be monitored at Batu Ampar VTS Center. Each station will be capable of monitoring 500 vessels. The entire system in the Straits will be capable of monitoring 1500 vessels.

2) Dumai VTS Sub-Center (Tanjung Medang)

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

3) Bengkalis VTS Sub-Center (Tanjung Parit)

This facility will have the same function as Dumai VTS Sub-Center.

4) 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 divided into several images to be displayed on several monitor screens. As needed, the area to be monitored will be displayed continously in three monitor displays as shown in Fig 2-2-3 hereunder.

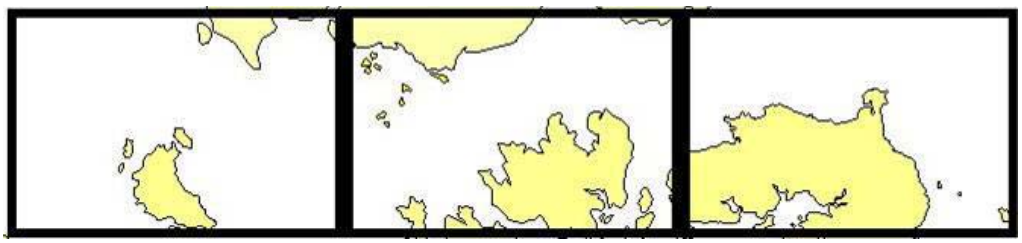


Fig. 2-2-3 Sample Display (Image Map)

- 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, Hiyu Kecil and Tanjung Berakit will be provided with data logger interface mechanism for the gathering of essential weather information for dissemination by VHF, AIS and FM 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 and Batu Ampar VTS Center through the 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 Batu Ampar VTS Center and 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 will be provided with FM transmitting devices for the dissemination of essential information to all vessels operating in the Straits. Dissemination devices will be provided for Batu Ampar and Tanjung Medang, and control devices will be installed for Batu Ampar VTS Center and VTS Sub-Center at Dumai. Obtaining the FM broadcasting license shall be arranged by Indonesian side.

(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.

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 Center and two VTS Sub-Centers, UPS and back up generators will be provided to maintain continuous operations in case of power is failure.

(15) Takong Kecil Lighthouse

An existing lighthouse is located in Takong Kecil with lantern coverage of 360^{o} and red and white lamps. With the center of the lighthouse as reference, red light covers the extent of 245^{o} to 316^{o} while white light covers the other segments. The lantern is set at a height of 48 meters above sea level and has a range of 19NM at 2 flashes per 10 seconds interval. The height of the steel tower for the installation of the radar scanner and parabola antennae will be higher than the lantern thus obstructing red light emissions. As a remedy, the steel tower will be provided with a complementary lamp of the same specifications.

(16) Tanjung Berakit Lighthouse

An existing lighthouse is also located in Tanjung Berakit with lamp coverage ranging from 265^{o} to 161^{o} in the clockwise direction from the north. The lamp has a range of 20 NM at 2 flashes per 10 seconds interval. The radar steel tower height will be 110 meters above sea level and similar to Takong Kecil a part of light emissions from the lantern will be obstructed. Therefore, as in the case of Takong Kecil, the radar tower will be provided with complementary lamp with the same specifications.

2-2-2-2 Electrical Supply Facility

The VTS Sensor Stations are located in remote areas and as such access is extremely difficult. Electrical supply which is also not yet available will be provided through generating sets. The generating sets will be fuel efficient, durable and stable considering the VTS 24 hours continuous operations, difficulty in providing maintenance and fuel which will be replenished once every 3 months.

Four generator sets will be provided for each site. Each unit will be capable of providing the required power. In order to reduce the incidences of normal wear and tear, the system will be

provided with automatic interchangeability switchgear to activate the operation of the next generator on a prescribed time. As measure against instantaneous power breakdown during switch over of generating sets, the system will be automatically shut down and UPS will be provided to provide power for the computer system temporarily. This automatic operation the system will facilitate normal re-start when power is recovered.

While reliable commercial power is available for Batu Ampar VTS Center and Dumai VTS Sub-Center, one (1) standby generating set will be provided for each site for emergency purposes. Bengkalis will be provided with two (2) generating sets due to the absence of commercial power.

Electrical power will be supplied from PDB to NFL with sufficient capacity to each equipment.

2-2-2-3 Basic Plan of Building Facilities

(1) Batu Ampar VTS Center

1) Site Layout

The existing facilities in Batu Ampar Coastal Radio Station comprise of administration office, generator building, two units of staff house and three sets of antenna tower. The northeast corner of the station was chosen for the location of the new VTS Center because it is the best observation post of Singapore Strait. The proposed location is also close to the PLN facility thus facilitating power supply tapping.

2) Architectural Design

a. General

The VTS Center is planned and designed to facilitate maintenance and operation. The building structure to be resistant to fire and earthquake will be constructed of reinforced concrete.

b. Floor Plan

The operation room will be on the 4th floor to facilitate vessel traffic surveillance of

the Singapore Strait. The 3rd floor will contain compartments for the UPS and the engineers as support to the operation of the 4th floor. The 2nd floor will contain the sleeping/napping area. The administration office, conference room with for a capacity of 10 to 20 persons, kitchen, pump room, generator room, toilet, kitchen and related services, will be located on the 1st floor.

Table 2-2-9 hereunder shows the required space which was determined based on the results of the site investigation and discussions with concerned Indonesian Officials. Drawings 14 and 15 show the layout plan, section and the elevation of the building.

Table 2-2-9 Floor Area Schedule for Batu Ampar VTS Center

									Total Floor Area
1st Floor	STAFF ROOM	MEETING ROOM	KITCHEN	TOILET	GENERATOR ROOM	PUMP ROOM	CORRIDOR	STAIRCASE	162.00 m2
Floor Area	24.00 m2	30.00 m2	4.50 m2	15.75 m2	23.40 m2	12.60 m2	33.75 m2	18.00 m2	
2nd Floor	NAP ROOM	STOCK ROOM	-	-	-	-	CORRIDOR	STAIRCASE	72.00 m2
Floor Area	27.00 m2	9.00 m2	-	-	-	-	9.00 m2	27.00 m2	
3rd Floor	ENGINEERS' ROOM	UPS ROOM	-	TOILET	-	-	CORRIDOR	STAIRCASE	72.00 m2
Floor Area	27.00 m2	9.00 m2	-	9.00 m2	-	-	9.00 m2	18.00 m2	
4th Floor	OPERATION ROOM	-	-	-	-	-	-	STAIRCASE	90.00 m2
Floor Area	72.00 m2	-	-	-	-	-	-	18.00 m2	
Penthouse Floor	-	-	-	-	-	-	-	STAIRCASE	18.00 m2
Floor Area	-	-	-	-	-	-	-	18.00 m2	
									414.00 m2

(2) 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 related facilities including steel towers and service facilities 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 needs at the southern size of the station will have to be relocated to the west side for 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 the various precision equipment of the VTS System. Considering the importance of the facility, the building structure will be constructed of reinforced concrete to be fire proof and resistant to seismic forces. The roofing with wooden truss support is sloped to be in harmony with other existing buildings. The main entrance faces 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 covered 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 2-2-10 hereunder shows the required space which was determined based on the topography of the site and discussions with concerned Indonesian Officials. Drawing 16 shows the plan, section and the elevation of the proposed VTS Sub-Center.

Table 2-2-10 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	

(3) Equipment Building

1) Site Locations

Buildings to contain the equipments will be constructed in Hiyu Kecil, Takong Kecil, Tanjung Berakit, Tanjung Medang and Tanjung Parit for a total of 5 sites.

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. Special attention was made for Hiyu Kecil, Takong Kecil and Tanjung Berakit due to the limited land space.

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 proof and resistant to seismic forces. The roof with wooden truss support is sloped to facilitate water drain 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 2-2-11 below shows the floor area schedule which was determined based on the site survey and discussions with concerned Indonesian Officials. Drawing 17 shows the plan, section and the elevation of the equipment building.

Table 2-2-11 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	

(4) Generator Building（Types A and B）

1) Site Locations:

a. Generator House -Type (A)

The generator house for Hiyu Kecil, Takong Kecil, Tanjung Berakit, Tanjung Medang and Tanjung Parit is Type (A), 55sqm in area.

b. Generator House-Type (B)

The generator house for Bengkalis and Dumai is Type B 45sqm in area.

2) Site Layout

The generator house is located 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 proof and corrosion resistant. The roof with wooden truss support is sloped to facilitate water drain in times of heavy downpour.

b. Floor Plan

The house has no compartment and will contain the generating 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 2-2-12 shows the floor area schedule which was determined based on the site survey and discussions with concerned Indonesian Officials. Drawing 17 shows the plan, section and elevation of the generator house.

Table 2-2-12 Floor Area Schedule for Generator House

GENERATOER BUILDING - B		Total Floor Area	Piloti, Pouch, etc.	Total Construction Area
1st Floor	GENERATOR ROOM	45.00 m2	-	45.00 m2
Floor Area	45.00 m2		-	

2-2-2-4 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 2-2-13 shows the schedule of heights of the steel towers to be erected for each site.

Table 2-2-13 Study on the 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	from RSL of the Building m
Hiyu Kecil	28.0	66.0	62.0	49.0	66.0	38.0	
Takong Kecil	16.0	65.0	61.0	48.0	65.0	49.0	
Batu Ampar	60.5	110.0	106.0	93.0	110.0	49.5	30.0
Tg. Berakit	37.0	110.0	106.0	93.0	110.0	73.0	
Tg. Medang	4.0	65.0	108.0	95.0	110.0	106.0	
Tg. Parit	2.0	80.0	76.0	63.0	80.0	78.0	
Bengkalis	5.0	-	76.0	63.0	80.0	75.0	
Dumai	4.0	-	108.0	95.0	110.0	106.0	

Note: 1: EL means elevation above sea level
2: Elevation of equipment is indicated at center level

The type of substructure for the towers depends on the ground conditions for each site. In the case of Hiyu Kecil and Takong Kecil, the substructure will comprise of shallow reinforced concrete foundation which will be placed directly on top of the prepared bed manually due to the difficulty in mobilizing heavy construction equipment to the remote islands. The radar tower for the VTS Center in Batu Ampar will be constructed on top of the RC roof slab of the VTS Center building which took into account the tower load and other conditions. The substructure in Tanjung Berakit will comprise of reinforced concrete to be placed directly on top of the prepared bed considering the soil conditions. The towers for Tanjung Medang, Tanjung Parit, Bengkalis and Dumai will be resting on piles due to the poor subsoil conditions.

(2) Fuel Supply Facilities

The VTS Sensor Stations will be provided with generating sets for power supply due to the absence of commercial power supply. Some 2,000 liters of fuel supply per month is required for the 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.

The existing fuel supply practice for the light houses in Hiyu Kecil, Takong Kecil, Tanjung Medang and Tanjung Parit is by drums which are hurled onto the sea from the DN vessel

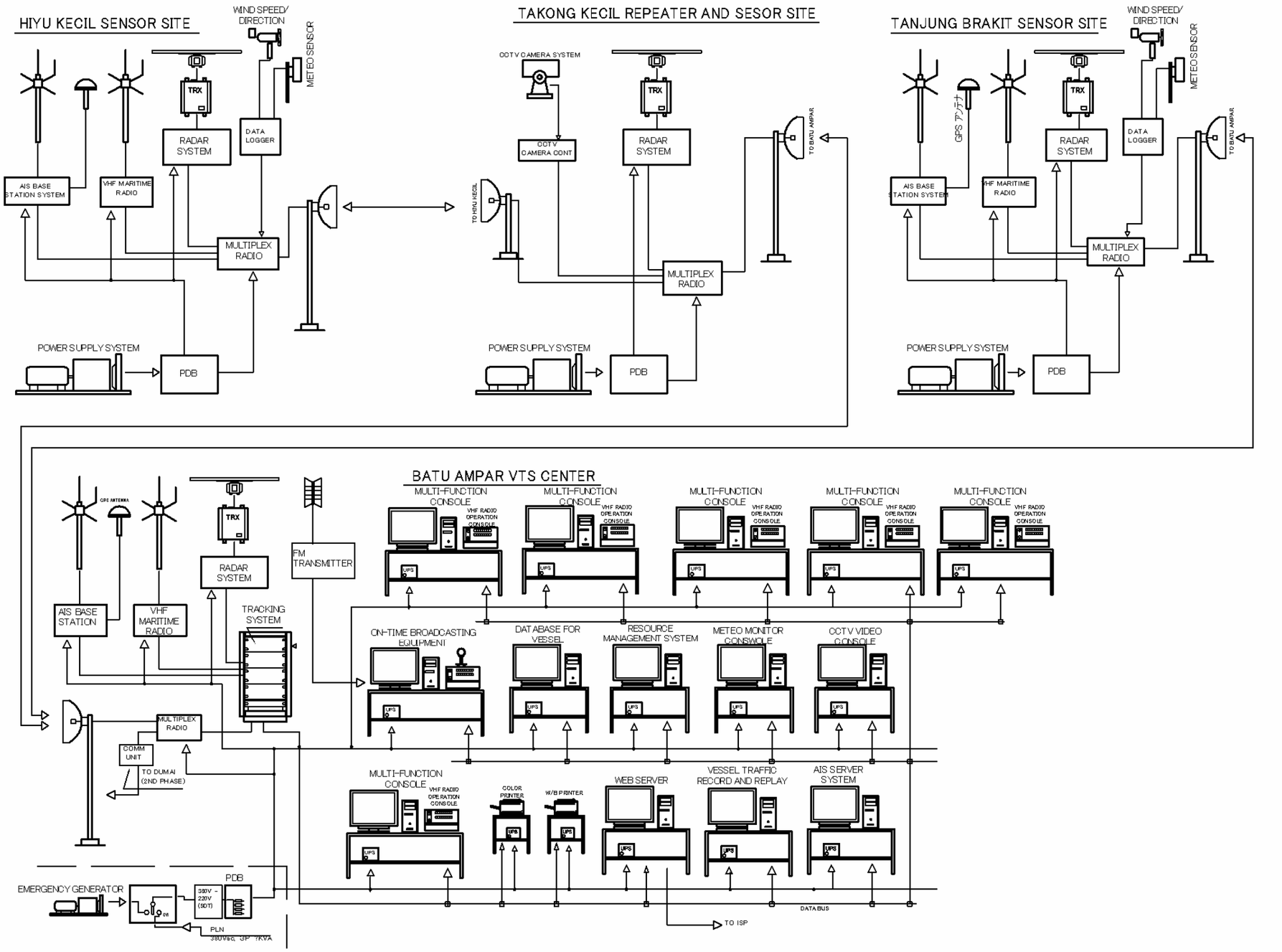
anchored offshore. The drums are towed by small boats to the shore and then rolled up manually to the sites. The same method will be adopted for these sites, however, Hiyu Kecil and Takong Kecil except for slight variations to be made due to the difference in elevations between the shore and inland, at 15m and 11m respectively. Movement of the drums manually from shore to inland would therefore pose extreme difficulty and for this reason, a 1-cubic meter storage tank will be erected in an appropriate location onshore which will be filled with fuel from drums hurled from the DN vessel, similar to the supply practice for the lighthouses. The fuel on the storage tank onshore will then be pumped up to the inland fuel storage depot of the generators.

For the protection of the environment, the fuel storage tanks will be provided with oil entrapments as safeguards against possible spillage.

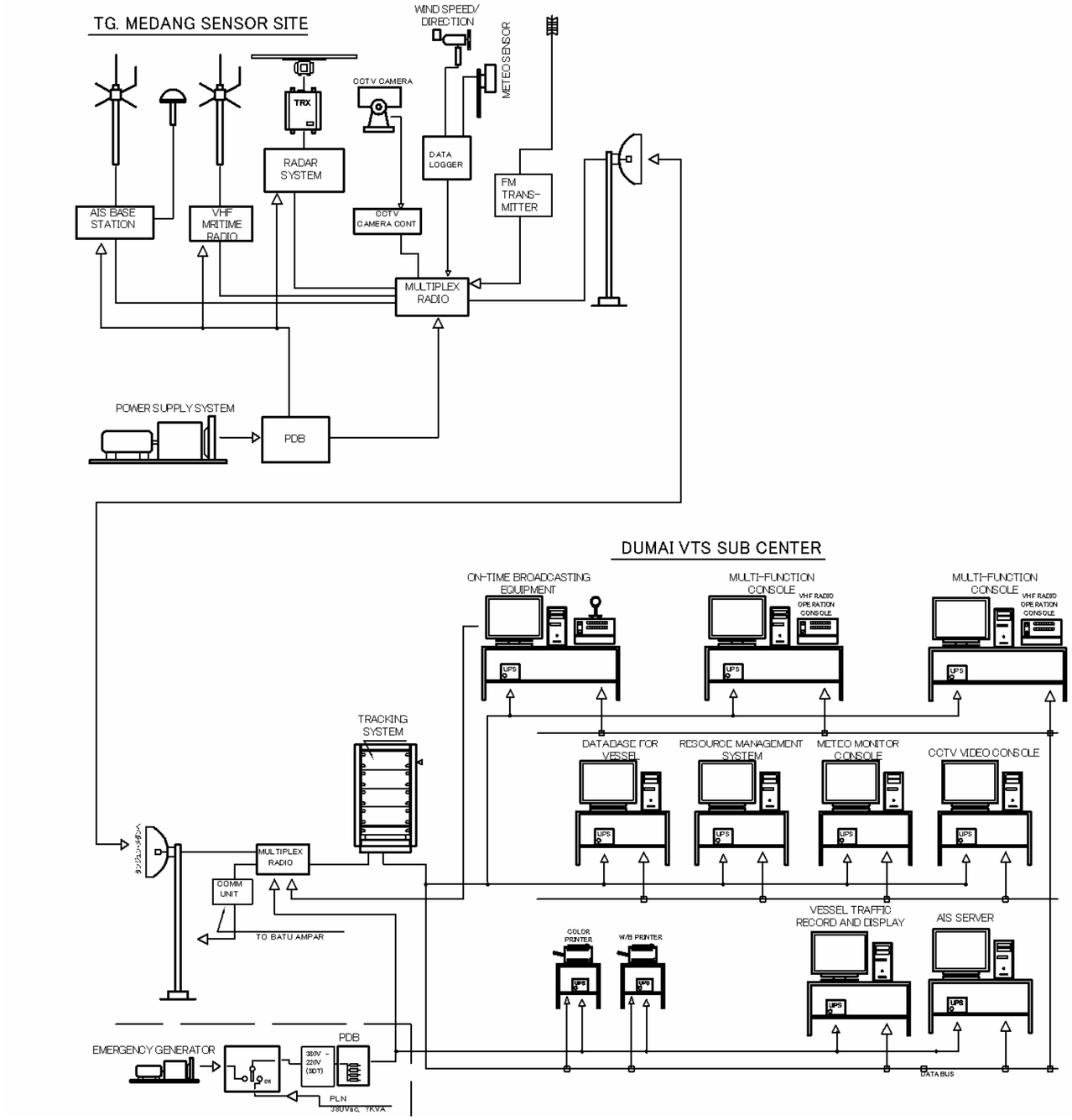
2-2-3 Basic Design Drawings

The list of Basic Design Drawings is tabulated as follows:

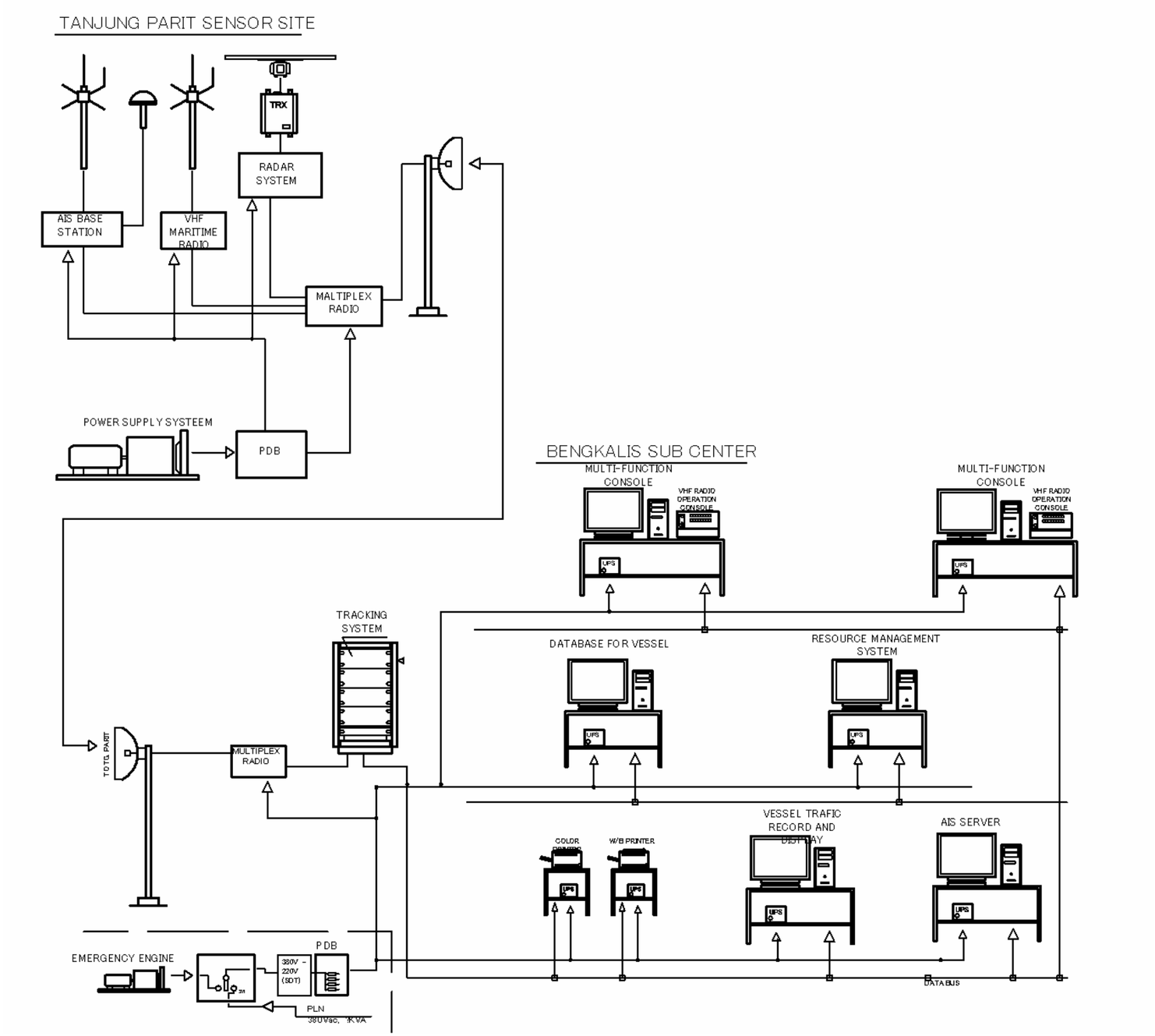
Drawing 1	Block Diagram of Batu Ampar VTS System
Drawing 2	Block Diagram of Dumai VTS Sub-System
Drawing 3	Block Diagram of Bengkalis VTS Sub-System
Drawing 4	VTS System Configuration
Drawing 5	Circuit Configurations
Drawing 6	Plot Plan of Facilities (1) Hiyu Kecil
Drawing 7	Plot Plan of Facilities (2) Takong Kecil
Drawing 8	Plot Plan of Facilities (3) Batu Ampar
Drawing 9	Plot Plan of Facilities (4) Tanjung Berakit
Drawing 10	Plot Plan of Facilities (5) Tanjung Medang
Drawing 11	Plot Plan of Facilities (6) Tanjung Parit
Drawing 12	Plot Plan of Facilities (7) Bengkalis
Drawing 13	Plot Plan of Facilities (8) Dumai
Drawing 14	Floor Plan of Batu Ampar VTS Center
Drawing 15	Elevation and Section of Batu Ampar VTS Center
Drawing 16	Plan, Elevation and Section of Dumai VTS Sub-Center
Drawing 17	Plan, Elevation and Section of Equipment and Generator Building
Drawing 18	Steel Tower Elevations



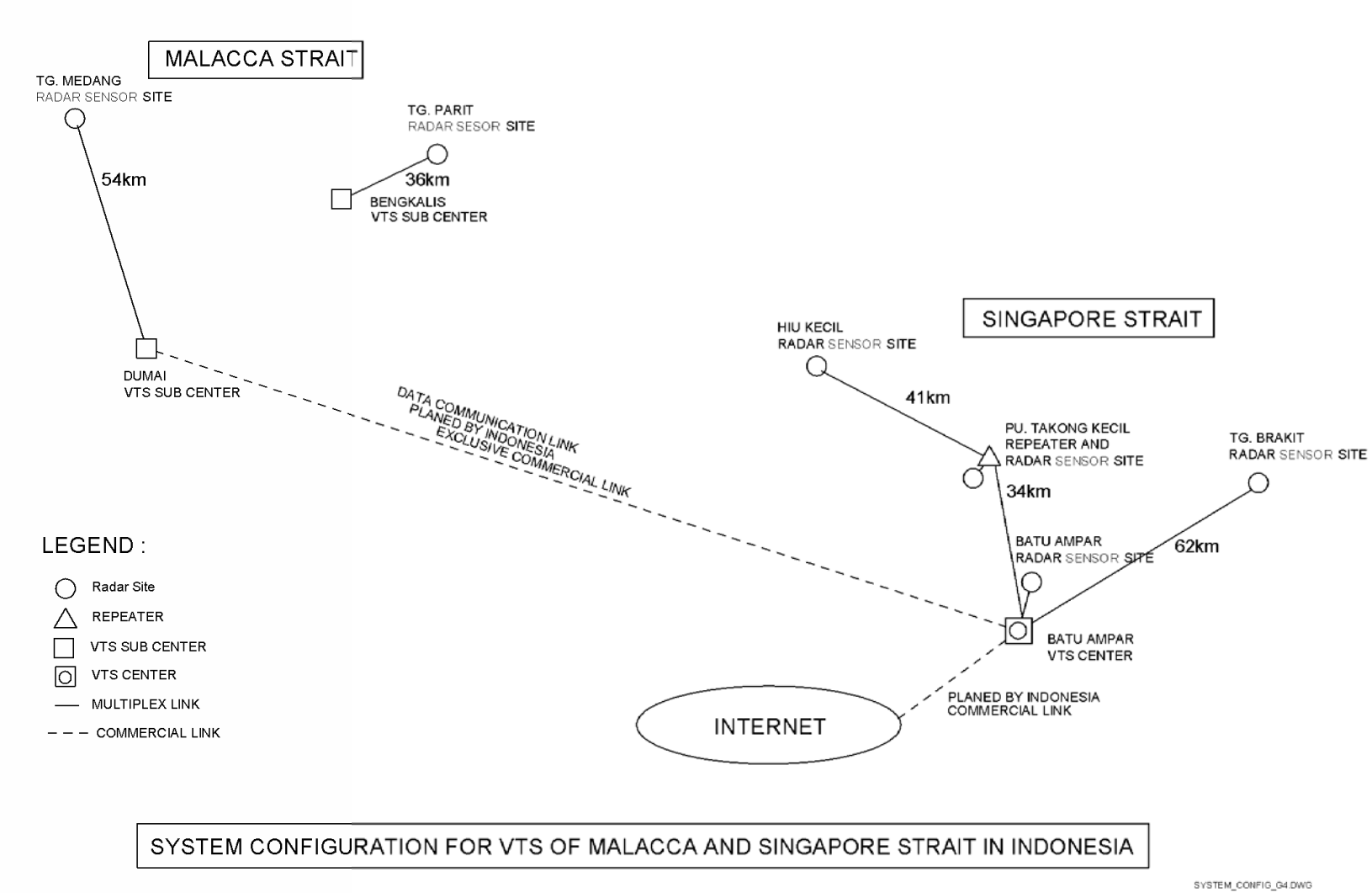
Drawing 1 Block Diagram of Batu Ampar VTS System



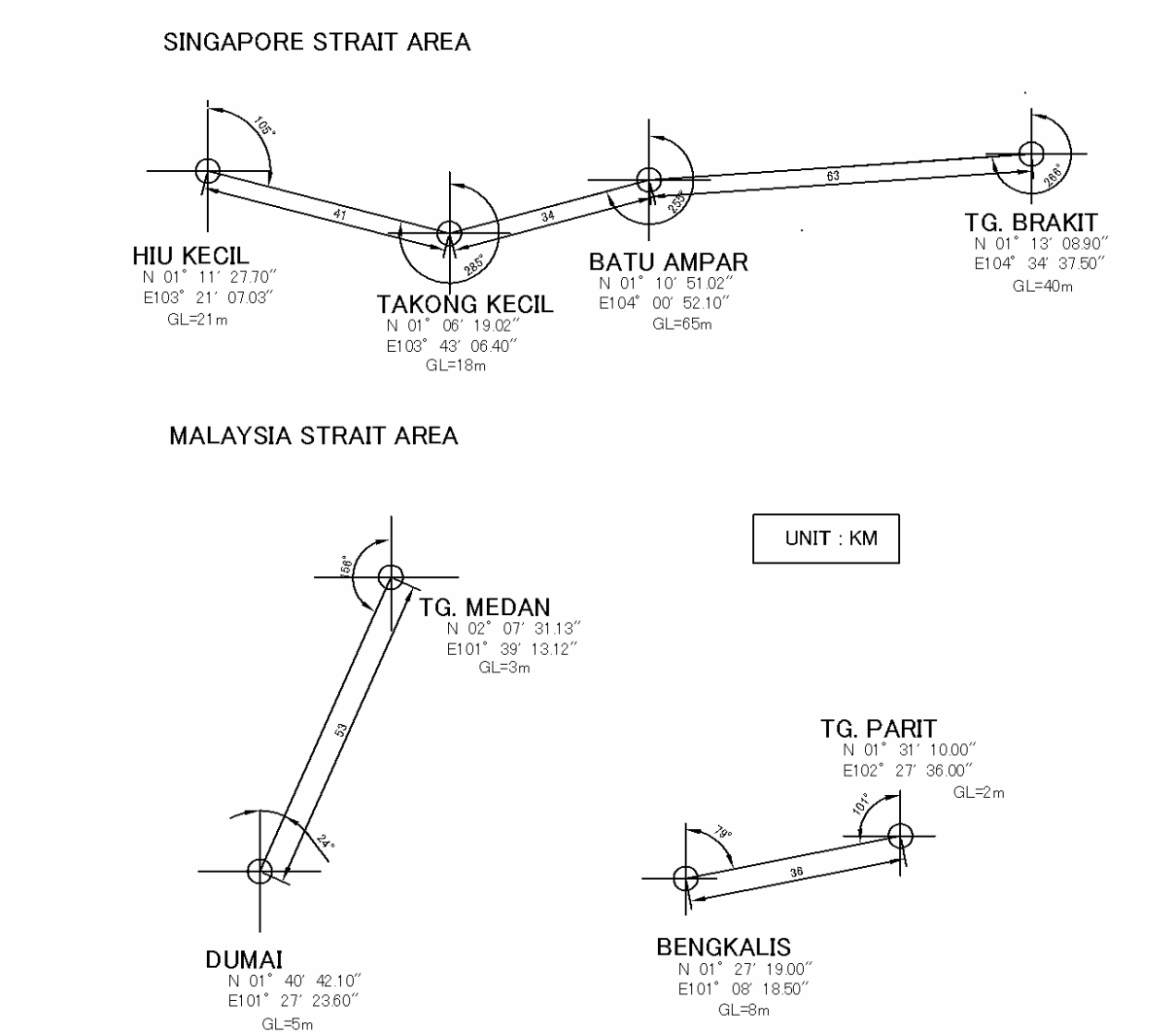
Drawing 2 Block Diagram of Dumai VTS Sub-System



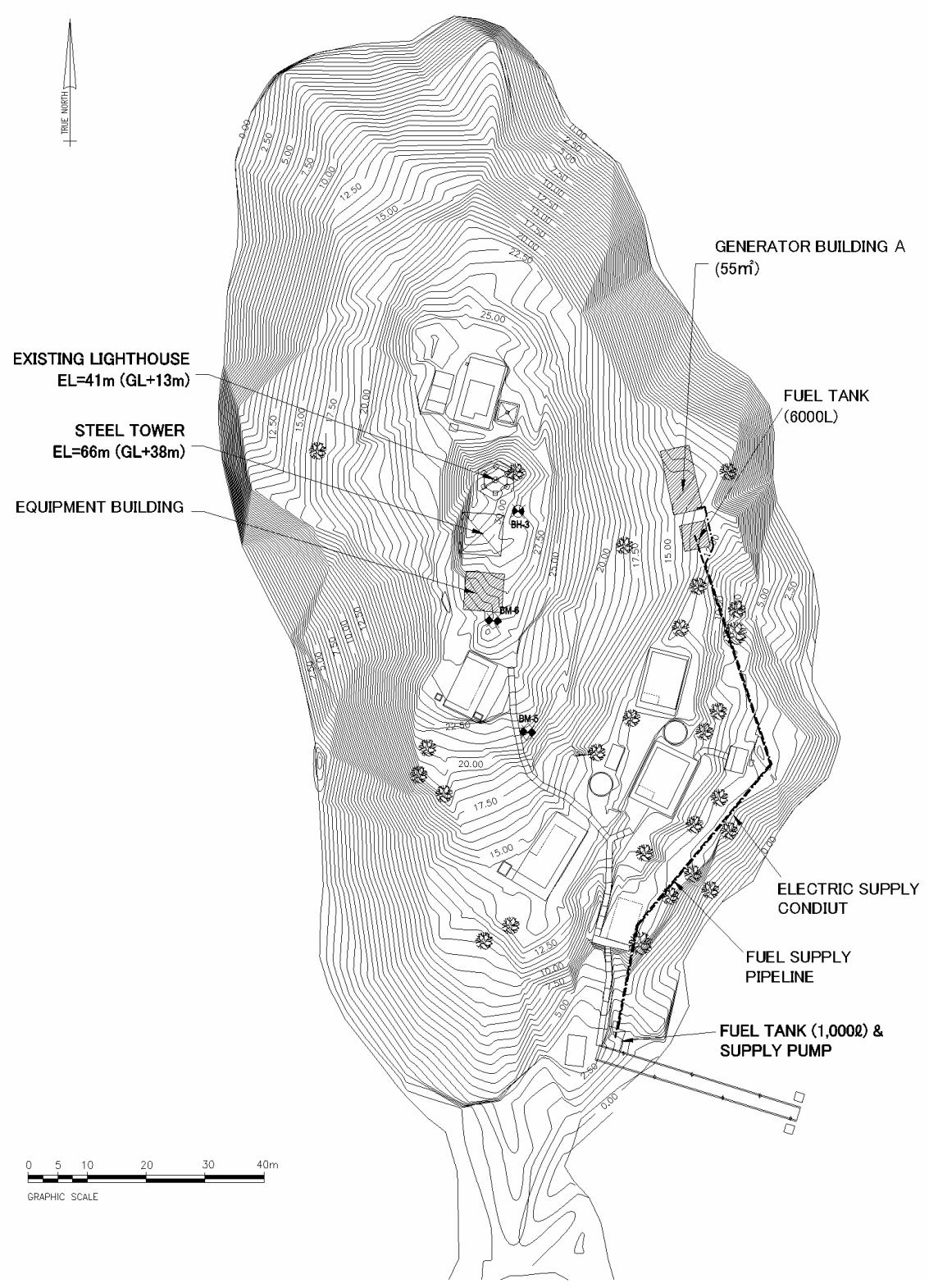
Drawing 3 Block Diagram of Bengkalis VTS Sub-System



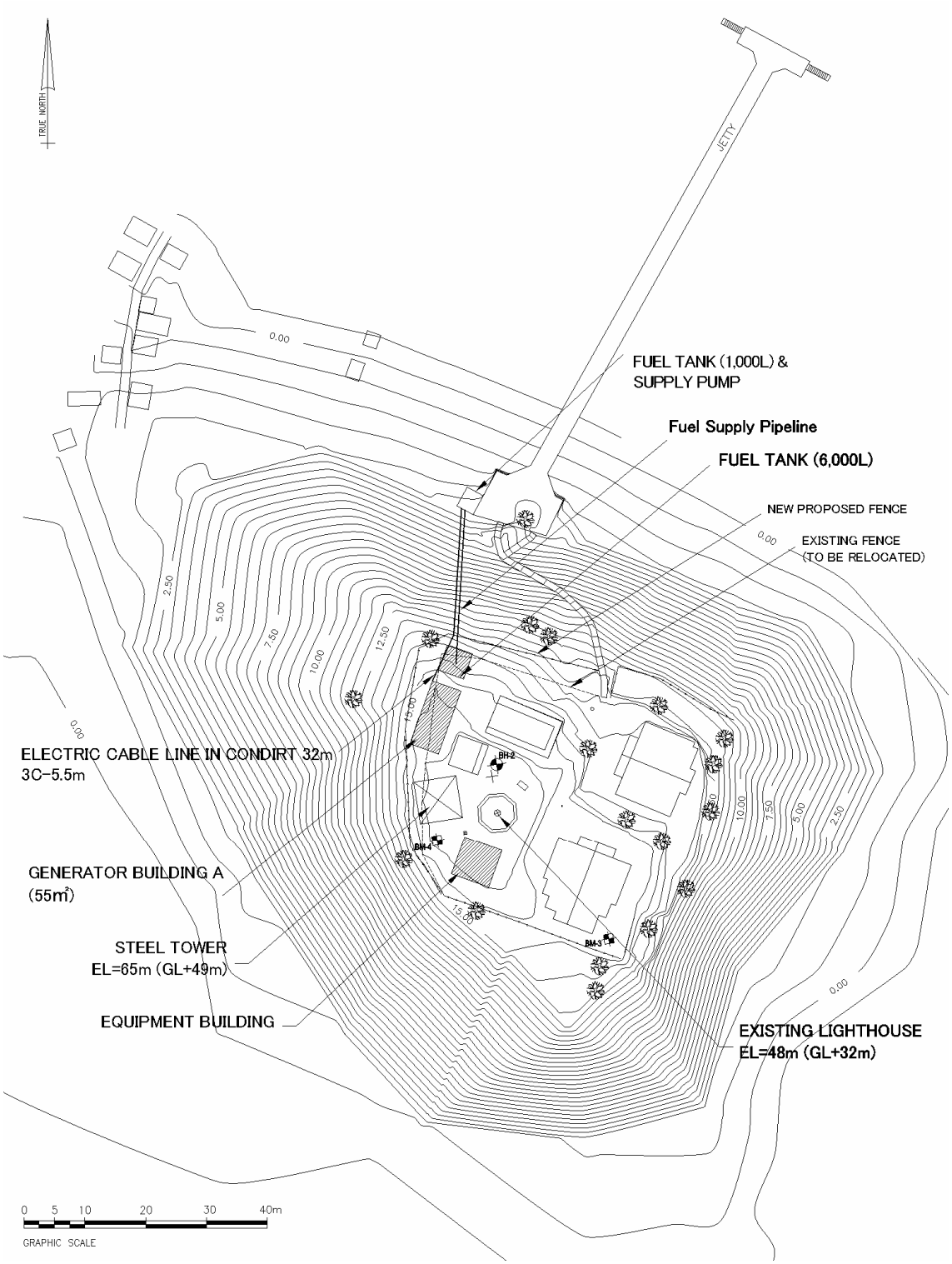
Drawing 4 VTS System Configuration



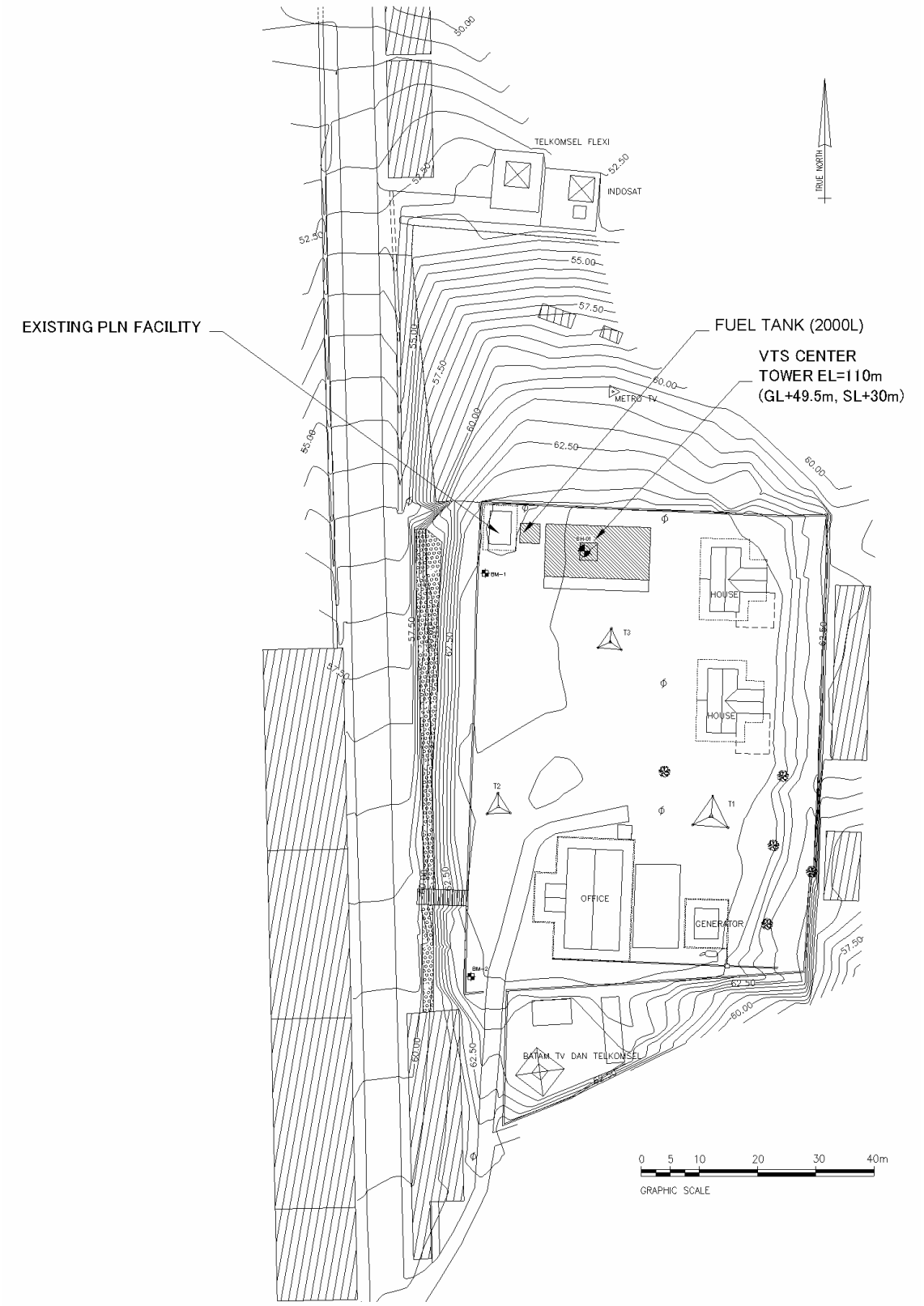
Drawing 5 Circuit Configurations



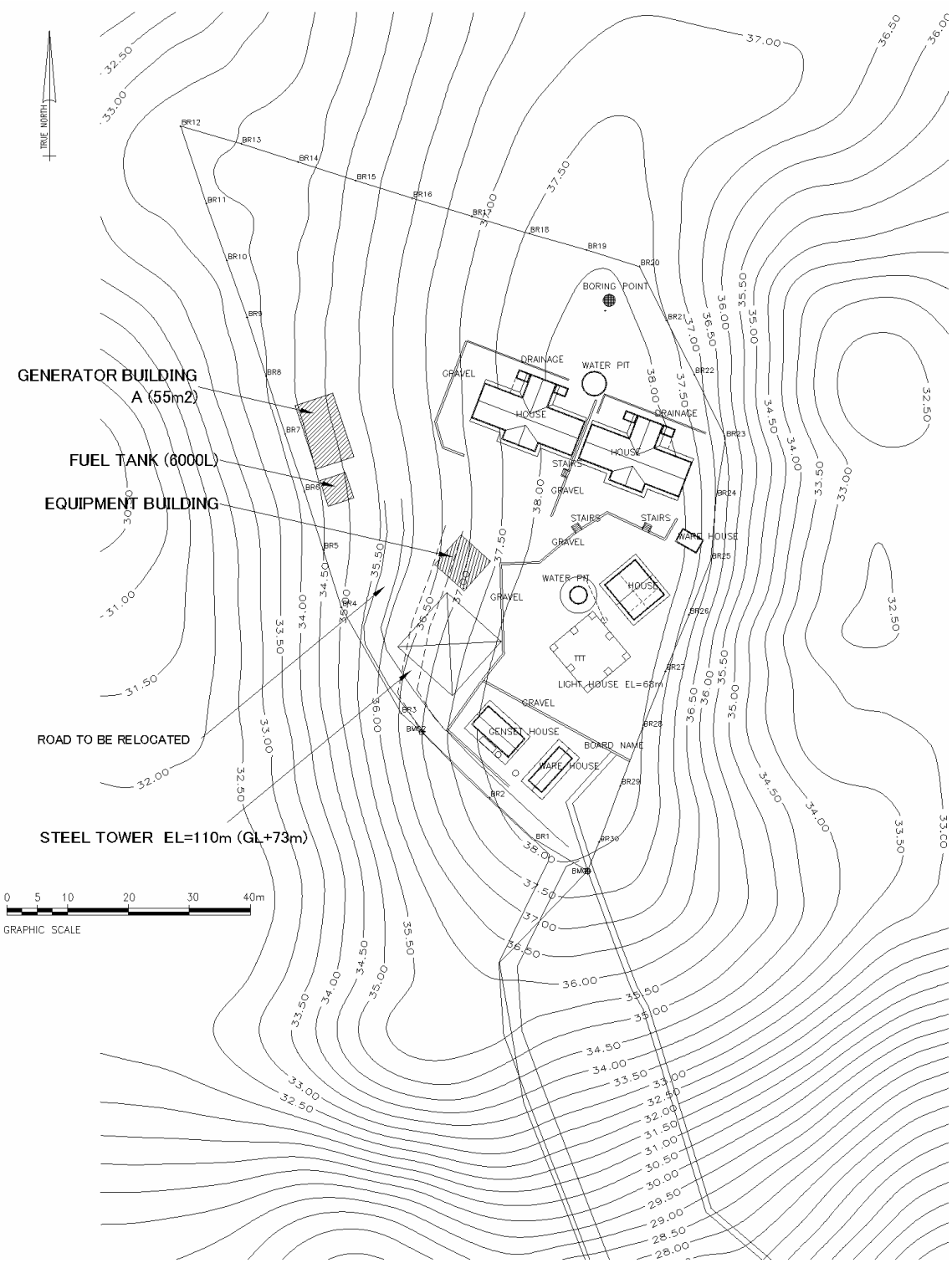
Drawing 6 Plot Plan of Facilities (1) Hiyu Kecil



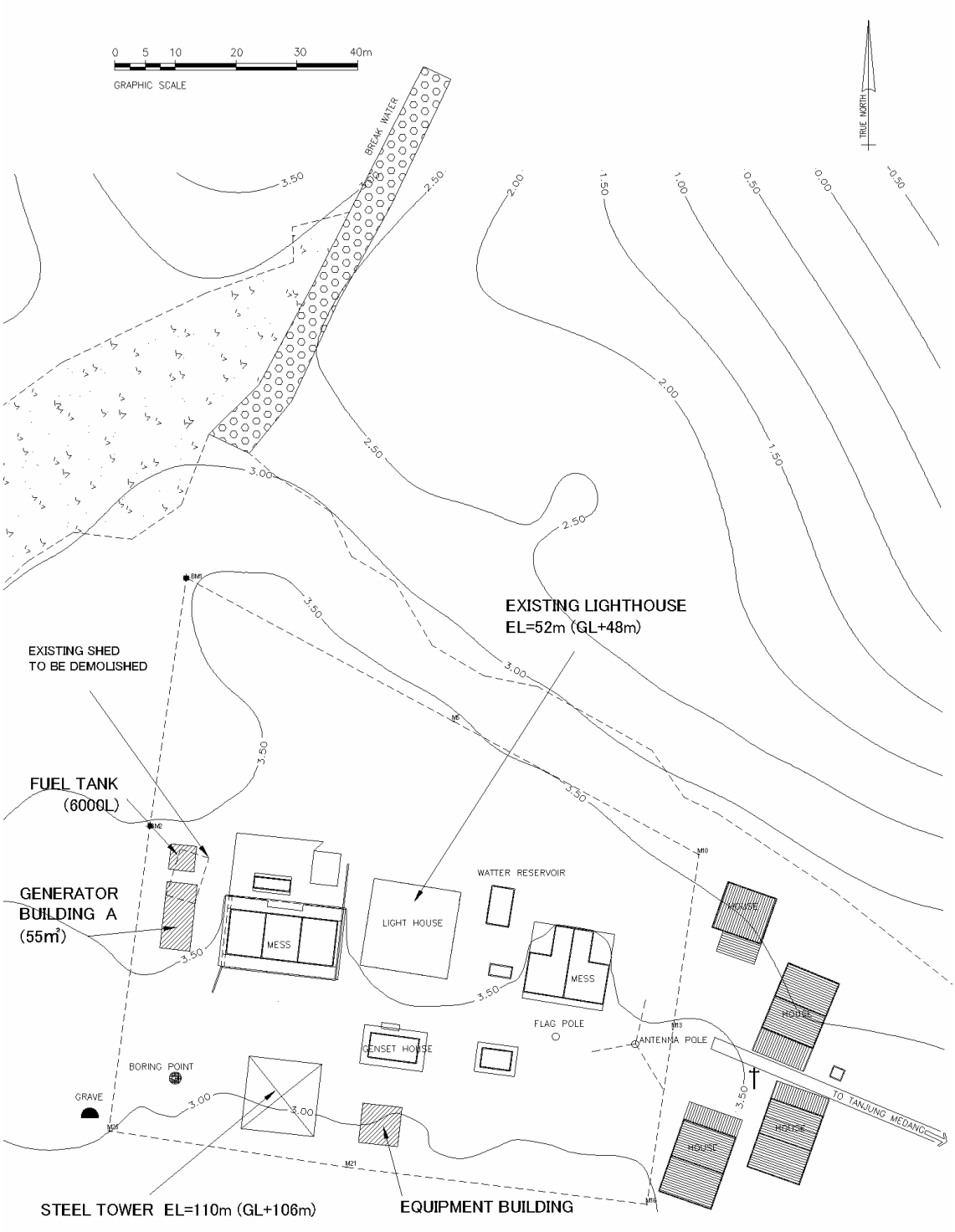
Drawing 7 Plot Plan of Facilities (2) Takong Kecil



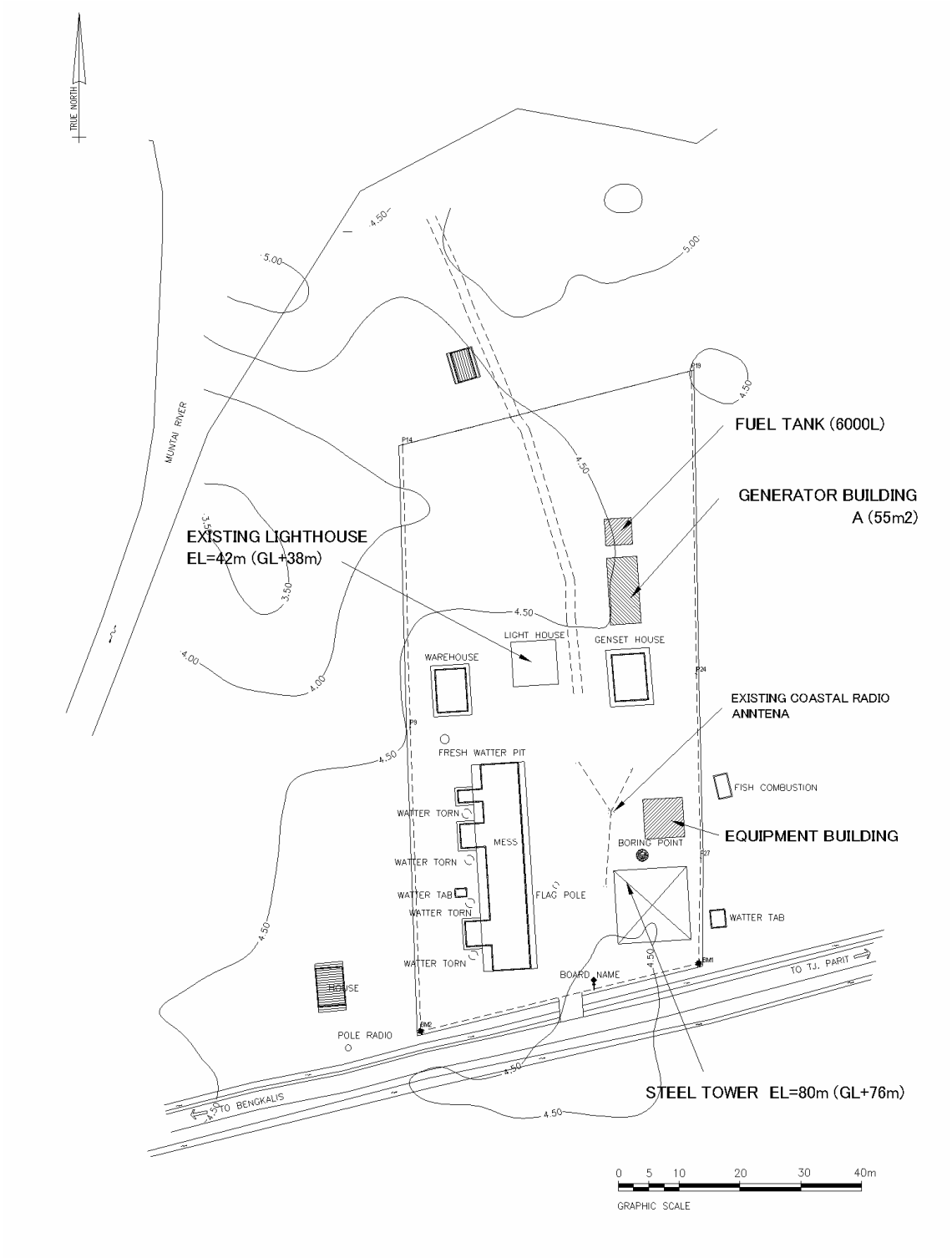
Drawing 8 Plot Plan of Facilities (3) Batu Ampar



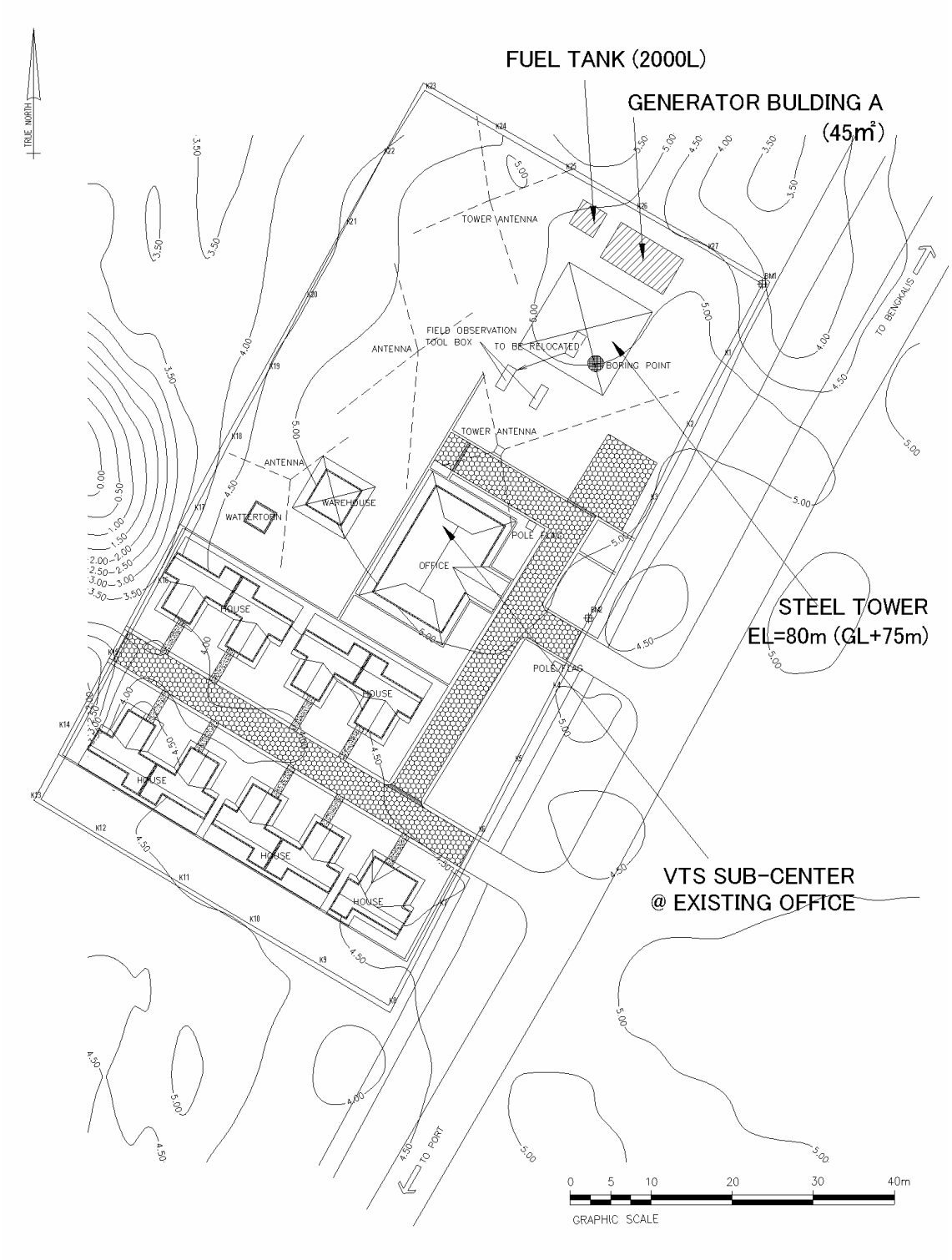
Drawing 9 Plot Plan of Facilities (4) Tanjung Berakit



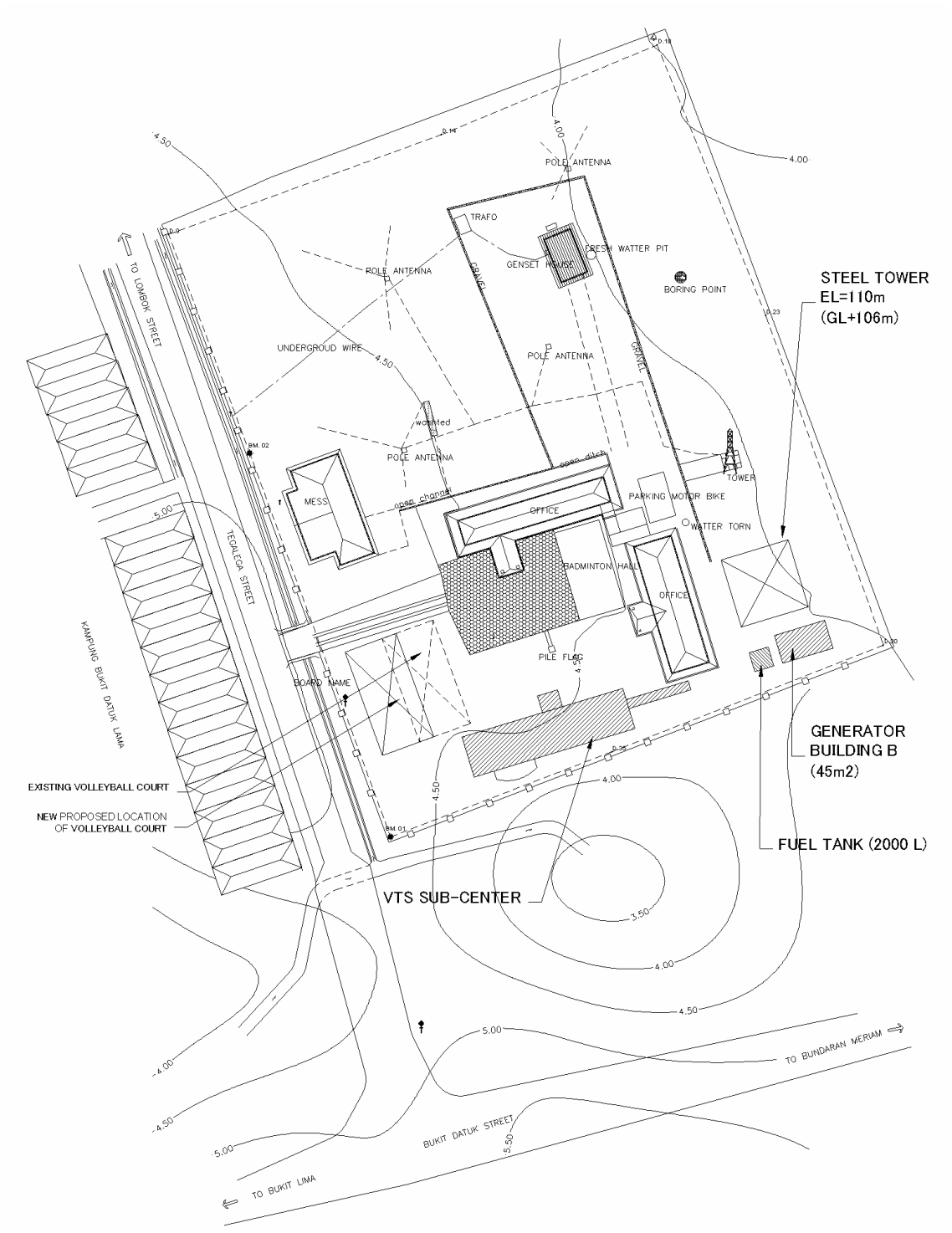
Drawing 10 Plot Plan of Facilities (5) Tanjung Medang



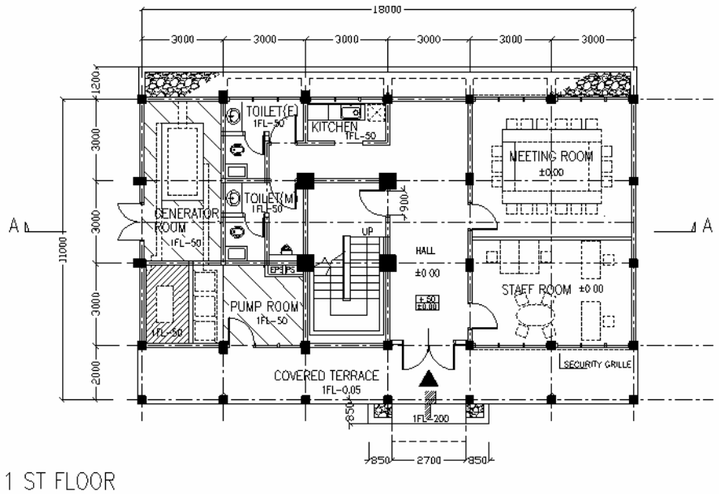
Drawing 11 Plot Plan of Facilities (6) Tanjung Parit



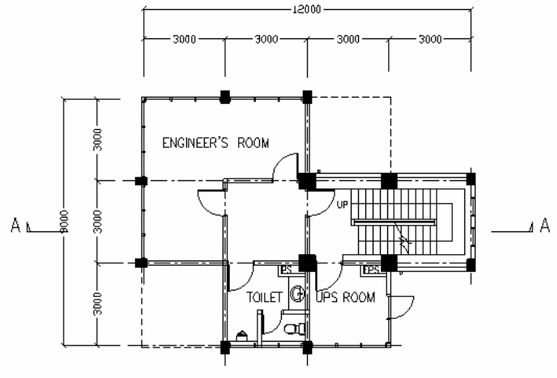
Drawing 12 Plot Plan of Facilities (7) Bengkalis



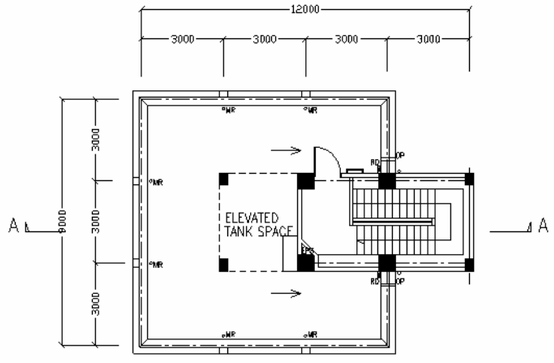
Drawing 13 Plot Plan of Facilities (8) Dumai



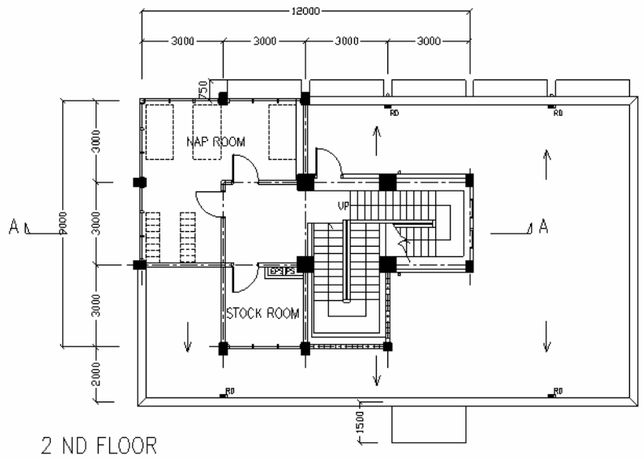
1 ST FLOOR



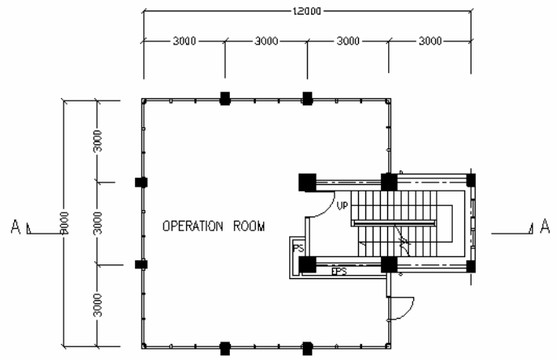
3 RD FLOOR



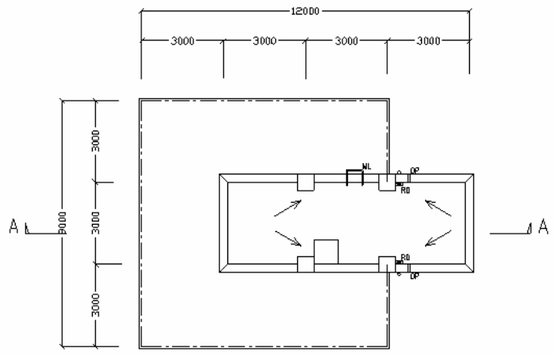
PENTHOUSE FLOOR



2 ND FLOOR

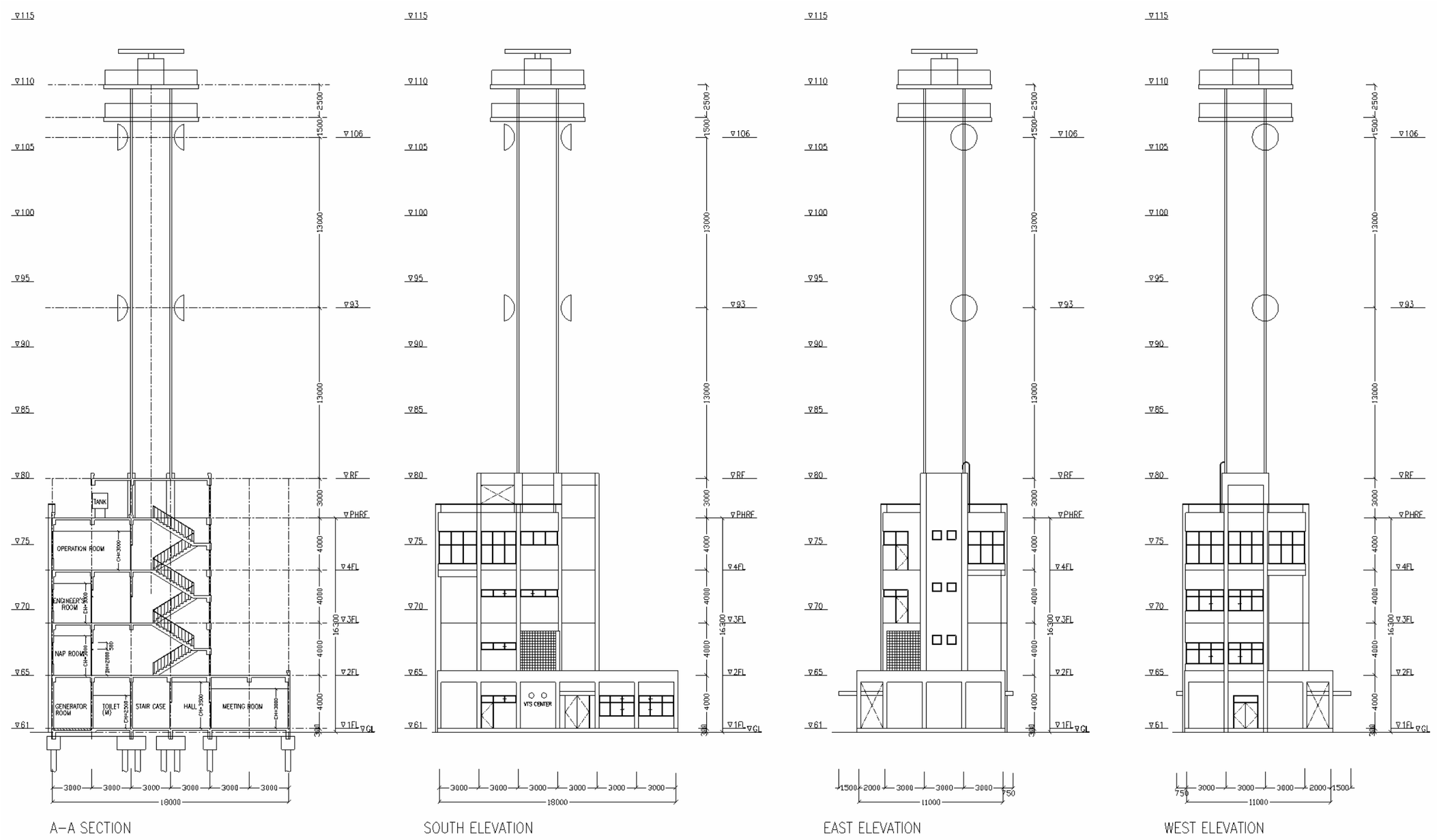


4 TH FLOOR

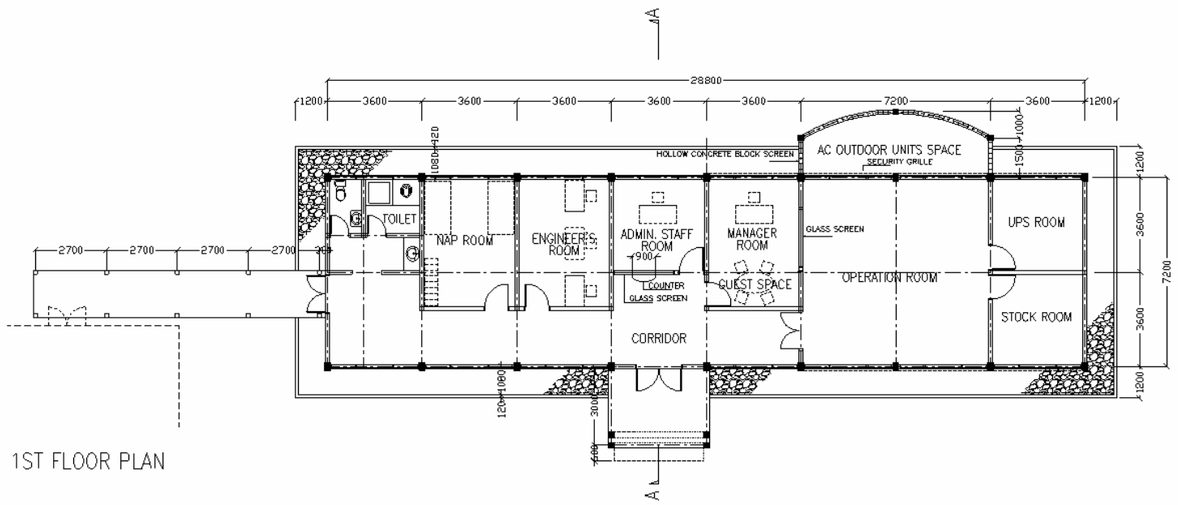


ROOF FLOOR

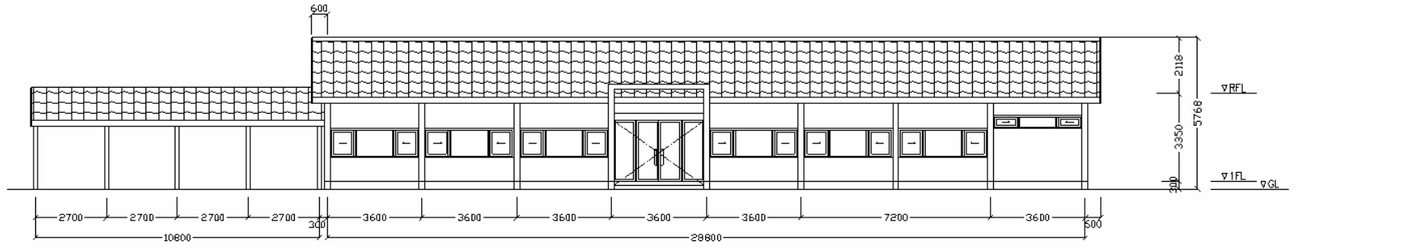
Drawing 14 Floor Plan of Batu Ampar VTS Center



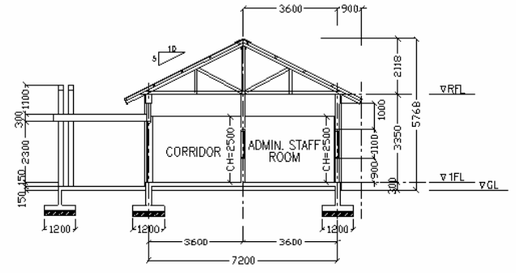
Drawing 15 Elevation and Section of Batu Ampar VTS Center



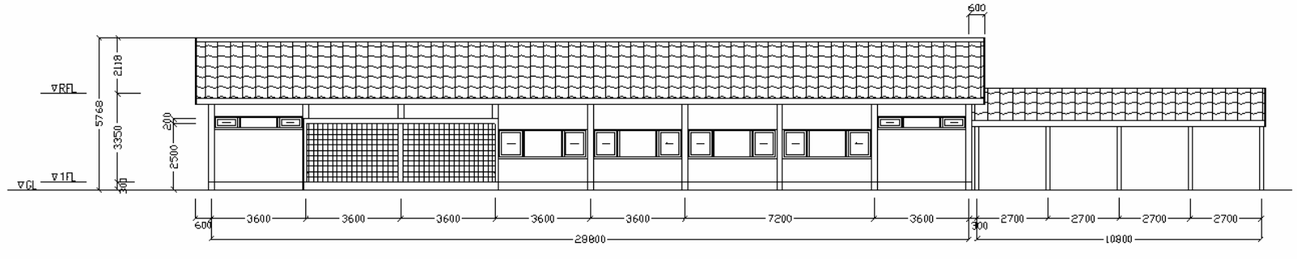
1ST FLOOR PLAN



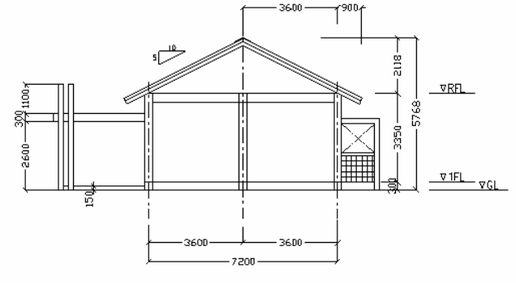
NORTH ELEVATION



A–A SECTION



SOUTH ELEVATION

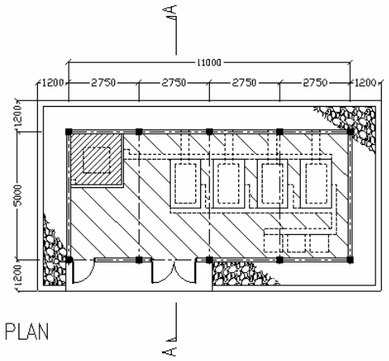


WEST ELEVATION

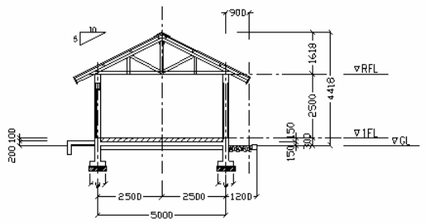
Drawing 16 Plan Elevation and Section of Dumai VTS Sub-Center

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

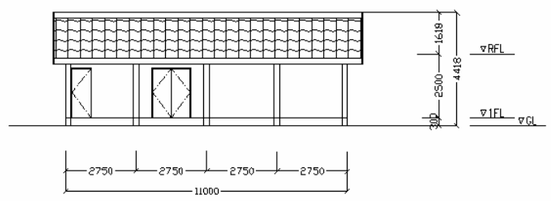
GENERATOR BUILDING (TYPE-A)



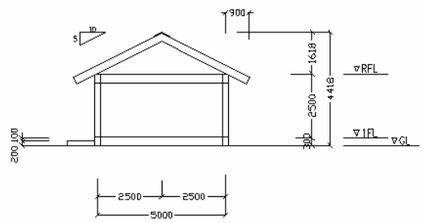
FLOOR PLAN



A-A SECTION

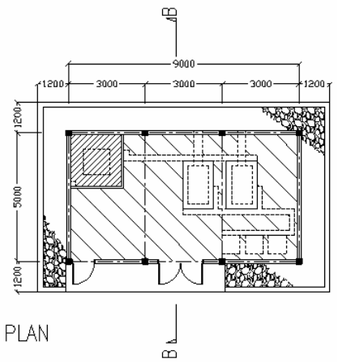


FRONT ELEVATION

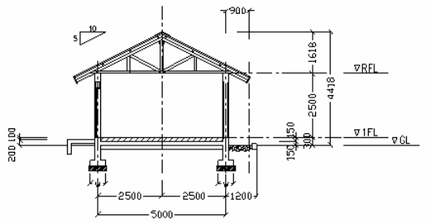


SIDE ELEVATION

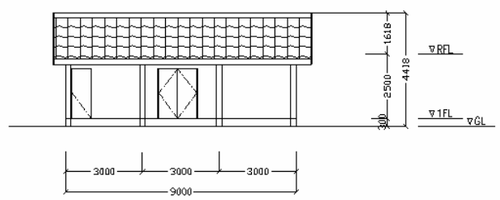
GENERATOR BUILDING (TYPE-B)



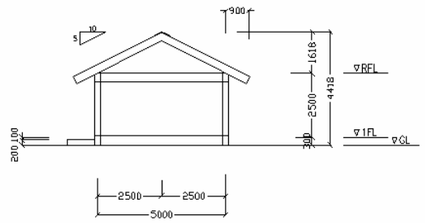
FLOOR PLAN



B-B SECTION

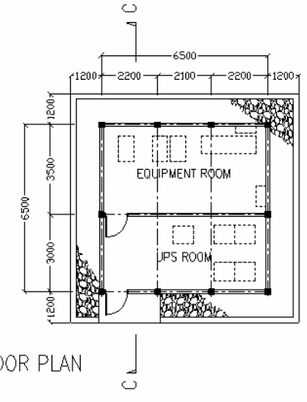


FRONT ELEVATION

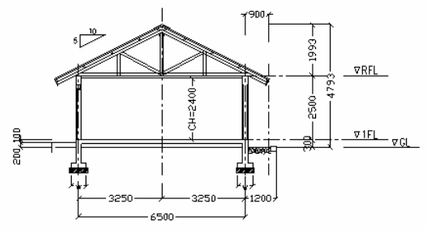


SIDE ELEVATION

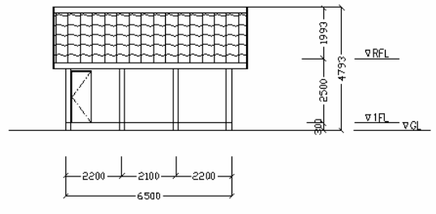
EQUIPMENT BUILDING



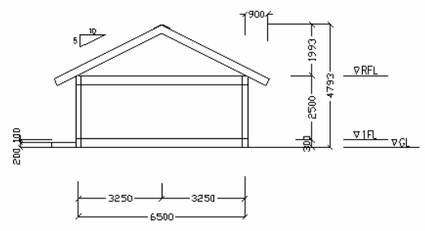
FLOOR PLAN



C-C SECTION

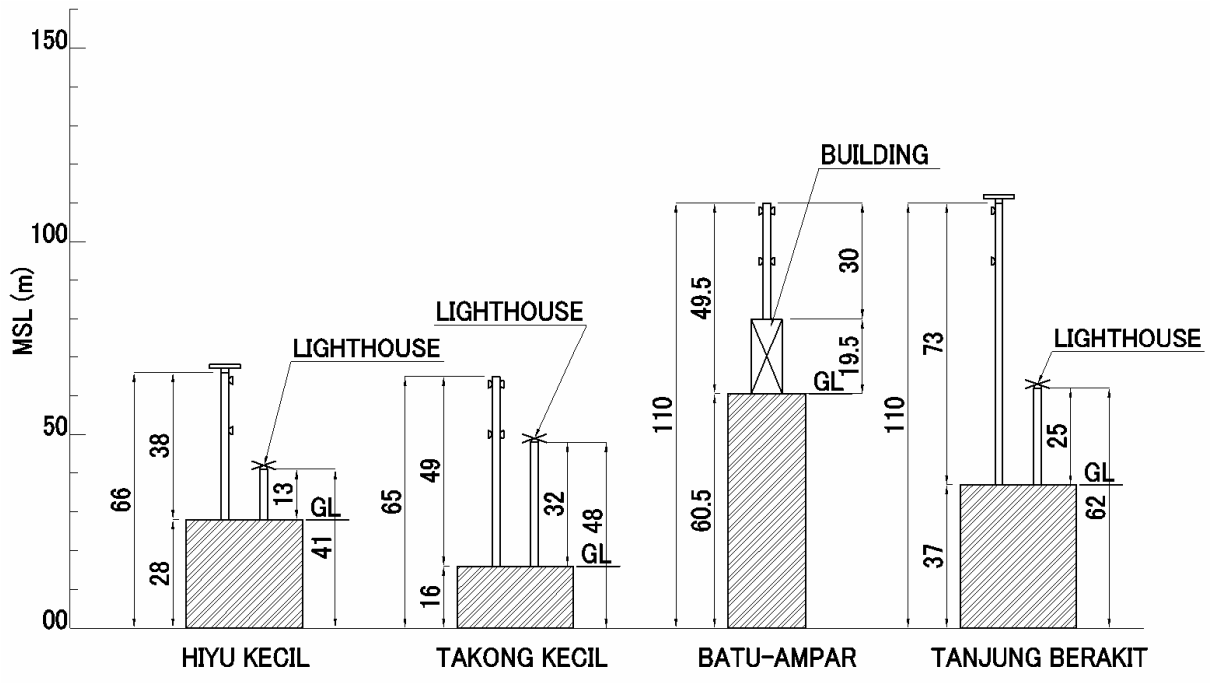


FRONT ELEVATION

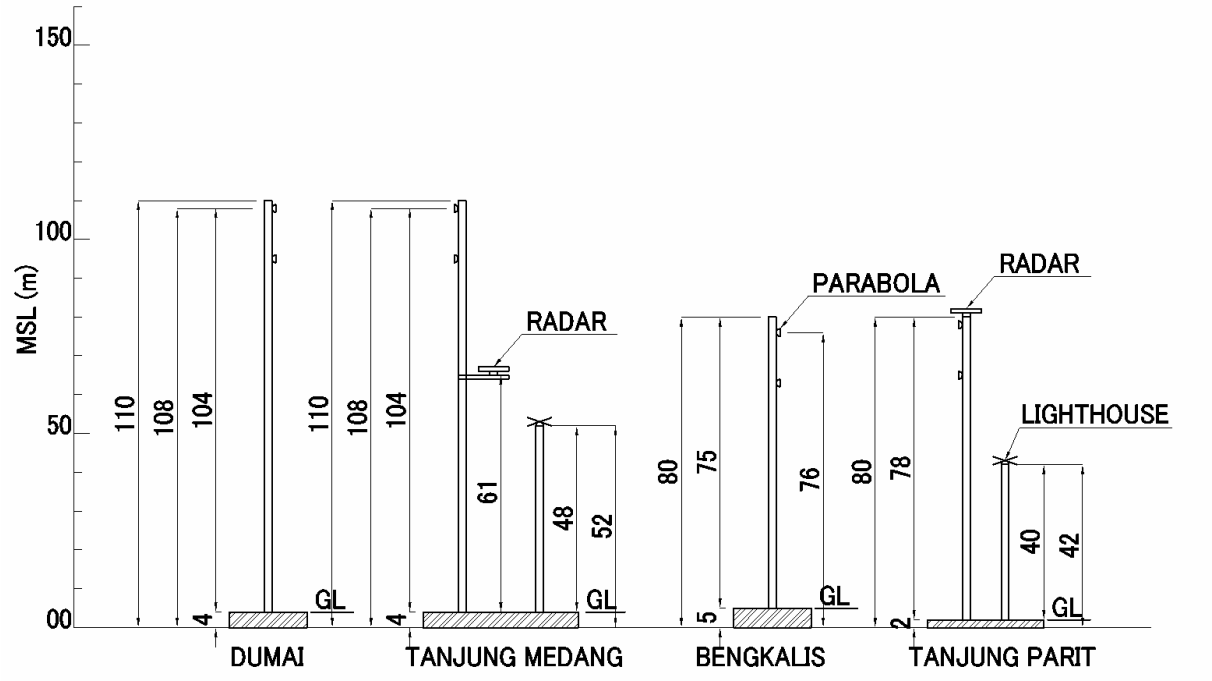


SIDE ELEVATION

Drawing 17 Plan Elevation and Section of Equipment and Generator Building



Phase I



Phase II

Drawing 18 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

Except for Batu Ampar, Dumai and Bengkalis, five among the eight sites are located in remote areas or isolated islands. Special attention is therefore needed for hauling/delivery of materials and construction as described hereunder.

Hiyu Kecil and Takong Kecil which are located in isolated Islands are accessible only by sea and as such electricity and fresh water supply are not available. Stockpiling of materials and equipment in the Islands is not possible due to the extremely constricted space. Accordingly, construction will have to be carried out manually. The critical factor is on how to provide a yard for the stocking of materials and light equipment and the method of delivering and

replenishing materials at appropriate intervals to maintain continuous operation. One method will be the used of flat barge(s) with service/tug boats or reclamation near shore for stockpiling of materials and light equipment.

The whole island of Hiyu Kecil is resting on bedrock but the surface weathered rocks needs to be removed manually and the bed prepared for the construction of the foundations/substructures of the steel tower and related building facilities.

As mentioned earlier, light emissions from the lantern of the existing lighthouse will be temporarily obstructed during the construction of the steel tower for Takong Kecil. While the steel tower will eventually be provided with a complementary lamp of the same flashing, discussions with the DGST is needed on how to remedy the temporary obstruction.

While it possible to move on land in Tanjung Berakit, the access road is quite narrow. During the first site inspection in February 2007, the supply of commercial power in the neighbourhood was almost completed but the water supply system was not yet developed. Similar to Takong Kecil, remedial measures for the obstruction of light emissions from the existing lighthouse will have to be discussed with DGST.

Access to the Tanjung Medang is possible only through the sea from Dumai. Electrical power supply and fresh water supply are still not available. Due to the absence of infrastructures, 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.

- Tapping of commercial power supply for the VTS Center in Batu Ampar and the VTS Sub-Center in Dumai and Bengkalis
- Demolition and removal of the existing fence in Takong Kecil
- Demolition and relocation of the road located in the yard of Tanjung Berakit
- Demolition and removal of the existing warehouse in Tanjung Medang
- Relocation of the volley ball court in Dumai
- Provision of openings for connection of the existing office building with the VTS Sub-Center building.

The Indonesian Side will provide the space needed for the installation of VTS monitor system in Bengkalis while the Japanese side will be responsible for the construction of the facilities and provision of diesel engine generators for the power supply. Electrical facilities including indoor lightings, ventilating fans, air-conditioning units and tapping of power including provision of backup generators will be provided by the Indonesian side.

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

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 related 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 for Stages-1 and 2 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

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 Batu Ampar and Dumai. Test of concrete specimens for the other sites will be conducted in Batu Ampar or Dumai. Sampling is planned to be conducted at every $150m^3$ 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 Batu Ampar or 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.

(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 for Stage-1 will be transported to Batu Ampar Port from Tg. Priok, and Dumai Port for Stage-2. Transportation from Batu Ampar and 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 Hiyu Kecil, Takong Kecil, Tanjung Medang and Tanjung Parit.

Construction materials including aggregates, cement, building materials among others will be procured in Batam for Stage-1 and Dumai for Stage-2. 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 who conducted the tuning and test operations. Table 2-2-14 hereunder shows the guidance program and the number of staffs to be trained.

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

Location	VTS Center	VTS Sub-Center
Trainee (Expected)	16 personnel	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 2-2-15 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 engineers who conducted the adjustment and fine tuning of the system.

Table 2-2-15 Guidance for Maintenance Program and Staffing Schedule

Location	VTS Center	VTS Sub-Center	Site
Trainee (Expected)	5	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	○	○	○
⑨ Maintenance for the radar transmitter and receiver	○		○
⑩ Maintenance for the VHF transmitter and receiver	○		○
⑪ Maintenance for the AIS base station	○		○
⑫ Maintenance for the CCTV camera	○		○
⑬ Server Maintenance	○	○	
⑭ Structure of the software system	○	○	
⑮ Maintenance for vessel data base	○	○	
⑯ 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 training of Indonesian staffs for the operation and maintenance of the VTS System in addition to the guidance for operation and maintenance. As mentioned many 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.

Stage-1, the VTS System is under installation, therefore, the training for operations and maintenance as a soft component by using the system will be considered in Stage-2. Technical cooperation is also to be considered.

2-2-4-9 Implementation Schedule

The schedule for implementation is shown in Fig. 2-2-4 and Fig. 2-2-5.

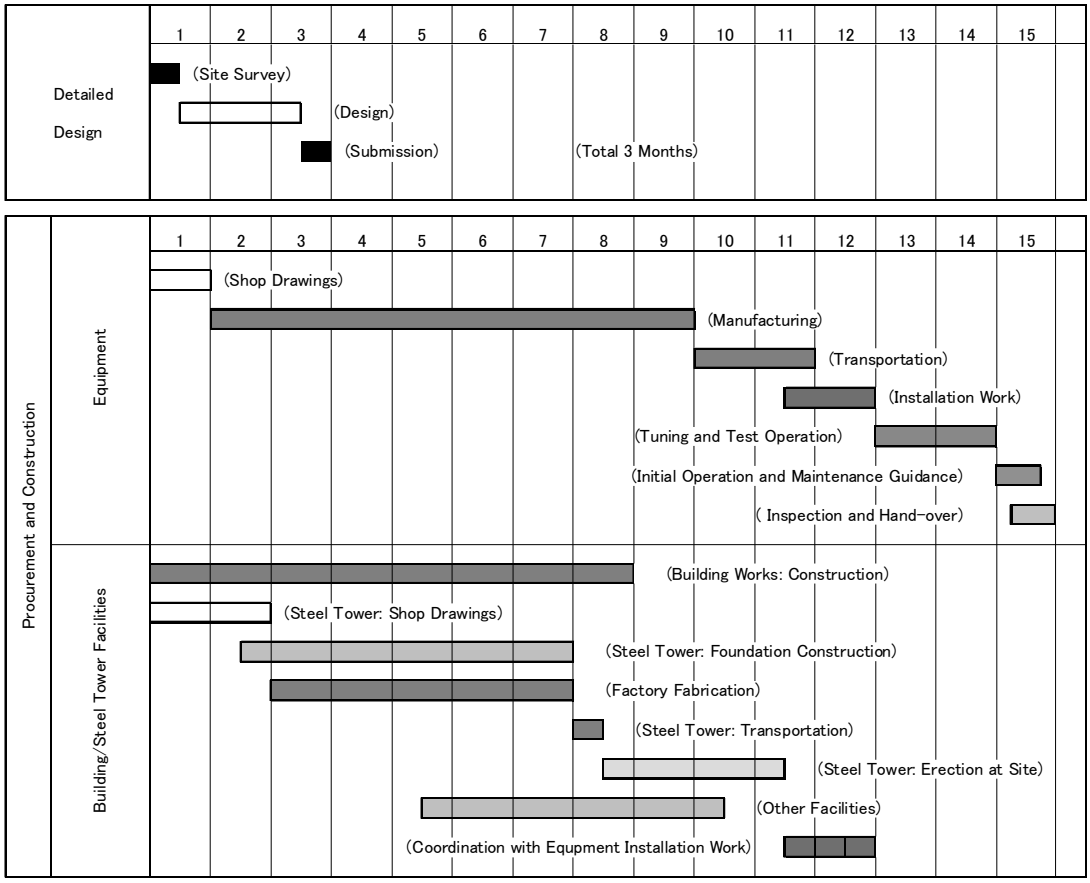


Fig. 2-2-4 Implementation Schedule for Stage-1

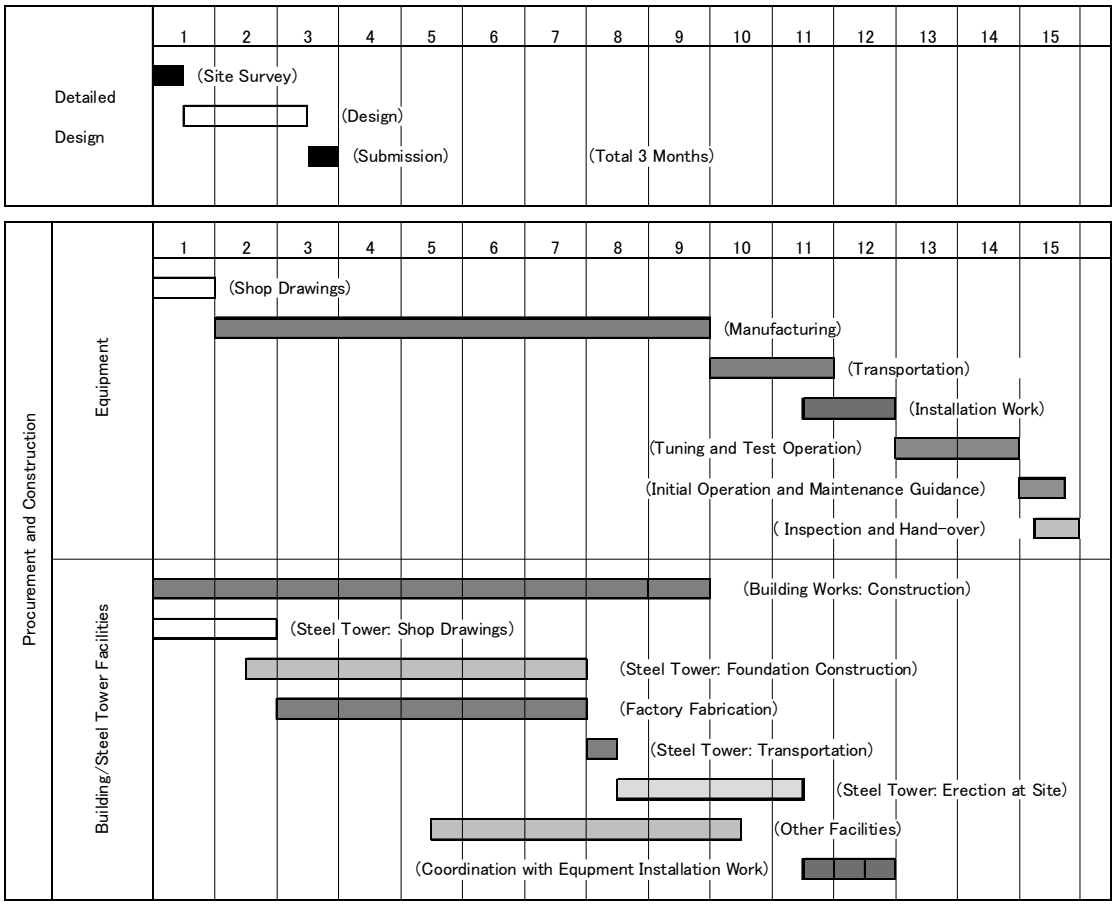


Fig. 2-2-5 Implementation Schedule for Stage-2

2-3 Obligations of Recipient Country

The full cooperation of the Indonesian Government is being 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 smooth implementation of the Project particularly on the following:

1) Stage-1 and Stage-2
   - 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
     - FM broadcasting

2) Stage-1
   - Issuance of permits to use the existing wharf in Hiyu Kecil and Takong Kecil for handling of construction materials, and to construct a temporary yard for stocking of construction materials
   - Tapping of commercial power supply for the VTS Center in Batu Ampar
   - Demolition and relocation of the existing fence in Takong Kecil
   - Demolition and relocation of the road located in the yard of Tanjung Berakit
   - Issunce of notices to related authorities regarding the provision of temporary navigation light aid during the construction of the radar steel tower due to the obstruction of light emissions from the existing lighthouse in Takong Kecil and Tanjung Berkit

3) Stage-2
   - Issuance of permit to construct the temporary faciliteis especially for the temporary

jetties for material handling in Tanjung Medang and Tanjung Parit

- Demolition and removal of the existing warehouse in Tanjung Medang
- Tapping of commercial power supply for the VTS Sub-Center in Dumai and Bengkalis
- 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 a space for the installation of VTS equipment, air conditioner, indoor lightings, wall sockets, and electrical power supply in Bengkalis
- Provision of high speed circuit (internet connections) between Dumai and Bengkalis

2-4 Project Operation Plan

2-4-1 Maintenance Structure

2-4-1-1 Area of Responsibility

According to DN, the Navigation District Offices (Distrik Navigasi) will be tasked for the operation and management of the VTS System under the following arrangements:

1) Tanjung Pinang Navigation District

Batu Ampar, Takong Kecil and Tanjung Berakit will be under control of this office.

2) Dumai Navigation District

Hiyu Kecil, Tanjung Medang, Dumai, Tanjung Parit and Bengkalis will be under control of this office.

Operation-wise, information gathered in Hiyu Kecil, Takong Kecil, Batu Ampar and Tanjung Berakit will be transmitted to Batu Ampar VTS Center for intensive monitoring. For efficient operation, full cooperation/coordination between Dumai and Tanjung Pinang is required for the operation of Hiyu Kecil which needs to be simplified to avoid possible confusion. For this reason, it is desirable that Hiyu Kecil be under the control of Tanjung Pinang Navigation District instead of Dumai.

(2) Staffing schedule

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

Table 2-4-1 Staffing Schedule for the Operation

(VTS Center/Sub-Center and Sensor Station)

Position	VTS		
	Center	Sub-Center	Site
Project Manager	1	1	-
Deputy Project Manager	1	1	-
Clerk	2	1	-
Computer Engineer	1	1	-
VTS Management	5	5	-
VTS Operator	10	5	-
Electrical Engineer	2	2	1
Technical Assistant	2	2	2
Total	24	18	3

Table 2-4-2 Staffing Schedule by Sites

Site	Number of Staff
Hiyu Kecil	3
Takong Kecil	3
Batu Ampar	24
Tanjung Berakit	3
Tanjung Medang	3
Dumai	18
Tanjung Parit	3
Bengkalis	18
Total	75

2-4-2 Maintenance Method

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

site.

According to DN, fuel and other required consumables for the VTS operation will be supplied once in 3 months considering 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 and maintain efficient VTS System operations. 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

The scope of cost to be borne by the Indonesian side is listed as follows:

1) Stage-1

- Demolition and removal of the existing fence in Takong Kecil
- Relocation of the road in the yard of Tanjung Berakit
- Others
- Bank commissions

The cost for the above works is estimated at about Rp.128 million.

2) Stage-2

- Demolition and removal of the existing warehouse in Tanjung Medang
- 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
- Others
- Bank commissions

The cost for the above works is estimated at about Rp.135 million.

(2) Bases of the Cost Estimates

The bases of the cost estimates are listed in the tabulation hereunder.

1)	Base date	August 2007
2)	Exchange Rate	1 US Dollar＝121.32 Yen 1 Rp.＝0.0146 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 is estimated at 18.48 Rp. Billion (¥ 270 Million) per year for 8 sites after completion of Stage-1 and 2. The maintenance cost for Stage-1 development comprising Hiyu Kecil, Takong Kecil, Batu Ampar and Tanjung Berakit, is estimated at Rp. 8.27 Billion (¥ 121 Million). The cost is exclusive of salaries of staffs for the operation of the VTS System. The annual budget of DN at Rp. 693.79 Billion (¥ 10.1Billion) in 2007, for salaries of staff are reduced to Rp.522.77 Billion (¥ 7.6 Billion), and the estimated operation costs for Stage-2 and Stage-1 will account about 3.5 % and 1.6 % of the annual budget of Rp. 522.77 Billion exclusive of staff salaries. Maintenance of the steel tower by paint application at 10 year interval is estimated at Rp. 4.2 Billion (¥ 62 Million) for the 8 sites for both Stage-1 and Stage-2 development, and Rp.1.1 Billion (¥ 17 Million) for 4 the sites for Stage-1 development.

2-6 Other Relevant Issues

(1) 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.

(2) Tanjung Parit VTS Sensor Station and Bengkalis VTS Sub-Center in Stage-2

The Japanese side did not fully recognize the rationale of establishing a VTS Sensor Station in Tanjung Parit. Moreover, the means for transmitting radar images from Tanjung Parit to Dumai are not currently possible due to the absence of Repeater Stations. For this reason, effective monitoring of Malacca Strait in Dumai will not be achievable for the time being. In this connection, the rationale for the necessity of a VTS Sensor Station in Tanjung Parit shall be clarified by further discussions in the related officials in Japan, and the potential location(s) for the Repeater Station(s) other than Silincing will have to be identified by the Indonesian side. Considering to the above, the basic design for Stage-2 may be revised based on the mode of data transmission from Tanjung Parit to Dumai.

On the basis of the foregoing, the design works will be reviewed immediately after receipt of the identification of candidate locations for the Repeater Station. Considering the required works and studies to be undertaken for site reconnaissance survey, technical evaluation of the multiplex communication link availability and its design, topographic survey and soil investigations, review design of the equipment and related facilities, project cost re-estimations and other relevant works, the estimated schedule to carry out the revised design work is about 10 months. It will be therefore, necessary to consider the period for the review design to implement the Stage-2 Project on schedule as called for in this study effort.

(3) 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. 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. DN previously explained that the AIS to be provided for both sites is based on the present plan of initial simultaneous operations in of the following: i) the main purpose of the AIS to be implemented by MEH project is for the surveillance of VLCC in the TSS to enhance traffic safety for the protection of the environment in the Straits, ii) Procurement of the equipment is scheduled in 2008, iii) MEH project is connected with several government agencies including the Ministry of Environment, Batam Industrial Development Authority (BIDA), DGST, among others iv) MEH project is a demonstration project and therefore the function and final estimated cost have not yet been

finalized.

The AIS system to be implemented by the MEH Project will be for two-year test operation for demonstration purposes only and for this reason, the conditions of use have not yet been finalized. At present, to consider the joint use of the facility will be difficult. Since the AIS system under the JICA Project is a fundamental component of the VTS System, the, installation of an AIS for Hiyu Kecil in Stage-1 will be conducted as scheduled.

The JICA project will be implemented in two stages. As such it is desirable that the issue be resolved prior to the implementation of Stage-2. Should AIS be installed in Hiyu Kecil, joint use of the facility with MEH will be possible. In this case, relocation of the AIS to other sites for Stage-2 implementation will have to be considered.

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 Singapore Strait. (4 VTS Sensor Stns, and 1 VTS Center) - Establishment of VTS System in Malacca Strait (2 VTS Sensor Stns, 2 VTS Sub-Centers)	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 Straits - reducing the risks of marine accidents - increasing the rescue rates of lives and assets - decreasing illegal ships and activities in the Straits - law enforcement against illegal ships and activities in the Straits - 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 Scanners at Sensor Stns and Multi-function console at VTS Center in Singapore Strait. - Installation of Radar Scanners at Sensor Stns, and Multi-function consoles at VTS Sub-Centers 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 and Singapore Straits and installation of AIS Server System at VTS Center and 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 VTS Sensor Stns in Malacca and Singapore Straits - Installation of VHF marine radio system, FM radio broadcasting 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, AIS and/or FM radio 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 and Singapore Straits (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

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.