No.

Department of Transportation and Communications
Philippine Coast Guard
The Republic of the Philippines

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR
PCG COMMUNICATIONS SYSTEM CAPABILITY ENHANCEMENT
ON MARITIME SAFETY & SECURITY
IN
THE REPUBLIC OF THE PHILIPPINES

March 2007

JAPAN INTERNATIONAL COOPERATION AGENCY

PACIFIC CONSULTANTS INTERNATIONAL

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PREFACE

In response to a request from the Government of the Republic of the Philippines, the Government of Japan decided to conduct a basic design study on the Project for PCG Communications System Capability Enhancement on Maritime Safety & Security and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Philippines a study team from June 1 to July 3, 2006.

The team held discussions with the officials concerned of the Government of the Philippines, and conducted field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Philippines 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 the Philippines for their close cooperation extended to the teams.

March, 2007

Masafumi Kuroki
Vice-President
Japan International Cooperation Agency

March, 2007

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for PCG Communications System Capability Enhancement on Maritime Safety & Security in the Republic of the Philippines.

This study was conducted by Pacific Consultants International, under a contract to JICA, during the period from May, 2006 to March, 2007. In conducting the study, we have examined the feasibility and rationale of the Project with due consideration to the present situation of Philippines 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,

Noboru Mihara
Project Manager,
Basic Design Study Team on
The Project for PCG Communications
System Capability Enhancement on
Maritime Safety & Security
Pacific Consultants International

SUMMARY

The Republic of the Philippines is an archipelagic country consisting of some seven thousands islands. Sea transportation plays an important role for the nation's economy and social development. However, Marine crimes, such as drug/arms smuggling, bomb fishing, and piracy, are recently being increasing at the sea surrounding Philippines. Such circumstances become noticeable issue for Japan, which depends 90% of oil transportation through coastal shipping route in the area.

The Philippine Coast Guard (PCG), an agency under the Department of Transportation and Communications (DOTC), performs search and rescue, safety administration, environmental protection, and low enforcement in the area. PCG's communication system currently relies on old equipment, which was introduced in past naval age, and SMS (Short Message Services) using staff's private cellar phone. Some of the PCG stations have radio communication equipment which operate only on a limited coverage or no longer operational. Precise and encrypted information, required for immediate and coordinated search and rescue operations, is not able to be transmitted quickly within the organization. In addition, the Manila Coast Station, consisting of Operation Centre, Transmitting (Tx) station and Receiving (Rx) station and having maritime distress communication system, is out of operational since the microwave circuit between those stations have been cut off by radio wave interference from mobile communication. Further, Asian countries has already established and shifted to GMDSS (Global Maritime Distress and Safety System, perfection execution since February 1999) from former Morse telegraph communication system, but the Philippines has not carried out this yet in the Asian countries.

Under such circumstances, in May 2003, the PCG requested to Japan for grant aid for procurement of communication equipment to enhance their communication system. In response to the request, the Government of Japan dispatched Preparatory Study Team to the Philippine from February to March 2005. Continuously, Japan International Cooperation Agency (JICA) sent the basic design study team to Philippines for field surveys from June 1 to July 3, 2006. During the field surveys, the study team carried out various surveys to clarify the request, project site survey, organization for operation and maintenance, and facility and equipment plan. The draft basic design report was prepared after the design work in Japan. The basic design explanation team was sent to the Philippines from October 22 to October 29, 2006 and obtained agreement on the contents of the report in principle from relevant officials of the Philippine side.

Agreed grant aid components and the Project Sites are summarized in below.

Component (Systems)	Project Site	Remarks
VSAT Satellite Communication System		
HUB Station	Operation Centre (1 station)	
Fixed Station	H2CGD Cebu, H3CGD Zamboanga, H4CGD Palawan, H5CGD Batangas, H6CGD Iloilo, H7CGD San Fernando, H8CGD Davao, H9CGD Legaspi, H10CGD Cagayan de Oro (9 stations)	
Transportable Station	Operation Centre (1 station)	
Microwave Communication System	Headquarters, Operation Centre, Transmitting Station, Receiving Station, Sangley Point, H1CGD (6 stations)	applying 7.5GHz band
VHF/HF Radio System	CGSs in H1CGD Manila: Manila, Pasig, Raguna de Bay, Corregidor, PSCC Manila, Subic CGSs in H2CGD Cebu: Cebu, Tagbilaran, Dumaguete, Ormoc, Maasin, Tacloban, Catbalogan CGSs in H3CGD Zamboanga: Zamboanga, Dapitan, Pagadian, Mapun, Jolo, Bongao, Cotabat (3 HCGDs + 20 CGSs) Operation Centre (1 station)	for VSAT Trans-portable station
Manila Coast Station (Rehabilitation)	Operation Centre, Transmitting Station, Receiving Station (3 stations)	Equip RCC console in PCG Headquarters

Based on above project components, technical specification, basic design, implementation plan, and project cost estimate was developed by the Study Team. Total project duration, including detailed design and construction, will be approximately 18 months (14 months for construction). Total project cost is estimated to be 747 million Yen (603 million Yen by Japan side, and 144 million Yen by Philippine side).

The Project forms an essential part of upgade of the Coast Guard Communication System, which was stated in the 15 Years Development Plan promulgated by the authority of the Commandant, PCG on April 2000. The main objective of this project is to enhance the capability of communication system at Philippine Coast Guard. The following effects are expected by implementation of the Project;

Current Problem	Measures taken by the Project	Direct Effect and Degree Improved	Indirect Effect and Degree Improved
1. Telecommunication between Headquarters and Coast Guard Districts • Unstable telecommunication by HF Transceivers • Limited information of SMS by personal mobile phones	Development of VSAT and microwave communication systems for all 10 Coast Guard Districts	• Stable and sufficient capacity link is realized. • Dedicated communication link secures encrypted communication. [100% improved]	1) Improvement of command and control systems for SAR and counter-terrorism operations Response Time Before Project: 2 days After Project: 1 -2 hours 2) Improvement of lifesaving rate, mitigation of property loss 3) Cost saving for SAR and counter-terrorism operations 4) Protection for expansion of environmental pollution
2. Telecommunication between Coast Guard Districts and Coast Guard Stations • Unreliable telecommunication by obsolete VHF/HF transceivers • No radio communication equipment at some CGS • Unable to transmit intelligence and security information due to unsecured radio link	Introduction of heavy duty VHF/HF transceivers with antennas	• New equipment provides stable and clear communication. • Encrypted function is enable to transmit all required information. [38% improved (procured to 20 CGSs among 52 GSSs)]	
3. Manila Coast Station • Malfunctioned 2GHz microwave links between Operation Centre and Tx/Rx stations due to radio-wave interference problem • Unserviceable condition of Manila Coast Stations by equipment failure • Incompliance with the Global Maritime Distress and Safety System (GMDSS)	Development of 7.5GHz microwave communication system Rehabilitation and upgrade of existing MF/HF equipment by GMDSS equipment	• New microwave system provides voice, data and control signal communication between Manila Coast Stations. • Manila Coast Stations is enable to serve sufficient communication for Search and Rescue operations. [apprx. 10% improved] • GMDSS becomes in operational. [50% improved for NAVEX service]	

The Study Team recommend PCG the followings to enhance benefit and sustainable utilizations of the systems provided by the Project:

- To carry out proper maintenance of the telecommunication system and its equipment, and conclude a maintenance contract with third-party specialist for the portion requiring professional skill
- To develop human resources for operation and maintenance of the telecommunication system and its equipment
- To execute periodical exercise for operation of the telecommunication system (especially for transportable VSAT system)
- To carry out continuous security patrol to prevent squatters from intruding into the antenna yard at Tx station

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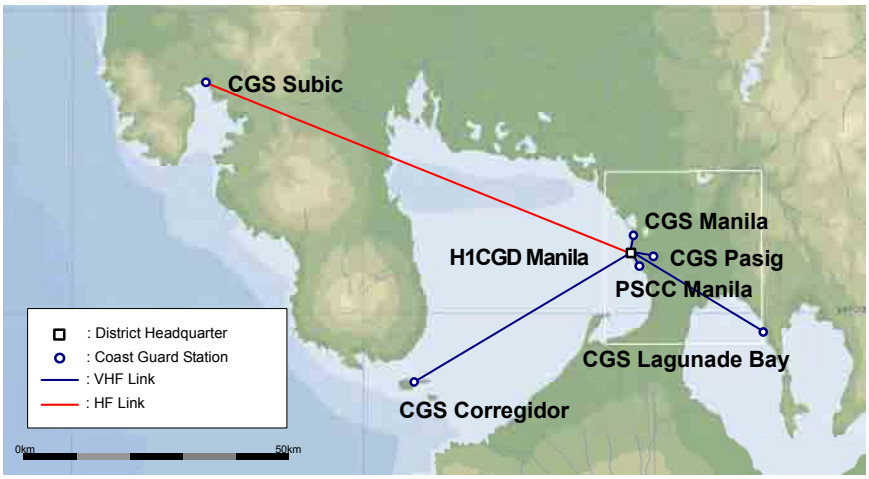
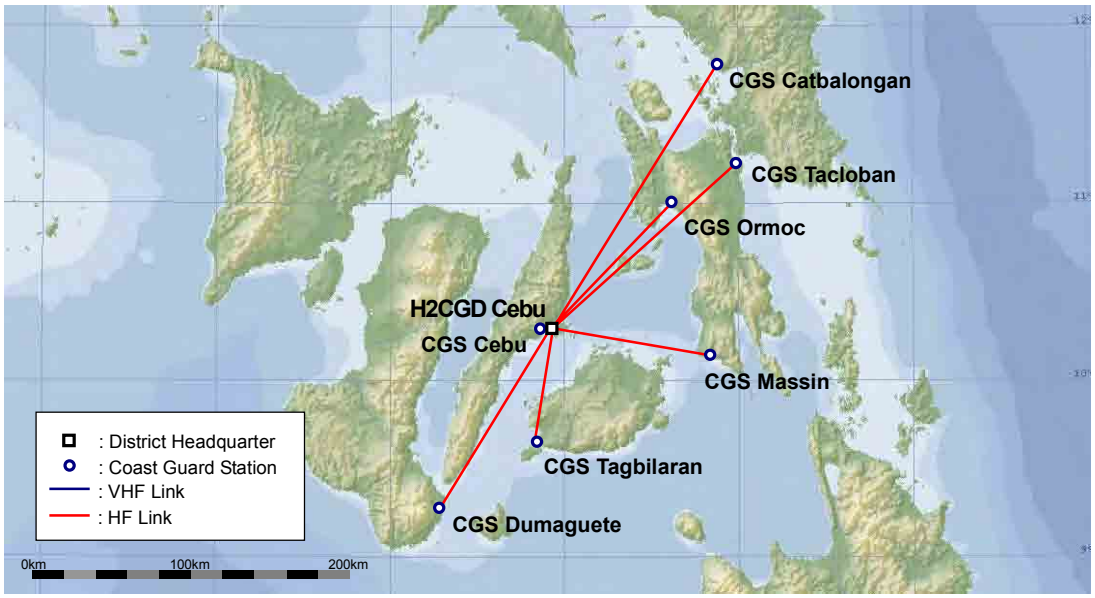
Site Location (Map of Philippines and VSAT Communication System)

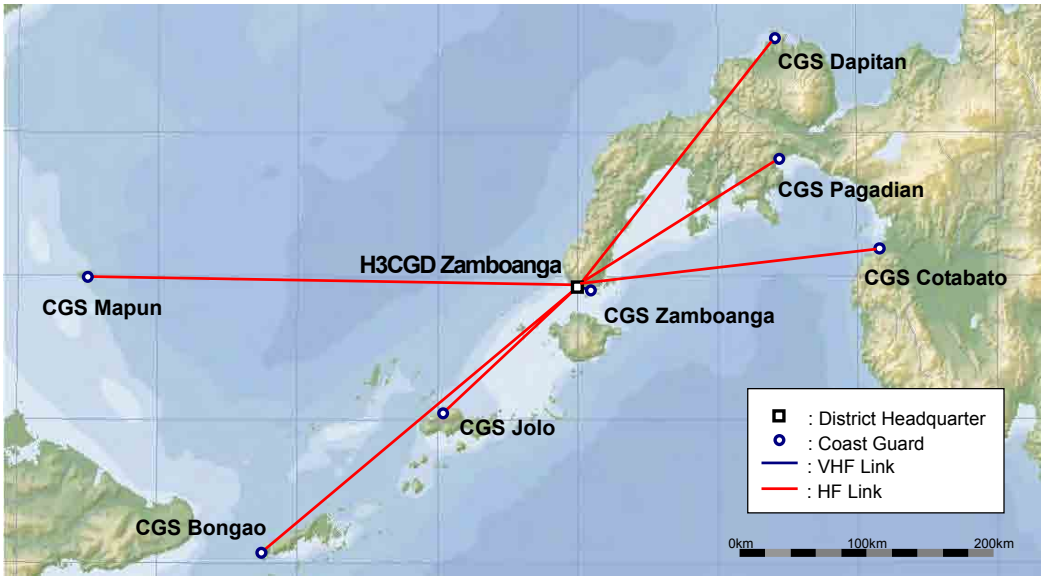
Site Location (Microwave Communication System in Manila)



H1CGD Manila

H2CGD Cebu





H3CGD Zamboanga

Site Location (VHF/HF Radio System at 3 CGDs)

LIST OF FIGURES & TABLES

ABBREVIATIONS

A/P	Authorization to Pay
B/A	Banking Arrangements
CGD	Coast Guard District
CGS	Coast Guard Station
DAMA	Demand Assignment Multiple Access
DOTC	Department of Transportation and Communications
DSC	Digital Selective Calling
E/N	Exchange of Notes
FM	Frequency Modulation
GMDSS	Global Maritime Distress and Safety System
GUI	Graphical User Interface
WCEISS	Weapons, Communications, Electronics and Information System Services
HF	High Frequency
HQ	Headquarters
IMO	International Maritime Organization
IP	Internet Protocol
ISPS	International Ship and Port Facility Code
ITU	International Telecommunication Union
ITU-R	ITU-Radiocommunication
ITU-T	ITU-Telecommunication Standardization Sector
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
L/A	Loan Agreement
(M)RCC	(Maritime) Rescue Coordinate Centre
NBDP	Narrow Band Direct Printing
NAVTEX	Navigation Telex
PTT	Press-to-talk
RR	Radio Regulations
SAR	Search and Rescue
SOLAS	Convention for Safety of Life at Sea
SSB	Single Side Band
TDM	Time Division Multiplexing
TDMA	Time Division Multiple Access
VAT	Value Added Tax
VHF	Very High Frequency
VSAT	Very Small Aperture Terminal

Chapter 1

Background of the Project

Chapter 1 Background of the Project

1-1 Current Situation and Problem for Subject Sector

1-1-1 Current Situation and Problem

The Republic of the Philippines is an archipelagic country consisting of some 7,000 islands. Sea transportation plays an important role for the nation's economy and social development. The sea surrounding the Philippines is also important as coastal shipping routes for international cargo vessels including Japanese oil tankers. Maritime safety at the area is indispensable to development of Philippine and other countries. However, due to its meteorological and geographical characteristics (i.e. subtropical monsoon, pan-pacific volcanic belt), natural disasters often cause serious damages to sea transport. Marine crimes, such as drug/arms smuggling, bomb fishing, and piracy, are recently increasing at the area. In addition, terrorist groups are becoming more active, enhancing relationships with outside organizations in neighboring countries. Such circumstances become noticeable issue for Japan, which depends 90% of oil transportation through coastal shipping route in the area.

The Philippine Coast Guard (PCG), an agency under the Department of Transportation and Communications (DOTC), performs search and rescue, safety administration, environmental protection, and low enforcement in the area. PCG have formulated the "15 Year Development Plan (15YDP)" in 2000 as executive guidance to enhance its organization for their functions. However, implementation of the plan is facing some difficulties due to shortage of budget and human resources.

Meanwhile, PCG's communication system currently relies on old equipment, which was introduced in past naval age, and SMS (Short Message Services) using staff's private cellar phone. Some of the PCG stations have radio communication equipment which operate only on a limited coverage or no longer operational. Precise and encrypted information, required for immediate and coordinated search and rescue operations, is not able to be transmitted quickly within the organization. In addition, the Manila Coast Station, consisting of Operation Centre, Transmitting (Tx) station and Receiving (Rx) station and having maritime distress communication system, is out of operational since the microwave circuit between those stations have been cut off by radio wave interference from mobile communication. Further, Asian countries has already established and shifted to GMDSS (Global Maritime Distress and Safety System, perfection execution since February 1999) from former Morse telegraph communication system, but the Philippines has not carried out this yet in the Asian countries.

1-1-2 Development Plans

Development plan of Philippine is established leading by the National Economic and Development Authority (NEDA). President Arroyo, who was re-elected with election in May 2004 (inauguration in January 2001, tenure after the re-electing: 6 years), has declared the 10-points Agenda for the next six years to the Cabinet Clusters. According as the Agenda, the NEDA published "Medium-Term Philippine Development Plan for the period 2004-2010" (MTPDP) in November 2004. In the MTPDP, PCG-related issue is mentioned as "Maritime safety and security will also be enhanced through the ratification of maritime safety and security related conventions".

In the PCG 15YDP, the PCG is tasked for "Materiel Acquisition and Technology Development" together with "Organizational Development", "Human Resource Development" and others. The 15YDP also represents the planned acquisition of suitable sea/air platforms and weapons,

communications, electronics and information systems (WCEIS), and states main objectives of (1) Enhancement of the distress signal monitoring, (2) Upgrade of the Coast Guard Communication System, etc., to support their five main functions. Communication equipment to be acquired in the Plan are as of VHF, MF and HF transceivers, NAVTEX transmitters, satellite communication COSPAS/SARSAT and INMARSAT systems, and etc.

(Demand and International Cooperation with Respect to International Treaty)

In 1979, the International Maritime Organization (IMO) decided to establish an automated, digitalized maritime communication system so-called Global Maritime Distress and Safety System (GMDSS) under the assistance of International Telecommunication Union (ITU). In 1988, the Conference of Contracting Governments to the 1974 SOLAS Convention on the GMDSS adopted amendments to the 1974 SOLAS Convention concerning radio-communications for the GMDSS, together with several relevant resolutions. These amendments entered into force on 1st February 1992, and the GMDSS shall be fully implemented on 1st February 1999. Basic policy of the GMDSS is to enable distress alerting to be performed not only ship-to-ship, but also ship-to-shore, and the initial alert is primarily transmitted in the ship-to-shore direction so that rescue operation starts immediately.

In April 2000, "International Conference of All Maritime Related Concerns, both Governmental and Private, on Combating Piracy and Armed Robbery against Ships" have been held between ASEAN10 plus related 7 countries and IMO at Tokyo, and assure their firm resolve to cooperate, devise and implement all possible measures to combat piracy and armed robbery against ships. In November 2004, "ASEAN-JAPAN Joint Declaration for Cooperation in the Fight Against International Terrorism" was passed on ASEAN-JAPAN summit. Based on the achievements of the above conferences, Japan has organized experts-level meetings involving coast guard agencies and also maritime policy authorities in Southeast Asia and neighboring countries. Meantime, Japan started Grant Aid Program for Cooperation on Counter-Terrorism and Security Enhancement to enhance security measures for countries concerned in Asia and other regions.

1-1-3 Socio-Economic Condition

The Philippines is a developing country with an agricultural base, light industry, and service-sector economy. Nominal GDP of Philippine in 2005 was 5,419 billion Pesos (98.3 billion US dollars), and real GDP growth rate registered 5%. Average GDP growth rate was in the range of 4.6 to 6.2% since year 2002. Real GNP per capita in 2005 was 1,232 dollars, grew by 5.6% against the previous year.

The real GDP in 2005 consists of 14.3% of primary sector, 32.3% of secondary sector and 53.4% of tertiary sector industries. The composition of work force by the above sectors is 35%, 15% and 50% respectively. High unemployment remains the country's single clearest indicator of a weak economy, averaging 11% of the labor force since 2002.

Meanwhile Philippines is a significant source of migrant workers. Overseas Filipino Worker (OFW) estimated 8 million have remitted $10million (which is equivalent to 10% of national GDP) to home within the year 2005, that becomes valuable source for acquisition of foreign currency.

Although the Government maintains fiscal discipline, the public sector's deficit remains the most significant macroeconomic imbalance due to its impact on debt sustainability. The deficit in the year 2002 reached P210.7 billion. Acknowledging that low revenue collection is a fundamental cause of the budget deficit, the Government conduct a package of measures to

increase tax revenues, consisting an increase in the basic VAT rate from 10% to 12%; re-imposition of a 3% franchise tax on telecommunications companies; adoption of gross income taxation for corporations and self-employed individuals; rationalization of fiscal incentives for investors; and indexation to inflation of excise taxes on alcohol, tobacco, and petroleum products, among other measures. In a favorable consequence, the deficit in 2005 was improved by P146.8 billion (2.7% of GDP). External debt of US$57.4 billion (70% of GDP) in 2003 was slightly reduced by US$55.4 billion as of March 2005.

1-2 Background of Request for Grant Aid

To solve current problem described in Section 1-1-1, the Government of the Philippines made a request for Grant Aid for the Project for PCG Communications System Capability Enhancement on Maritime Safety & Security (the Project) to the Government of Japan in 2003. In response to the request above, the Government of Japan dispatched Preparatory Study Team from February to March 2005. Continuously, Basic Design Study Team was dispatched from Grant Aid Management Department of Japan International Cooperation Agency (JICA) from June to July 2006, and in October 2006.

1-3 Japanese Assistance to the Marine Transportation Sector

Japan has traditionally placed a high priority on its diplomacy with Asia, and the Official Development Assistance (ODA) Charter designates Asia as a priority region. Philippines in particular have a close interdependent relationship with Japan in all aspects including politics, economy, and culture. Japan continues to support economic infrastructure developments for the Philippines through ODA, and facilitates private-sector investments and trade through means such as enhancing economic partnerships.

On the basis of studies and research concerning development conditions and tasks in the Philippines and its development plans, as well as policy dialogues between Japan and the Philippines, Japan has given priority to assistance in the following areas; 1) Strengthening of the economic structure for sustainable growth and the removal of impediments; 2) Mitigation of disparities; 3) Environmental conservation and disaster management; and 4) Human resources development and institution building.

Japan has provided following assistance to the Philippines in marine transportation sector.

Table 1-3-1 Technical Assistance Project

Fiscal Year	Project	Grant Amount (million Yen)	Description
2002 - 2007	Human Resources Development Project	600 (actual)	Long Term Experts：5 persons（Chief, Maritime Environmental Protection / Oil Pollution Response, Maritime Distress/ Navigation Safety, Low Enforcement, Project Coordination） Short Term Experts： 4-5 persons/year

Table 1-3-2　Loan Project

Fiscal Year of E/N	Project	Amount (million Yen)	Description
1989 – 1996	Maritime Telecommunication System Development Project	2633	Constriction of Mania Coast Station （Operation Centre, Tx and Rx Stations）
1991– 1994	Maritime Safety Improvement Project（I）	3516	Rehabilitation of 29 existing lighthouses along with Manila-Cebu route
1995– 2001	Maritime Safety Improvement Project（II）	5579	Installation of beacons at Visaya region, Construction of　buoy base （Cavite）, and Procurement of buoy tender

Since the East Asian financial crisis of the late 1990s, the Government of Philippines has maintained fiscal discipline under the guidance of the IMF. As the result, No Japanese loan aid was requested by Philippine from 2003 to 2005 and some committed loan aid projects were cancelled.

Japan grant aid project, except for emergency aid, is also deferred from 2004 up to the end of 2005 owing to such situation that the Philippine government have failed to refund the VAT collected from the contractors and consultants involved in grant aid projects. After the situation had been improved; 85% of VAT was refunded to Japanese contractors, the grand aid program was resumed recently.

1-4 Assistance by Other Donors

Other donors have provided following assistance to the Philippines in marine transportation sector.

Table 1-4-1 Projects Executed by Other Donors

Year	Donor	Project	Amount (Thousand US$)	Type of Aid	Description
1993	England	Lighthouses Development Project	_	Grant	Construction of 122 lighthouses
1998	France	GMDSS Development Project *)	17,390	Loan	Installation of GMDSS equipment at 19 coast stations 〔Suspended since July 2000〕
2003 - 2004	Australia	Procurement of Search and Rescue Vessels	68,400	Loan	Procurement for 2 SAR vessels (180 ft class) and 4 SAR vessels (115 ft class)

Note *) GMDSS Development Project

To comply with the Safety of Life at Sea (SOLAS) Convention amended in 1988, the DOTC have made a construction contract between French Contractor to develop GMDSS financed by France Loan Aid in 1998. Although the Project aimed to complete by January 2000, the Project have been suspended due to dispute based on various claims by the Contractor since 2000.

Though all GMDSS equipment for the Project was brought to each construction site, most of equipment still remains in containers at the Site. The equipment in the containers seems no longer use due to leave in hot and humidity condition during 6 years. The progress and resolution of dispute between the DOTC and French Contractor is obscurity at present.

Currently, the United States and Australia support the Philippine for counter-terrorism. But both nations' supports are mainly provided in terms of technical assistance for Defense Department, Custom, and Maritime Drug Enforcement Centre. Thus, there is no overlap between these assistances and this aid Project.

Chapter 2

Contents of the Project

Chapter 2 Contents of the Project

2-1 Basic Concept of the Project

2-1-1 National Policy and Objective of the Project

In "Medium-Term Philippine Development Plan for the period 2004-2010" (MTPDP 2004-2010) issued in November 2004, PCG-related issue is mentioned as "Maritime safety and security will also be enhanced through the ratification of maritime safety and security related conventions".

PCG has formulated the "PCG 15 Year Development Plan (PCG 15YDP)" in 2000 for "Materiel Acquisition and Technology Development" together with "Organizational Development", "Human Resource Development" and others. PCG is going to enhance distress signal monitoring system, upgrade coast guard communication system, etc. in line with the 15YDP.

The Study Teams formulated the framework of the Project through a series of discussions, and confirmed the National Policy and Objective of the Project as follows.

National Policy

To establish an effective and efficient disaster management system in the Philippines to respond for rescue, security and counter to terrorism at sea.

Objective of the Project

To improve the communications situation of the Philippine Coast Guard and enhance search & rescue activities including counter to terrorism in the Philippines by procuring and upgrading communication equipment.

2-1-2 Outline of the Project

The Project aims to supply and install communication equipment for Recipient (Implementing Agency): Philippine Coast Guard in order to achieve the before-mentioned objective of the Project. Components of the Project consist of four major systems listed below.

The Project Sites by each component are shown in Table below.

Table 2-1-1 Aid Components and the Sites

Component (Systems)	Project Site	Remarks
VSAT Satellite Communication System		
HUB Station (1 stn.)	Operation Centre	
Fixed Station (9 stn.)	H2CGD Cebu, H3CGD Zamboanga, H4CGD Palawan, H5CGD Batangas, H6CGD Iloilo, H7CGD San Fernando, H8CGD Davao, H9CGD Legaspi, H10CGD Cagayan de Oro	
Transportable Station (1 stn.)	Operation Centre	
Microwave Communication System		
(6 stn.)	Headquarters, Operation Centre, Transmitting Station, Receiving Station, Sangley Point, H1CGD	
VHF/HF Radio System		
	CGSs in H1CGD Manila: Manila, Pasig, Raguna de Bay, Corregidor, PSCC Manila, Subic	
	CGSs in H2CGD Cebu: Cebu, Tagbilaran, Dumaguete, Ormoc, Maasin, Tacloban, Catbalogan	
	CGSs in H3CGD Zamboanga: Zamboanga, Dapitan, Pagadian, Mapun, Jolo, Bongao, Cotabat	
(3 + 20 stn.)	(3 HCGDs + 20 CGSs)	
(1 stn.)	Operation Centre	Add to VSAT Trans-portable station
Manila Coast Station (Rehabilitation)		
(3 stn.)	Operation Centre, Transmitting Station, Receiving Station	Equip RCC console in PCG Headquarters

Note: Manila Coast Station consists of Operation Centre, Transmitting Station, and Receiving Station

2-1-3 Outcomes Expected

Table 2-1-2 shows expected outcomes by implementation of the Project.

Table 2-1-2 Outcomes by the Project

Current Condition	After Implementation
1. Communication between Headquarters and CGDs	
• Unstable connection by HF transceiver. SMS (short message service) by personal mobile phones communication	• A dedicated line connects PCGHQ with all CGDs by introducing VSAT system / Microwave system. The line is stable, has sufficient capacity, and concealed.
2. Communication between CGD and CGSs	
• Old and unreliable VHF or HF equipment, or no communication equipment in CGSs • No encrypted talk function, not suitable for precise and/or intelligent information	• Heavy duty transceiver provides reliable and qualified communication. It has concealed talk function suitable for precise and/or intelligent information.
3. Manila Coast Station	
• Radio interference disables 2GHz microwave link between Operation Centre and Transmitting/Receiving Stations. • MF/HF wave is inactive because of the above. Coast station function is lost. • Distress and safety communication system have been transferred from Morse code to GMDSS in the world, but current PCG's system does not comply.	• 7.5GHz link enable transmission of voice, PC data, signal, and commands. Manila Coast Station is restored consequently. Restoration is done by GMDSS compliant equipment. NAVTEX broadcast also begin.

2-2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

2-2-1-1 Requested Components

Requested components of the Project are reviewed and revised by each phase as shown in Table 2-2-1.

Table 2-2-1 Requested Components of the Project

Phase / System	May 2003 (Original)	May 2003 (Requested)	March 2005 (Agreed at Preparatory Study)	June 2006 (Additional)
VSAT (HUB)	PCGHQ (1 stn)	PCGHQ (1 stn)	Ope Centre. (1 stn)	
VSAT (Fixed)	10 PCGs (10 stn)	H1CGD, H2CGD, H3CGD (3 stn)	9CGDs (9 stn)	
VSAT (Transportable) **<Trunk link>**	Manila (1 stn)	Manila (1 stn) (with Repeater)	Manila (1 stn) **[Priority A]**	+ VHF (1 set)
7.5GHz Microwave System **<Trunk link>**	None	None	Ope Centre, Tx Station, Rx Station, PCGHQ, Sangley Point, H1PCG (6 stn) **[Priority A]**	+ Repeating Station (1 stn)*
VHF/HF System **<Spur link>**	VHF: 10 CGDs, 52 CGSs, 145 CGDets, (207 stn) Repeater (65 stn) HF: Isolated CGSs & CGDets	VHF: H1,2,3CGDs, 19 CGSs, 65 CGDets (87 stn)	VHF: H1,2,3 CGDs 7 CGSs (10 stn) HF: H1,2,3 CGDs, 12 CGSs (15 stn) **[Priority-B]**	+ CGS Cotabato (1 set)
Rehabilitation of Manila Coast Station	Upgrading to GMDSS System (Ope Centre, Tx Station, Rx Station)	None	Upgrading to GMDSS System (Ope Centre, Tx Station, Rx Station **[Priority A]**	
Air band VHF/HF	VHF: PCGHQ, 10 CGDs, Major CGSs	None	VHF&HF: Air Base (1 stn) **[Priority C]**	+ Marine band VHF (1 set)

Note: * Repeating Station of the Microwave System was withdrawn by PCG himself at the time of discussion on Explanation of Draft Report in October 2006.

Aid Components and Project Sites were decided based on following considerations;

1) VSAT Communication System

Three (3) nos. of Coast Guard District offices had been requested as the Sites where VSAT communication system are to be installed, when the application for Japan's Grant Aid was submitted by PCG. The JICA Study Team recommended to install VSAT communication system to all (10 Nos.) Coast Guard District offices by the Project for reasons that;

- Required frequency band wide of satellite transponder for VSAT system, which is currently available enough for all GGSs, seems to be fully occupied by others in the future;
- VSAT System as backbone communication system should be totally installed in nationwide to avoid regional differences of SAR operation. Limitation of accessibility and certainty to required information due to lack of backbone communication will lead CGDs to imbalance of respective quality and serviceability.

2) Microwave Communication System

In Metro Manila, there are main functions of PCG, such as Headquarters, Manila Coast Station (Operation Centre, TX Station, and RX Staiton), ANC Center (Sangley Point), and Manila Coast Guard District. Microwave communication system will be introduced as backbone communication system between such main functions to meet one of main objectives; communication facilities solely dedicated for maritime safety & security for monitoring and disaster response operation of maritime accident. Restoration of microwave link at Manila Coast Station is essential for the Project.

3) VHF/HF Radio System

VHF/HF radio system should be also provided to all stations belonging to each CGD as same as VSAT systems. Meanwhile, the cost of equipment for the system is relatively reasonable for procurement by PCG's own budget. Thus, the scope of the Project merely cover for three CGSs, i.e., Manila, Cebu, and Zamboanga, where high priority was given in the view of importance of the area;

- Maritime disaster is generally occurring in the coastal and offshore waters where have large volume of vessel traffic. Table 3-2-2 showing 70% of sea passenger traffic originates from NCR (Manila) and Central Visayas (Cebu), indicates importance of the area for SAR operation;
- Manila and Cebu are the two defined metropolitan areas in the Philippines. Both are the political, economic, social, and cultural centre of the Philippines, and are likely to be a target of terrorism;
- Much unlawful incidents, or terrorist activities occur at CGD Zamboanga area, i.e., Moro Gulf, part of the Celebes Sea, and the Sulu Sea, where are considered as the pirates and terrorists' most intensified operational area in the Philippine.

An additional HF transceiver for Cotabato Coast Guard Station was requested by PCG on first visit of Study Team since the station is recently activated for their function.

A VHF transceiver is also provided for use with VSAT transportable station. VSAT transportable station will be deployed at disaster area. But, the equipment will be put on open space near the disaster area, not in action field of disaster scene. VHF transceiver will establish communication between VSAT station and the action field.

Table 2-2-2 Sea Passenger Traffic for Long and Short Distance

Short Distance Sea Passenger

		2001	2009	2024
NCR	NCR+3+4A	462,074	796,780	1,696,397
3		71,803	110,742	277,179
4A		3,434,249	5,113,704	10,084,181
4B	Southem Tagalong	2,122,977	3,124,358	5,996,324
5	Bicol	2,742,515	5,189,259	12,807,037
6	Westem Visayas	4,890,230	7,398,350	13,676,488
7	Central Visayas(CEBU)	16,360,906	21,422,742	35,703,036
8	Eastem Visayas	3,783,133	6,231,742	13,353,773
9	Westem Mindanao	5,068,594	7,704,628	17,623,691
10	Northem Mindanao	4,648,268	5,059,284	6,641,322
11	Southem Mindanao	355,378	1,230,043	5,081,549
12	Central Mindanao	2,621,431	3,638,717	6,825,001
13	Caraga	1,621,304	2,851,735	6,051,963
ARMM	ARMM	0	3,379,413	7,521,676
	Total	48,182,862	73,251,497	143,339,617

Long Distance Sea Passenger

		2001	2009	2024
NCR	NCR+3+4A	3,435,663	4,810,256	6,447,018
4B	Southem Tagalong	84,550	118,377	158,657
5	Bicol	9,575	13,406	17,967
6	Westem Visayas	637,532	892,606	1,196,329
7	Central Visayas(CEBU)	1,302,080	1,823,036	2,443,351
8	Eastem Visayas	108,939	152,525	204,424
9	Westem Mindanao	175,793	246,128	329,876
10	Northem Mindanao	676,583	947,281	1,269,607
11	Southem Mindanao	962,996	1,348,286	1,807,061
12	Central Mindanao	66,172	92,647	124,171
13	Caraga	155,050	217,085	290,952
	Total	7,614,933	10,661,632	14,289,414

4) Rehabilitation of Manila Coast Station

The GMDSS, which is an internationally agreed-upon set of safety procedures, types of equipment, and communication protocols, have not been implemented by PCG. Introduction of GMDSS is possible to provide maritime communication network for timely delivery of distress and safety communications and warnings between coast station and ships at the sea.

Fortunately, some equipment and facilities at Manila Coast Station, which is established by Japan Loan Aid of former JBIC (OECF), is still in operational, efficient utilization of such equipment for GMDSS is most favorable for both Donor and the Recipient.

The IMO introduced Digital Selective Calling (DSC) on MF, HF and VHF maritime radios as part of the GMDSS system. The DSC distress alerts, which is distinguished by the nature of 10 Distress options; Fire; Flooding; Collision; Grounding; Capsizing; Sinking; Adrift; Abandoning ship; piracy; and man overboard, are generally recognized as useful function for counter-terrorism.

5) Airband VHF/HF

Since only a VHF transceiver is equipped as communication equipment at Coast Guard Aviation Base (CGAB) at present, CGAB often loss the communication with the aircraft on long-range surveillance. Such situation is undesirable in terms of efficiency of surveillance and risk of missing its aircraft/helicopter, and to be solved as soon as possible. CGAB should have an airband HF and a VHF transceivers at least.

However, VHF/ HF transceivers for CGAB listed as Priority-C have not been recognized as the essential equipment of this PCG communication system Project, and it seems to be possible to be procured by PCG's own budget.

All systems, equipment and structures for the Project are designed in accordance with the following policies.

2-2-1-2 Policy on Environmental Aspect

Environmental aspect to be considered for building/structural design, such as frequency of typhoon, earthquakes, and wind conditions, is described in National Structural Code of the Philippines (NSCP). All steel structures for the Project, such as antenna tower and pole, should comply with NSCP. Wind Load to the structures should be calculated based on wind velocity of 55 m/s at Manila in the NSCP. All exposed surface of steel structure should be finished by hot-dipped galvanization to endure seashore condition.

Erection of four (3) antenna towers at PCGHQ, H1CGD and Sangley Point (ANC Operation Office) is required. A steel antenna pole for Sangley Point will be erected at the roof of the building. Meanwhile, pile foundations are required for cylindrical tower and 4-legs angle tower at PCGHQ and H1CGD due to poor soil conditions known from past geological data around the Sites and soil investigation (boring test) executed under this JICA Study at the Sites.

2-2-1-3 Policy on Socio-economical Aspect

Since all Project Sites are located within property of PCG or Philippine Government, no socio-economic impact to inhabitants is expected. No other serious socio-economic impact such as changes of land property line, emission of chemical harmful substance or construction of large scale infrastructure is conceived

On the other hand, many squatters have currently occupied large space of antenna yard at Manila Tx Station in Taguig. It is mandatory for rehabilitation of existing facilities and for activation of the transmitting function and protection of human life from high-tension voltage at the Site to keep them away from operational antenna yard. For such purpose, PCG has planned and started to undertake: 1) Scheduled security patrol, 2) Construction of security posts (barracks) and 3) Construction of barbed wire fence. PCG should continue to provide appropriate security measures for the Site to maintain operational condition of antennas in future.

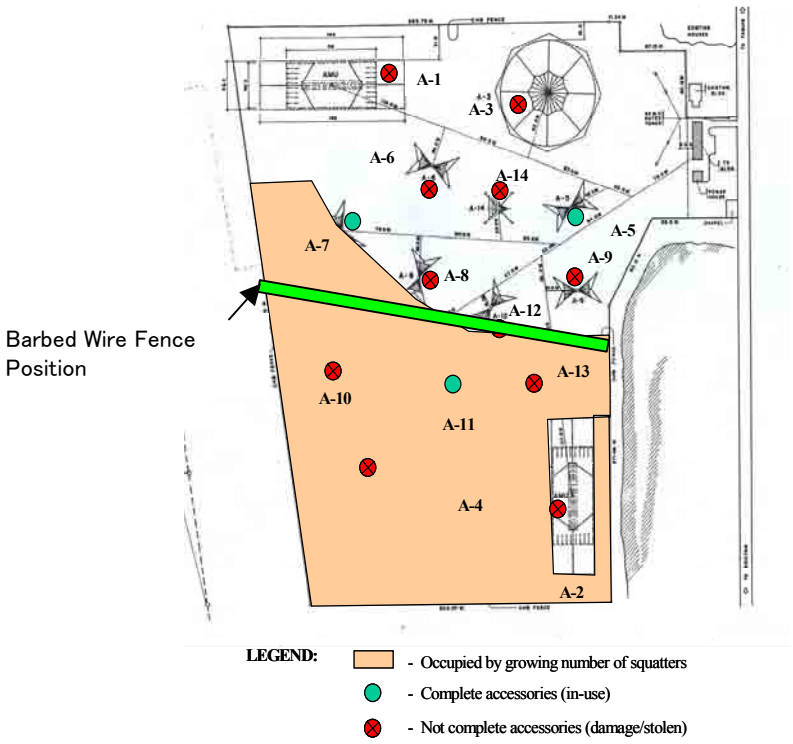


Figure 2-2-1 Occupied Area by Squatters in November 2006 and Fence Position

2-2-1-4 Policy on Introduction of Local Contractors, Materials and Equipment

There are some experienced local contractors in telecommunication construction field in Philippines. There are also steel fabricators having technical advisor from Japanese company, and no difficulties to procure construction materials in Philippines. It is assumed in project cost estimate that construction material and auxiliary equipment available in local market will be fully utilized as far as possible, and all equipment installation will be carried out by local contractor.

Main communication equipment for the Project should be procured from Japanese manufactures. Some auxiliary equipment and construction materials will be also procured in Japan, depending on Supplier's option.

2-2-1-5 Policy on Operation and Maintenance

Since the operation of 2GHz microwave link at Manila Coast Station, which was transferred from DOTC to PCG in 2002, was suspended due to frequency interference by public mobile communication system, PCG does not have sufficient experience of microwave communication system operation. Although VHF/HF radio communication system is very familiar with PCG staff, both VSAT and GMDSS systems are the first introduction for PCG's communications system. Considering above situation, provision of basic operation and maintenance trainings (initial instructions) by manufacture's engineer for these systems are included in the scope of the Project.

Further to the basic training program, JICA Study Team realizes importance of advanced/ theoretical training in operation and maintenance of above new systems for sustainable operation. However, provision of such training is excluded from scope of the Project because advanced training generally requires long-term period of half-year approximately, and project period of grant aid scheme applied for the Project is not able to cover such training period. Thus, the advanced training program should be provided by different assistance scheme such as Technical Assistance Project by JICA.

2-2-1-6 Policy on Grade of Equipment

All equipment provided by the Project is of standard grade. All equipment and installation work should comply with international and/or Philippine standards, i.e., ITU, EIA, JIS, NSCP, PEC and/or equivalent.

2-2-1-7 Policy on Schedule Planning

For development of implementation schedule, parallel works for installation and adjustment at plural Sites are assumed so as to shorten project period as much as possible. Communication engineer for basic training at the Site in provincial area is planned to be the same engineer for adjustment and testing of the system to save the time for his transportation.

Required period for design, manufacturing, and testing of systems is set out based on manufacture's recommendation. Other required periods for transportation, installation, and adjustment of equipment are also set out based on estimation by the companies concerned.

2-2-2 Basic Plan (Equipment Plan)

2-2-2-1 Overall Plan

1) VSAT Communication System

VSAT system is installed as trunk link communication system connecting between PCG Operation Centre at Manila to nine (9) CGDs at provincial area. Operation Centre will function as VSAT HUB station that controls and manages the whole circuit of the system as well as fixed VSAT stations including Transportable station. Transportable VSAT, which is used for disaster field or emergency on fixed station failure, will be stationed at Operation Centre.

Satellite system can be selected from two prevailed systems; i.e., C-band or Ku-band. The comparison of two systems is shown in Table 2-2-3.

Table 2-2-3 Comparison of Satellite System for the Project

Provider	MABUHAY SATELLITE		SINGTEL	
Origin Country	Philippine		Singapore	
Branch Office	Manila		Manila	
Satellite Name (Position)	Agila 2 (146° E)		ST-1 (88° E)	
Frequency Band	C-band	Ku-Band	C-band	Ku-Band
Transponder Range	36MHz	36MHz	36MHz	54MHz
Equivalent Isotropically Radiated Power（EIRP）	42dBW	55dBW	41dBW	49dBW
Required Antenna Diameter (Objective availability 99.8%)	HUB: 3.8m ϕ Fixed: 2.4m ϕ Transp. 2.4m ϕ	HUB: 2.4m ϕ Fixed: 1.8m ϕ Trsnsp. 0.9m ϕ	HUB: 3.8m ϕ Fixed: 2.4m ϕ Transp. 2.4m ϕ	HUB: 3.6m ϕ Fixed: 2.4m ϕ Transp. 1.2m ϕ
Equipment Cost (HUB x 1, Fix x 9 + 1)	¥ 265 M	¥ 204 M	¥ 265 M	¥ 231 M
Transponder Lease Cost (1.5MHz)	US$3,750/M (US$45,000/Yr)	US$3,300/M (US$39,600/Yr)	US$5,400/M (US$64,800/Yr)	US$4,800/M (US$57,600/Yr)
Sustainability of Satellite	Launched: 1997 Life Period: 15yr (until 2012) Next launch: Under planning		Launched: 1998 Life Period: 12yr (until 2010) Next launch: Under planning	
Conclusion		**Recommendable**		Alternative

As the result of the comparison, MABUHAI's Ku-band system is most economical and recommendable to be employed for the Project. SINGTEL's Ku-band is selected as an alternative due to high initial cost for large size antenna. In general, maintenance cost is in proportion to initial cost of equipment, and construction cost is exponentially in proportion to antenna size. Thus, Ku-band is preferred in terms of maintenance/construction cost saving. Further, antenna of Ku-band's transportable VSAT is practical size for transportation by manpower in contrast to 2.4 m size of C-band antenna.

Reliability objective for satellite link is set out as follow:

Circuit Design Objective for Satellite Link (Targeted Availability)

HUB Station – Fixed Station: 99.8% (inoperative 17.5 h/year)
HUB Station – Transportable Station: 99.5% (inoperative 43.8 h/year)

99.8% reliability of the circuit (targeted availability) shown in above is based on recommended values of Japan Telecommunications Technology Council, since ITU has no specified figure of the rate for private circuit.

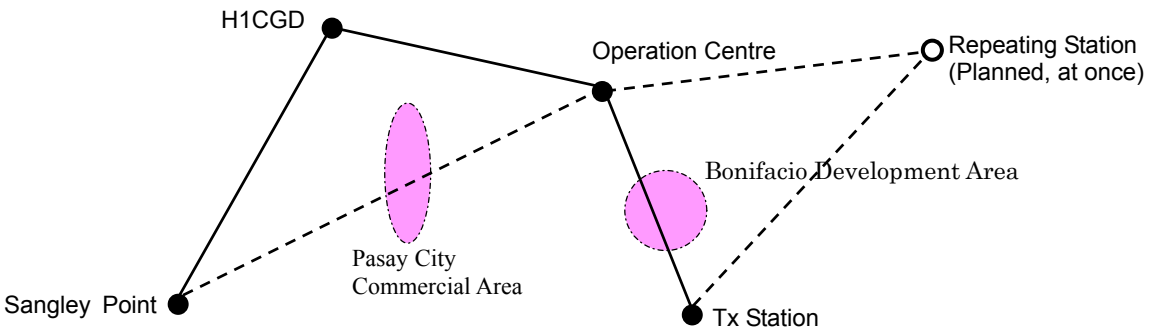
Circuit availability (operational rate) of Ku-band mostly depends on rainfall conditions, and the rates shown above are calculated as accumulated value of a year with 24 hours-operation per day. Hence, interruption of communication will happen very little in actual operational conditions.

2) Microwave Communication System

7.5GHz microwave system is introduced as trunk link system too, connecting between Operation Centre to PCGHQ, Tx Station, Rx Station, Sangley Point and H1CGD.

Although radio path between Operation Centre and Tx Station is currently free from obstacles, the radio path is probable to be interrupted by high-rise buildings at Bonifacio Development Area in the near future. JICA study team accordingly has recommended to construct a Repeating Station between Operation Centre and Tx station to secure the radio path from now on. However, PCG informed JICA Study Team, at the time of discussion on Explanation of Draft Basic Design in October 2006, of their intention to exclude the Repeating Station from scope of the Project, and guaranteed that the Philippine side will establish a repeating station by themselves in case the microwave path is interrupted by such high-rise buildings.

Instead of radio path between Operation Centre and Sangley Point, radio path between H1CGD and Sangley Point is set out so as to avoid going through seaside area of Pasay City, where high-rise building constructions are expected in the future.



Targeted circuit reliability (operational rates) of the Microwave System is determined considering connectivity with public network and in accordance with recommendation of ITU-R (F1493): Access Portion (not more than 250 km);

Circuit Design Objective for Microwave Link (Targeted Availability)

For each path, Interruptive probability of BER10^{-6}: 0.002% (inoperative 10.5 min/year) or less

Required antenna size for each radio path is listed in Table 2-2-4.

Table 2-2-4 Required Antenna Size of Microwave System

Route/ Distance	Ope Centre – H1CGD 7.9 km H1PCG – PCGHQ 2.0 km PCGHQ – Sangley Point 12.2 km	Ope Centre – Rx Station 31.9 km
Frequency Band	7.425 – 7.725 GHz	
Transmission Capacity	34 Mbps	
Required Circuit Quality	Interruptive Probability of BER10^{-6}: 0.002% / year.path or less	
Transmitter Power	27 dBm	27 dBm
Receiver Threshold Level	-81.0 dBm (for BER10^{-6})	-81.0 dBm (for BER10^{-6})
Required Antenna Gain (Antenna Diameter)	29.8 dBi (0.6m ϕ w/ radome)	36.0 dBi (1.2m ϕ w/ radome)

3) VHF/HF Radio System

VHF/HF system is installed as spur link between CGD and CGSs or CGDets. VHF or HF transceivers are provided by the Project to H1CGD, H2GGD, H3CGD and CGSs belonging in those of three (3) CGDs.

All VHF/HF transceivers procured under the Project should have conversation privacy with voice encryptor or similar in respect of its usage for maritime safety and security operations.

4) Rehabilitation of Manila Coast Station

The Project will provide required consoles, transceivers and equipment enabling for GMDSS operation with efficient utilization of the existing equipment such as transmitters and antennas at Manila Coast Station. Namely, NAVTEX broadcasting, a digital selective calling (DSC), narrow-band direct printing telex (NBDP) are additionally introduced to provide such GMDSS services.

Manila Coast Station is also enhanced to work as backup communication system when VSAT System fails.

2-2-2-2 Equipment Plan

Major equipment, its purpose, function and quantities provided by the Project are listed in Table 2-2-5. Quantity of equipment by each Site appear in Annexed Table-1 through Annexed Table-5 of Appendix "Reference Drawings". Specifications of the major equipment are shown in Table 2-2-6.

Table 2-2-5 Major Equipment List

No.	Equipment	Purpose of Use	Main Function	Qty
1.	**VSAT Communication System**			
1.1	HUB Station's Equipment	To establish satellite communication links with VSAT stations (Fixed and Transportable), and to control/supervise the VSAT stations remotely. To be placed at Operation Centre.	• IP Transmission function • Remote control & supervisory function • Demand Assignment Multiple Access control function	1
1.2	Fixed Station's Equipment	To establish a link with HUB station. To be placed at 9 CGDs (from H2CGD to H10CGD).	• IP Transmission function • Remotely controlled and supervised function	9
1.3	Transportable Station's Equipment	To establish a link with HUB station. To be deployed at a place where distress, accident or disaster happens, and at Fixed station if it in failure. But usually, to be stored at Operation Centre.	• IP Transmission function • Remotely controlled and supervised function • Transportable function	1
1.4	Exchange (PABX)	To exchange telephone lines of VSAT and Microwave systems, and to connect with the existing PABX in PCGHQ to enable to enter public telephone network. To be placed at PCGHQ.	• Analogue telephone exchange function • Public network connection function • VoIP function	1
2.	**Microwave Communication System**			
2.1	7.5GHz Antenna (1.2mΦ)	Antenna for Microwave system, used in the section between Ope. Centre and Rx Station.	• Radio wave sending/ receiving function	2
2.2	7.5GHz Antenna (0.6mΦ)	Ditto, used in the links other than the above.	• Ditto	8
2.3	7.5GHz Multiplex Radio Equipment	To transmit/receive multiplex signals by one microwave radio signal. To be placed at the planned 6 microwave stations in Manila.	• Multiplex of signals and microwave communication function	10
2.4	Tower–A (62M angle)	Antenna tower for microwave antenna To be erected at H1CGD (Manila).	• Antenna support function	1
2.5	Tower–B (32M cylinder)	Ditto, to be erected at PCG Headquarters.	• Ditto	1
2.6	Tower–C (12M mast)	Ditto, to be erected at Sangley Point.	• Ditto	1
3.	**VHF/HF Radio System**			
3.1	VHF Transceiver (for spur link)	To establish link with CGSs under H1CGD, H2CGD, H3CGD by encrypted voice communication system.	• Voice communication function by VHF FM • Encrypted voice communication function	10
3.2	VHF Transceiver (for Transportable VSAT)	To establish link between transportable VSAT deployed place and the distress, accident or disaster point. Stored at Ope Centre usually.	• Ditto • Transportable function	1
3.3	HF Transceiver	To establish link with CGSs under H1CGD, H2CGD, H3CGD by encrypted voice communication system.	• Voice communication function by HF SSB • Encrypted voice communication function	16

Table 2-2-5 (Continued)

No.	Equipment	Purpose of Use	Main Function	Qty
4.	**Rehabilitation of Manila Coast Station**			
4.1	VHF Transceiver	To provide GMDSS service for A1 sea area. To be placed at Operation Centre.	• DSC/NBDP communication function • Voice communication function by VHF FM	1
4.2	Voice/PTT Matrix Equipment	To switch voice/PTT signals for Tx and Rx stations and VHF equipment. To be placed at Operation Centre.	• Voice/PTT switching function	1
4.3	MODEM Equipment	To modulate/demodulate DSC/NBDP/ NAVTEX signal and supervisory/control signals for equipment at Tx and Rx stations. To be placed at Operation Centre.	• Signal/Voice modulate and demodulate function	1
4.4	Management Consol	To manage equipment by PC-based console. To be placed at Operation Centre.	• Equipment manage, control and supervisory function	1
4.5	Management/ Telephone Consol	To manage equipment and operate radio telephone communication on HF/VHF by PC-based console. To be placed at Operation Centre as a sub-console of Management Consol.	• Equipment manage, control and supervisory function • Radio telephone operation function	1
4.6	Telephone Consol	To operate radio telephone communication on HF/VHF by PC-based console. To be placed at Operation Centre.	• Radio telephone operation function	1
4.7	DSC/NBDP Consol	To operate DSC, NBDP communication on HF/VHF by PC-based console. To be placed at Operation Centre.	• DSC/NBDP operation function	2
4.8	NAVTEX Consol	To operate NAVTEX and edit NAVTEX message by PC-based console. To be placed at Operation Centre.	• NAVTEX text editing and NAVTEX operation function	2
4.9	NAVTEX Monitor Equipment	NAVTEX receiver. To be placed at Operation Centre.	• NAVTEX radio wave monitoring function	1
4.10	5 kW MF Transmitter	To transmit NAVTEX broadcasting signal. To be placed at Tx Station.	• MF radio wave transmitting function	1
4.11	MODEM Unit	To interface and modulate/demodulate various signal from Operation Centre to new and the existing MF/HF transmitters. To be placed at Tx Station.	• Signal/Voice modulate and demodulate function	5
4.12	MF/HF Receiver	To receive DSC, NBDP, voice signals for GMDSS communication system. To be placed at Rx Station.	• Signal/Voice receiving function	1
4.13	RCC Console	To operate RCC by PC-based console. To be placed in Action Centre room at PCG Headquarters.	• Radio system supervisory function • Radio telephone operation function • DSC/NBDP operation function • NAVTEX editing function	1

1) VSAT Communication System

For the VSAT Communication System, five (5) IP modems are designed to be furnished at HUB station for simultaneous connection to 5 Fixed stations with assumed transmission speed of 128kbps x 2CH + 64kbps x 3 CH. Meanwhile Fixed station and Transportable station are designed to have one (1) 128 kbps or 64kbps modem CH, respectively.

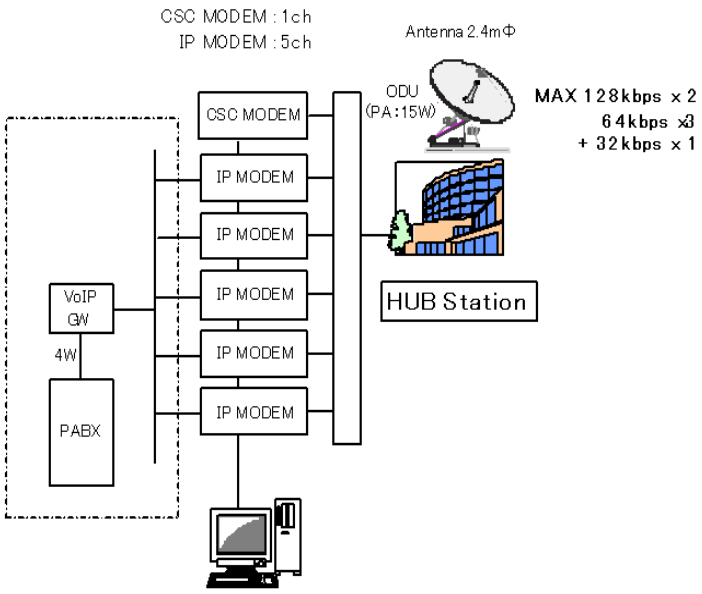


Figure 2-2-2 HUB Station System Diagram

When a connection between Fixed and Fixed/Transportable stations is required, the link is established through HUB station. In this case, two (2) modems at HUB station will be occupied simultaneously for this link establishment.

For design of telephone terminal in this VSAT System, ordinary analogue telephone set is to be employed considering possible usage without electric power and an affinity to existing telephone system. Hence, VoIP gateway is installed at each HUB, Fixed or Transportable station.

PABX of the telephone system is installed at PCGHQ.

2) Microwave Communication System

As shown in Project Location Map, Operation Centre (3-directions) and H1PCG (3-directions) are branching station type. Others, i.e., PCGHQ, Tx Station, Rx Station and Sangley Point are the terminal type.

3) VHF/HF Radio System

Equipment of the System and the Site to be implemented by the Project are shown in Table 2-2-6.

Table 2-2-6 List of VHF/HF Radio Equipment and the Sites

Equipment	Qty	Location			
VHF	10	CGD	Manila	Cebu	Zamboanga
		CGS/GGDet	Manila	Cebu	Zamboanga
			Pasig		
			Laguna de Bay		
			Corregidor		
			PSCC Manila		
	1	Ope. Center	Disaster Site (with Transportable VSAT)		
HF	16	CGD	Manila	Cebu	Zamboanga
		CGS/GGDet	Subic	Tagbilaran	Daputan
				Dumaguete	Pagadian
				Ormoc	Mapun
				Massin	Jolo
				Tacloban	Bongao
				Catbalongan	Cotabato

4) Rehabilitation of Manila Coast Station

As the result of site survey by JICA Study Team at Tx station, it was confirmed that existing antenna elements, antenna towers, and three eleventh (3/11) HF transmitters are still operational condition, and are able to be incorporated into new GMDSS system.

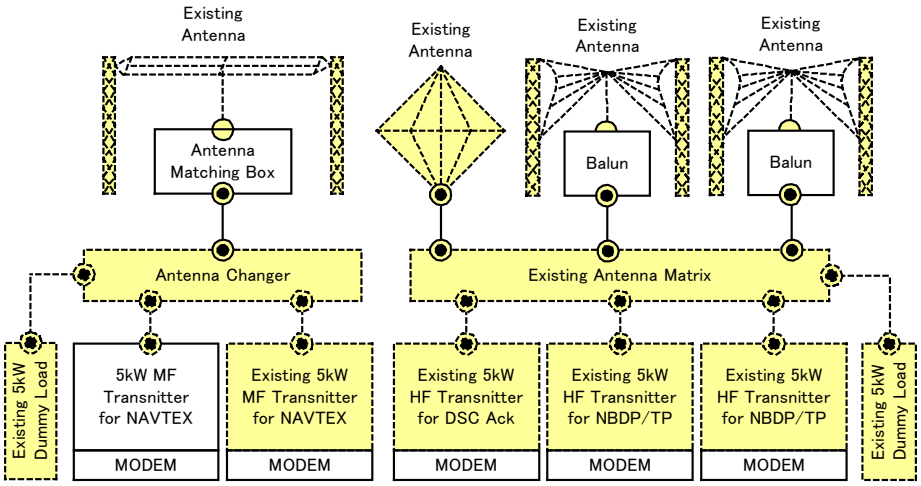


Figure 2-2-3 Tx Station Rehabilitation Concept

Thus, Equipment to be provided under the Project will be one (1) MF transmitter, one (1) antenna matching box, two (2) baluns, five (5) modems, and replacement of coaxial cables between antennas and equipment only.

NAVTEX broadcasting service, using new MF transmitter, will cover half of sea area in Philippines as shown in Figure 2-2-4.

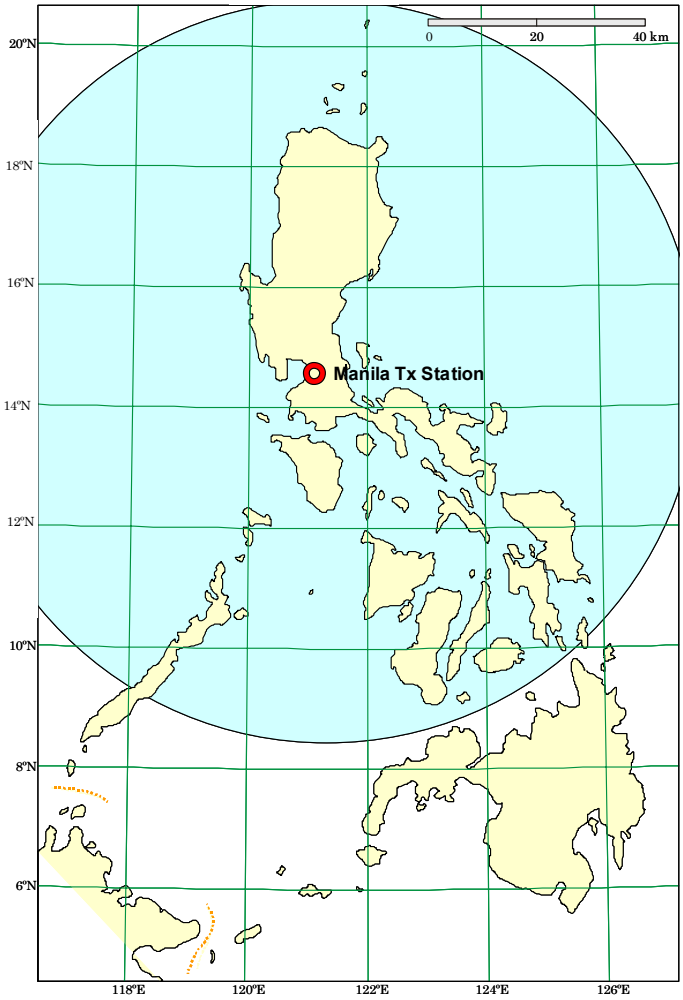


Figure 2-2-4 Manila NAVTEX Coverage Area

For Rx Station, the Project will merely provide HF receivers for NBDP/TP, and replacement of coaxial cables between antennas and equipment since serviceability of existing antennas is confirmed by site survey.

Four (4) sets of VHF GMDSS units, which consist of VHF transceiver, antenna, lightning arrester and modem, are installed at Operation Centre.

All GMDSS functions are controlled by the seven (7) consoles installed at Operation Centre or a Rescue Coordinate Centre (RCC) position (console) in Action Centre at PCGHQ.

Calculation Conditions of NAVTEX Coverage Area

- Transmitting Power : 5 kW
- Receiving Sensitivity : 39.7 dBμV emf
- Chart : ITU-R
- Calculated Range : 650 km in radius

Table 2-2-7 Specifications of Major Equipment

1.	**VSAT Communication System**		
1.1	Hub Station's Equipment	Frequency Band Access Scheme Control Signal Link Control Speed IP Transmission Rate Antenna Effective Diameter Operating Output Power System Noise	: Ku-Band : Demand Assign Multi Access (DAMA) Inbound: Time Division Multi Access (TDMA) Outbound: Time Division Multiplex (TDM): : 32 kbps or less : 32 kbps ~ 2048 kbps (5 CH) : 2.4 m ϕ : 37 dBm or more (antenna input) : within 220^{o} K
1.2	Fixed Station's Equipment	Link Control Speed IP Transmission Rate Antenna Effective Diameter Operating Output Power System Noise	: 32 kbps or less : 32 kbps ~ 2048 kbps (1 CH) : 1.8 m ϕ : 32 dBm or more (antenna input) : within 220^{o} K
1.3	Transportable Station's Equipment	Link Control Speed IP Transmission Rate Antenna Effective Diameter Operating Output Power System Noise	: 32 kbps or less : 32 kbps ~ 2048 kbps (1 CH) : 0.9 m ϕ : 32 dBm or more (antenna input) : within 220^{o} K
1.4	Exchange (PABX)	E1 Interface Analogue Interface C.O. Trunk Interface CPU Traffic Capacity	: 3 lines or more : 30 lines or more : 8 lines or more : 8000 BHCA or more (full configuration)

Table 2-2-7 (Continued)

2.	**Microwave Communication System**		
2.1	7.5 GHz Antenna (1.2m Φ)	Feature Frequency Range Antenna Gain	: 1.2m ϕ with radome : 7.425 ~ 7.725 GHz : 36 dBi or more
2.2	7.5 GHz Antenna (0.6m Φ)	Feature Frequency Range Antenna Gain	: 0.6m ϕ with radome : 7.425 ~ 7.725 GHz : 29.8 dBi or more
2.3	7.5 GHz Multiplex Radio Equipment	Multiplex Method Transmission Rate Frequency Range Transmitting Output Power Stand-by Configuration Communication Function	: Digital Multiplexing : 34 Mbps : 7.425 ~ 7.725 GHz : 23 dBm or more : 1 + 1 (Hot stand-by) : E1, IP, Voice (analogue 4W) communication
2.4	Tower – A (62M Angle)	Structure Design Wind Speed Twist and sway Accessories	: 4-legs angle tower, hot-dipped galvanized finish : 55 m/s or more : 2.4^{o} or less : Obstacle lights, obstruction mark painting
2.5	Tower – B (32M Cylindrical)	Structure Design Wind Speed Twist and sway	: Cylindrical mast, hot-dipped galvanized finish : 55 m/s or more : 2.4^{o} or less
2.6	Tower – C (12M Mast)	Structure Design Wind Speed Twist and sway	: Steel mast, hot-dipped galvanized finish : 55 m/s or more : 2.4^{o} or less
3.	**VHF/HF Radio System**		
3.1	VHF Transceiver (for Spur Link)	Frequency Range Transmission Output Antenna Gain Encrypt Function	: 156.025~162.025 MHz : 25 W or more : 5.15 dBi or more : Digital voice modem, etc.
3.2	VHF Transceiver (for Transportable VSAT)	Frequency Range Transmission Output Antenna Gain Encrypt Function	: 156.025~162.025 MHz : 25 W or more : 8.15 dBi or more : Digital voice modem, etc.
3.3	HF Transceiver	Frequency Range Transmission Output Antenna Encrypt Function	: 2~20 MHz : 100 W or more : 11m dipole : Digital voice modem, etc.

Table 2-2-7 (Continued)

4.	**Manila Coast Station**		
4.1	VHF Transceiver	Frequency Range Transmission Output Antenna Gain	: 156.025~162.025 MHz : 50 W or more : 5.15 dBi or more
4.2	Voice/PTT Matrix Equipment	Function	: Shall be able to exchange voice and PTT signals between operation consoles and radio equipment.
4.3	MODEM Equipment	Function	: shall be able to modulate/demodulate DSC/NBDP, NAVTEX signals into voice band FS signal.
4.4	Management Console	Function	: Shall be able to set and to supervise operation consoles/radio equipment. Consists of PC, monitor, headset, PTT switch, etc.
4.5	Management/ Telephone Console	Function	: Shall be able to set and to supervise operation consoles/radio equipment, and to operate radio telephone communication (HF, VHF). Consists of PC, monitor, headset, PTT switch, etc.
4.6	Telephone Console	Function	: Shall be able to operate radio telephone communication (HF, VHF). Consists of PC, monitor, headset, PTT switch, etc.
4.7	DSC/NBDP Console	Function	: Shall be able to select, control, and supervise radio equipment, and to operate DSC/NBDP (HF, VHF) communication. Consists of PC, monitor, printer, headset, PTT switch, etc.
4.8	NAVTEX Console	Function	: Shall be able to broadcast NAVTEX (MF), to edit NAVTEX message, and to select, control, and supervise radio equipment. Consist of PC, monitor, and printer, etc.
4.9	NAVTEX Monitor	Function Receiving Frequency	: Shall be able to monitor NAVTEX signal broadcasted. : 518 kHz
4.10	5 kW MF Transmitter	Frequency Range Preset Channel Transmission Output Mode of Emission	: 405~535 kHz : 5 channels or more : 5 kW or more : CW, MCW (DSB/SSB), FSK
4.11	MODEM Equipment	Function	: Shall be able to modulate/demodulate various signals from DSC, NBDP, NAVTEX, and voice MODEM to/from Operation Centre
4.12	MF/HF Transmitter	Frequency Range Mode of Emission Preset Channel	: 90 kHz~29.99 MHz : CW, MCW (DSB/SSB), FSK, FAX, ISB : 100 channels or more
4.13	RCC Console	Function	: Shall be able to select, operate and supervise DSC/NBDP communication (HF, VHF), and to operate radio telephone for subsequent communication. Consists of PC, monitor, printer, headset, PTT switch, etc.

2-2-3 Basic Design Drawings

Basic design drawings such as System Configurations, Site Layout Plan and Equipment Layout Plan for each Site appear as Reference Drawings at the end of this Report.

1) PCG Headquarters

Equipment to be installed at PCGHQ include Microwave system, DAMA GUI console for VSAT system, RCC position for GMDSS system, Telephone/IP network, and PABX. All equipment is installed in RCC Action Centre room at 2nd floor of Multipurpose Building.

A 3kVA generator set will be installed at generator room which will be prepared by PCG. A 32m height cylindrical tower for microwave antenna will be constructed at the vacant space of PCGHQ premises.

2) Operation Centre

Equipment to be installed at Operation Centre include VSAT HUB system, Microwave system, VHF transceivers for GMDSS system, GMDSS consoles for operator/supervisor, and Telephone/IP network. All equipment will be installed in radio or operation room.

Microwave antennas and VHF antennas are to be mounted on the existing 92m height 4-legs angle tower. A 6m height 4-legs antenna support for VSAT satellite antenna will be constructed at existing parking space near the radio room.

3) Transmitting Station

Equipment to be installed at Tx Station includes Microwave system, 5kW MF transmitter, modems, power cables for MF/HF antennas, net earth, radial earth and Telephone/IP network. All communication equipment will be installed in Tx or UHF equipment room.

Microwave antenna will be mounted on the existing 62m height guyed tower.

4) Receiving Station

Equipment to be installed at Rx Station includes Microwave system, MF/HF receivers, and Telephone/IP network. All equipment will be installed in existing equipment room.

Microwave antenna will be mounted on the existing 92m height guyed tower.

5) Sangley Point (ANC Operation Office)

Equipment to be installed at Sangley Point includes Microwave system, and Telephone/IP network. All equipment will be installed in the existing equipment room at 2nd Floor of the building.

A 12m height steel pole will be installed at roof of the Building for microwave antenna.

6) H1CGD Manila

Equipment to be installed at H1CGD includes Microwave system, VHF and HF transceivers, and Telephone/IP network. All equipment will be installed in the existing radio room at 1st floor of District Headquarters Building. A 2kVA generator set will be installed at generator room which will be prepared by PCG.

A 62m height 4-legs angle tower for microwave antennas will be constructed in the right rear position of the Headquarters Building.

7) H2CGD Cebu, H3CGD Zamboanga

Equipment to be installed at H2CGD or H3CGD includes VSAT Fixed System, VHF and HF transceivers, and Telephone/IP network. All communication equipment will be installed in the existing operation room (GMDSS room of H3CGD). A 2kVA generator set will be installed at existing generator room constructed by former GMDSS project.

A 15m height steel pole for VHF and HF antennas will be constructed within the Site. VSAT antenna will be mounted on a concrete foundation newly prepared on ground.

8) H4-H10 Coast Guard Districts

Equipment to be installed at from H4CGD to H10CGD includes VSAT Fixed System, and Telephone/IP network. All communication equipment will be installed in the existing operation or radio room (new building's operation room of H9CGD Legaspi). A 1kVA generator set, except for H4PCG Palawan, will be installed at the existing generator room (H6PCG and H9PCG), or new generator room to be prepared by PCG. (H5PCG, H7PCG, H8PCG and H10PCG).

VSAT antenna will be mounted on concrete foundation on ground.

9) Coast Guard Stations (CGSs), etc.

Equipment to be installed at CGSs and others are VHF or HF transceiver. A 15m height steel pole for VHF or HF antenna will be constructed within the Site.

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

All the systems and equipment to be provided under the Project should be carefully designed or selected taking account of each system/equipment's features, then should be integrated into a comprehensive security communication network of PCG by appropriate installation and proper connections each other.

Special consideration is to be made for systems design and terminal equipment selection in conjunction with delay time caused by satellite circuit. The interface with the existing equipment at Coast Station should also be carefully designed. Thus, the contract of the Project will stipulate the Supplier's responsibility so that the main manufacturer should be duly responsible for whole system integration of the Project.

Since the number of Project Site reaches 35 including remote rural sites, progress control at each Site is important to allocate resources for construction/installation efficiently.

Due to functional interaction between each system, adjustment and testing of VSAT and GMDSS systems are able to commence after the completion of adjustment/testing of the Microwave system. Thus, construction schedule and progress control of such system is essential for successful achievement of the Project.

For the reason that adjustment work of system, except for VHF/HF radio and telephone/IP network systems, need highly skilled technique, dispatch of Japanese radio communication engineers from manufacturers for adjustment and testing of equipment will be specified in Tender Document.

(Implementing Organization of Recipient Country)

The responsible organization of Philippine Government is the Department of Transportation and Communications (DOTC). The implementing agency is the Philippine Coast Guard (PCG).

2-2-4-2 Implementation Conditions

No major problem for implementation of the Project is currently anticipated on local law, special circumstance, constriction method, and site condition.

It is, however, noted that squatter houses and illegally parked trucks currently are obstacles to passing of heavy equipment or trailer at a part of access road to H1PCG. Traffic condition of such part should be confirmed and secured as required before construction.

Because the Site at PCGHQ have very limited working space and is facing to public road, safety and environmental protection measures by the Supplier and his sub-contractor(s) should be strictly supervised.

Most of CGSs are located in very small premises, therefore protection means against the existing buildings/structures should be considered when the antenna pole is erected.

2-2-4-3 Scope of Works

Scope of Works of both the Japanese side and the Philippine side are summarized in Table 2-2-8.

Table 2-2-8 Scope of Works to be Undertaken by Each Government

No.	Item	To be covered by Grant Aid (**Japan**)	To be covered by Recipient side (**Philippines**)
1	**Administration Expense and Procurement**		
1-1	Administration and commission fees for Banking Arrangement (B/A), and Authorization to Pay (A/P)		●
1-2	Payment and formalities for Value Added Tax (VAT), and other tax/duties under the law of the Philippines		●
1-3	Application fee and legal expense for radio stations operation		●
1-4	Application fee, legal expense, and annual payment for VSAT operation		●
1-5	Traveling costs of PCG staff for site survey, supervision, and inspection		●
1-6	Arrangement and provision of security guard for project members on site activities at danger area		●
1-7	Obtaining or issuance of permissions for construction works		●
1-8	Expenses for electric power supply and water supply during site activities (installation and testing)		●
1-9	Communication Equipment	●	
1-10	Transportation (oversea and inland) of Equipment	●	
1-11	Preparation of temporary yard/storage in Manila for distribution of equipment to provincial Sites		●
1-12	Preparation of temporary yard at each Site		●
2	**Land Preparation Works**		
2-1	Grading, security fence installation, etc.		●
2-2	Removal of existing structure or trees for tower construction		●
3	**Building/Equipment Room Works**		
3-1	Reinforcement or remedial works to existing Equipment and/or Operation Room		●
3-2	Construction or remedial works for Engine Generator Room		●
4	**Removal Works**		
4-1	Removal of existing equipment/materials which becomes obstacle of new equipment at indoor		●
4-2	Removal of pavement, if there is	●	
5	**Equipment Installation Works**		
5-1	Installation of communication equipment	●	
5-2	Installation of electrical equipment (including PDB)	●	
5-3	Commercial power supply (including switchboards, transformers, etc.)		●
6	**Steel Tower Construction**		
6-1	Antenna tower and antenna support foundations	●	
6-2	Erection of steel tower (including obstruction lighting system, lightning protection system, and finishing)	●	
7	**Adjustment and Testing**	●	
8	**Basic Operation and Maintenance Training (Initial Training)**	●	

2-2-4-4 Consultant Supervision

1) Basic Policy

Consultant will supervise the Supplier's workmanship, progress control, quality control, and safety and environmental management in accordance with approved drawings, schedule and methods throughout contract period of the Project. The Consultant also visit all Sites before commencement of construction/installation for site readiness confirmation, and witness site acceptance tests and final acceptance of all equipment and systems provided by the Project.

Since most of the Project Sites have limited working space, the Consultant will provide close supervision of the Supplier's safety measures for the Client and/or third party's property. The Supplier's environment protection measure during pile diving for antenna tower foundation is also certainly supervised.

2) Organization

The Project Site consist of 12 nos. in Metro Manila and 23 nos. of provincial area. Since the Project is located at a lot of Sites spreading in nationwide, Consultant's supervision should be planned so as to utilize local engineers and minimize mobilization between the Sits for efficient supervision. Organization of Consultants for construction supervision will be as follow;

Table 2-2-9 Consultant's Organization for Construction Supervision

Assigned Personnel	Spot / Expatriate	Duty
General Superintendent (Japanese Engineer)	Expatriate	Chief of Consultant's Engineers, Coordination and negotiation with Implementing Agency, Confirmation of Site Preparatory Works for VSAT system, Microwave system, and Manila Coast Station, Site Acceptance Test for Microwave System and Manila Coast Station, Supervision for Contractor's Final System Adjustment and Site Training, Final Acceptance Test
Project Manager (Japanese Engineer)	Spot	Coordination and negotiation with Implementing Agency, Confirmation of Site Preparatory Works for Steel Tower Foundation Works, Handover
Project Engineer I (Japanese Engineer)	Spot	Site Acceptance Test for VSAT System, Supervision for Contractor's Final System Adjustment and Site Training
Project Engineer II (Japanese Engineer)	Spot	Site Acceptance Test for Steel Tower Foundation and Tower Election Works
Inspector I (Japanese Engineer)	Spot	Review and Approval of Construction Drawings and Specifications for VSAT and Microwave Systems, Factory Test
Inspector II (Japanese Engineer)	Spot	Review and Approval of Construction Drawings and Specifications for VHF/HF System and Manila Coast Station, Factory Test
Inspector III (Japanese Engineer)	Spot	Review and Approval of Construction Drawings and Structural Calculation for Steel Tower, Shop Assembly
Engineer I (Local Engineer)	Spot	Supervision of Contractor's works during Microwave System and Manila Coast Station installation, support for Handover
Engineer II (Local Engineer)	Spot	Supervision of Contractor's works during Microwave System and Manila Coast Station installation, support for Handover
Engineer III (Local Engineer)	Spot	Supervision of Contractor's works during VSAT and VHF/HF Systems installation, Site Acceptance Test and Site Training for VHF/HF System
Engineer IV (Local Engineer)	Spot	Supervision of Contractor's works during VSAT and VHF/HF Systems installation, Site Acceptance Test and Site Training for VHF/HF System

2-2-4-5 Procurement Plan

1) Equipment and Material Procurement Plan

Procurement plan will be developed considering adequacy of required specifications, ease of maintenance, and sufficiency of after service and spare parts.

All main equipment for the Project will be procured from Japan since there are no manufacturers of such equipment in Philippines. Auxiliary equipment such as IP unit, printers, fax machines, UPS, and generator sets will be procured in Philippines for the reasons that: 1) consumables, spare parts and after-sales service are easily obtained, 2) price of such equipment in Philippines is cheaper than that of Japan.

For project cost estimate purpose, steel structure, such as antenna tower and antenna pole, is planned to be procured from manufacturers in Philippine considering adequacy of quality and lower cost to Japanese product. Steel pole for VHF/HF antenna is required to be transportable by manpower since mode of access to the Site at some remote rural locations is very limited. As a result of cost comparison between Japanese and Philippine product, Japanese product, i.e., panther mast, is selected. Construction materials for antenna foundation and equipment installation (such as cables, reinforcement bars, and concrete) are able to be obtained in Philippines.

2) Transportation Plan

Transportation of main equipment is planned by sea. All imported material from Japan will be required to be trucked from Manila port to temporary storage, and sorted by each Site for distribution. Sorted equipment will be delivered from temporary storage to each Site by means of multi-modal transportation.

Receiving Station is assumed as temporary storage in this Study.

3) Spare Parts and Warranty

Manufacturer's recommend spare parts enough for one year operation will be provided by the Project for enabling immediate recovery from equipment trouble. Guarantee period for supply of spare parts will be specified in Tender Document, and should be 10 years for main equipment, and 7 years for other equipment after issuance of Completion Certificate of the system.

Further to the above, Defect Liability Period of one (1) year after issuance of Completion Certificate for civil/steel structure will be specified in Tender Document.

4) Basic Operation and Maintenance Training (Initial Instruction)

Table 2-2-10 shows outline of Basic Training Program (Initial Instruction) to be provided by the Supplier.

All trainers for basic training should be dispatched from manufacturer, and are assumed to be the same persons for adjustment/testing of each system.

Table 2-2-10 Outline of Basic Training Program

		Basic Operation Training		Basic Maintenance Training	
		Trainee: **Operator** • System Concept • Limitation/Restriction for Operation • Method of Operation • Procedure for Power Cut-off and Lightning Strike • Caution for Equipment Storage/ Transportation		Trainee: **Technician** for Maintenance • System Concept • Limitation/Restriction for Operation • Method of Operation • Procedure for Power Cut-off and Lightning Strike • Regular Inspection Procedure • Measurement Theory and Technique • System/Equipment Repair and Maintenance • Caution for Equipment Storage/ Transportation • Maintenance for Antenna, Tower, and Power Supply • Measuring equipment/Spare parts Management	
System	Site	No. of Trainee	Term	No. of Trainee	Term
VSAT *)	Operation Centre	15	2 days	5	10 days
	H2CGD, H3CGD	5 per Site	1 day per Site	-	-
	H4CGD to H10CGD	3 per Site	1 day per Site	-	-
Microwave *)	Operation Centre	5	1 day	5	5 days
GMDSS *)	Operation Centre	10	2 days	5	5 days
VHF/HF **)	Operation Centre	15	1 day per Site	5	1 day
	H2CGD, H3CGD	5 per Site	0.5 day per Site	-	-
	CGSs (17 site)	2 per Site	0.5 day per Site	-	-

Note 1: *) By trainer dispatched from manufacturer of the system
**) By local trainer dispatched from manufacturer's branch office or manufacture's local agent

Note 2: Basic Training at all sites, except for Operation Centre, will be provided by same engineer for adjustment/testing of the system,

2-2-4-6 Quality Control Plan

The following quality control tests are planned for the Project:

1) Factory Test

Factory Test is conducted to assure equipment's conformity to the Specifications, which includes confirmation of color/layout of GUI console, performance test of each equipment or unit, and system performance test of each system. The tests will be carried out for each system at manufacturer's factory before shipment.

Shop assembly is carried out for antenna tower of 4-legs angle tower and cylindrical tower to verify accuracy of bending/processing of steel member at manufacturer's compound.

2) Pre-shipment Inspection

Pre-shipment inspection is carried out by the employed third-party inspector. The pre-shipment inspection consist of: 1) collation of shipping document with equipment list on the Contract, 2) checking quantity of equipment and shipping document, and 3) confirmation of packing condition and shipping mark.

3) Site Acceptance Test

As soon as the equipment is properly installed and adjusted, acceptance test for equipment unit and/or sub-system is carried out in the presence of the Consultant. The testing of equipment and/or sub-system is to be executed by the Supplier's engineer to collect all data showing conformity of performance to the Specifications. Quantity of equipment is also to be inspected by the Consultant and the Client.

4) Final System Adjustment and Final Acceptance Test

After completion of the Site Acceptance Test for each equipment and/or sub-system, final system adjustment will be conducted by the Supplier's engineer dispatched from manufacturer to verify required performance of whole integrated system to the Specifications. On Final Acceptance Test, the Supplier should demonstrate voice/data communication between all Sites excluding CGSs, and collect required test data for final acceptance in the presence of the Client and Consultant.

5) Handover

After confirmation of test results of Site Acceptance Test and Final Acceptance Test between the Supplier and the Consultant/the Client, the Consultant will issue Completion Certificate to the Supplier, and all equipment and system under the Project will be handed over to the Client.

6) Quality Control Test for Civil and Structural Works

The following tests are carried out by the Supplier at the presence of the Consultant:

Table 2-2-11 Quality Control Test for Civil and Structural Works

Item	Subject of Test	Test Method	Phase
Method Statement	Construction method	Review of submittal	before commencement of works
Piles	Size, dimension, and appearance	Observation at Site	material arrival on Site
Welding	Undercut, crack, etc.	Observation at Site	after welding work
Reinforcement Bars	Dimension and arrangement	Steel tape, observation at Site	before casting of concrete
Concrete Strength	Compressive strength of 28 days	Compressive strength test	sampling when pouring per 150 cu.m
Steel material	Strength and dimension	Mill certificate	on material approval

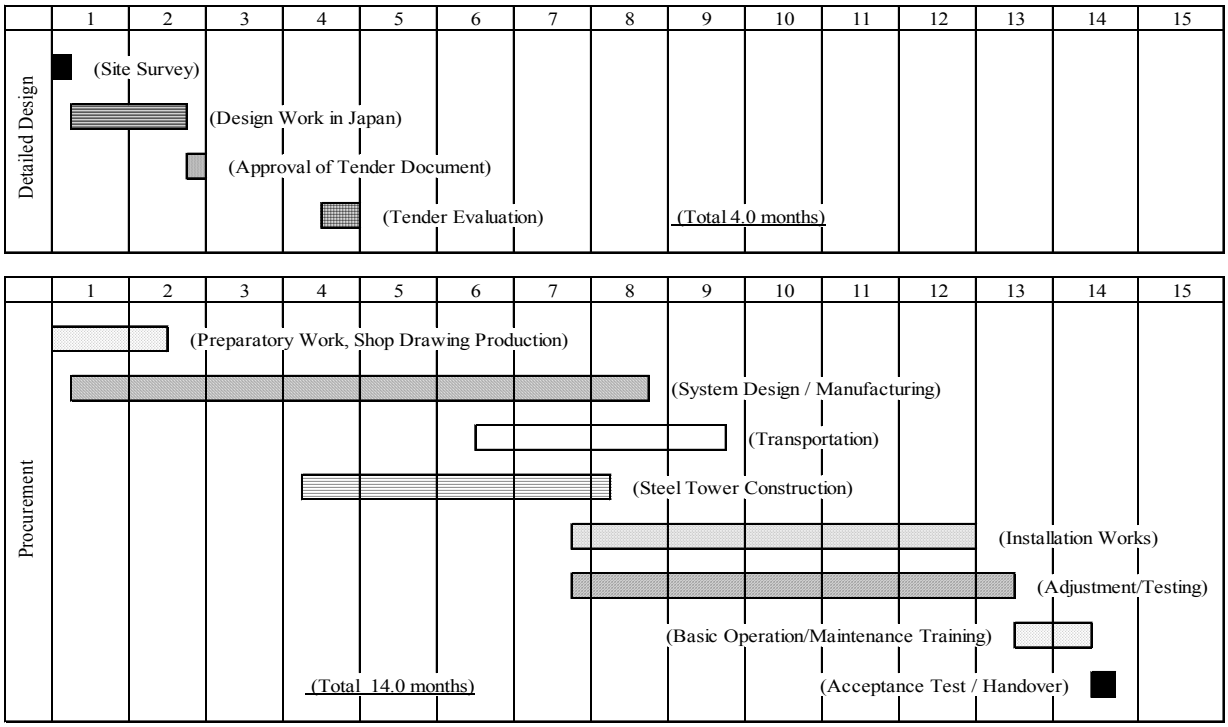
2-2-4-7 Soft Component (Technical Assistance) Plan

As described in Section 2-2-1-5, no Soft Component is provided by the Project. However, JICA study team recommends to implement Technical Assistance Project by other JICA scheme.

2-2-4-8 Implementation Schedule

Implementation schedule for the Project is shown in Table 2-2-12.

Table 2-2-12 Implementation Schedule



2-3 Obligations of Recipient Country

The government of the Philippines has the obligation to undertake the works decided with Basic Design Study Team on June 14, 2006. Table 2-3-1 shows detailed works to be implemented by the Philippine side, except taxes, banking arrangement matters.

Table 2-3-1 Obligations of the Philippine Government Side

	Items	Contents
General Items and Procurement	Obtaining radio station (or frequency) license	To show DOTC the frequency band to be applied, frequency (slot), occupying bandwidth, transmission power, antenna type, etc., and acquire the license(s) before the starting of equipment manufacturing.
	Negotiation and contract of satellite circuit to be leased	To make a contract of satellite circuit lease with Mabuhay. The circuit (Ku-band) shall be ready for use before the starting of equipment installation.
	Travel expenses for Philippine officials for supervision and inspection at the Site	These travel expenses are used for supervision and inspection at the Site.
	Arrangement and provision of security guard for project members on site activities at dangerous area	To guard project members (especially Japanese) while they are in Zanboanga area, antenna yard at Transmitting station and others.
	Permission for contraction/ installation works at the Site	To obtain from authorities concerned or to issue the necessary permissions to the Supplier.
	Provision of water and electricity during construction/installation and testing of the Equipment	To provide water and electricity during construction/ installation and testing at the Site.
	Securing temporary yard/storage in Manila	To prepare a temporary yard/storage in Manila for distribution of equipment and material to provincial Sites. Receiving station is recommended for this purpose.
	Securing temporary yard at each Site	To prepare a temporary yard at each Site, these will be used up to installation.
Installation, Adjustment and Testing.	Finishing the grading and installation of fences	To finish grading and install fences at Transmitting station before equipment installation. Grade for installation of antenna system, and install safety fences around the new boundary.
	Removal of existing structures and trees for tower erection	To remove existing structures and trees at tower positions before tower footing construction works.
	Rehabilitation, renovation or newly preparation of equipment/operation rooms	To repair rain leakage at Transmitting/ Receiving Stations. To check all rooms at the Sites, and to make good condition, if necessary.
	Construction or repair of engine generator rooms	To construct new generator rooms at Headquarters, H1, H5, H7, H8, H10CGDs. To check engine room at other Sites and fix them if necessary.
	Removal of existing equipment/ materials	To remove or relocate existing equipment/materials at where the new equipment is planned to be placed.
	Provision of commercial power supply	To check and install switchboards, transformers, etc. To make contract with commercial electricity authority where no electricity source is available.

All works above are executable by Philippine side, and are proper as the recipient country's works. However, these Philippine side works require complicated process, such as formalities within PCG and with relevant organizations, negotiation with other entities, and preparatory works at each Site. PCG is required to conduct such recipient country's works timely and smoothly.

PCG should also understand that the commitments of the Philippine side works are the prerequisite for the Japan Grant Aid project because the grant project necessitates for successful completion as par the scheduled date of the Project.

2-4 Project Operation Plan

It is necessary to allocate capable staff for operation and maintenance of facilities procured under the Project, and to execute concentrated training at the initial stage. Because VAST, GMDSS, Microwave and IP systems are introduced to PCG by the Project for the first time at once.

It is recommended that PCG make maintenance contracts with authorized agent of manufacturers or repair businesses to maintain the equipment provided by the Project in proper condition. PCG currently luck their technician in the number and in quality although they can execute ordinary check-up, maintenance, and repairs for minor trouble. Appropriate maintenance for the equipment should be provided by specialized and competent technician.

Table 2-4-1 shows required number of staffs to operate and maintain the systems provided by the Project.

Table 2-4-1 Required Number of Staffs for Operation and Maintenance

1) Manila area

	PCGHQ (RCC)		Operation Centre			Tx Stn	Rx Stn
	Operator	Technician	Operator	Technician	Patrol Technician	Technician	Technician
GMDSS System	7	3	11	5	2	2	3
VSAT System			Included in above			—	—
Microwave System	—	Included in above	—	Included in above		Included in above	Included in above
VHF/HF System	Included in above	Included in above	Included in above	Included in above		—	—

2) CGD and CGS

	CGD		CGS	
	Operator	Technician	Operator	Technician
VSAT System	4	2	—	—
VHF/HF System			3	—

The above number of operators for GMDSS and VSAT systems is determined assuming 24 hour operation. GMDSS/VSAT technicians should take care of both microwave system and VHF/HF transceivers, because frequency of maintenance for these equipment is relatively low.

The number of the staffs shown in Table 2-4-1 is for ordinary or minor incident occasion. It is necessary to reinforce the staff number when big incident or distress happens.

Table 2-4-2 shows comparison between current staff number and required staff number for each station obtained by above criteria. In Manila area, staff number will be sufficient for future, however, at CGDs and CGSs, additional operation/maintenance staff will be mandatory due to introduction of VSAT satellite system/IP system and enhancement of VHF/HF communication systems.

Table 2-4-2 Comparison of Staff Number at Each Site

	Station	At Present			After Project (Recommended)		
		Operator	Technician	Total	Operator	Technician	Total
Manila	PCG Headquarters	7	3	10	7	3	10
	Operation Center	9	8	17	11	7	18
	TX Station	0	2	2	-	2	2
	RX Station	0	4	4	-	3	3
	Sangley Point	3	0	3	3	0	3
H1CGD	H1CGD (Mainla)	2	1	3	4	2	6
	CGS Manila	2	0	2	3	0	3
	CGS Pasig	2	0	2	3	0	3
	CGS Laguna de Bay	2	0	2	3	0	3
	CGS Corregidor	2	0	2	3	0	3
	PSCC Manila			0	3	0	3
	CGS Subic	3	0	3	3	0	3
H2CGD	H2CGD (Cebu)	2	0	2	4	2	6
	CGS Cebu	1	0	1	3	0	3
	CGS Catbalogan	1	0	1	3	0	3
	CGS Tagbilaran	2	0	2	3	0	3
	CGS Dumaguete	3	0	3	3	0	3
	CGS Ormoc	1	0	1	3	0	3
	CGS Massin	1	0	1	3	0	3
	CGS Tacloban	1	0	1	3	0	3
H3CGD	H3CGD (Zamboanga)	2	0	2	4	2	6
	CGS Zamboanga	1	0	1	3	0	3
	CGS Dapitan	2	0	2	3	0	3
	CGS Pagadian	2	0	2	3	0	3
	CGS Mapun	1	0	1	3	0	3
	CGS Jolo	2	0	2	3	0	3
	CGS Bongao	1	0	1	3	0	3
	CGS Cotabato	1	0	1	3	0	3
Others	H4CGD (Palawan)	4	0	4	4	2	6
	H5CGD (Batangas)	3	0	3	4	2	6
	H6CGD (Iloilo)	3	0	3	4	2	6
	H7CGD (San Fernando)	4	0	4	4	2	6
	H8CGD (Davao)	2	0	2	4	2	6
	H9CGD (Legaspi)	3	0	3	4	2	6
	H10CGD (Cagayan de Oro)	2	0	2	4	2	6
TOTAL		77	18	95	121	35	156

(Maintenance of Spare Parts)

The current maintenance condition of spare parts is extremely bad: spare parts are packed in carton boxes, which are stacked in hot and humid emergency generator rooms at Operation Centre, for example. Such condition shall be improved immediately, and establishment of a proper maintenance system by the above maintenance staff is required.

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

The cost of the Project will be approximately ¥665 million (excluding taxes such as VAT, and VSAT transponder lease fee) in total. The contents of the Project cost are shown separately for Japanese borne portion and Philippine borne portion in accordance with the conditions in item (3) below.

This cost estimate is provisional and would be further examined by the Government of Japan for the approval of the Grant.

(1) Cost to be borne by Japan : approximately ¥603 million

Table 2-5-1 Approximate Total Cost for Japanese Portion

Cost Items		Approximate Cost (million Yen)	
Equipment	VSAT Satellite Communication System	283	551
	Microwave Communication System	88	
	VHF/HF Radio System	55	
	Rehabilitation of Manila Coast Station	103	
	Procurement Management & Initial Training	22	
Detailed Design & Consultant's Supervision			52

(2) Cost to be borne by Recipient Country: P26.02 million (approximately ¥62 million)

Demolition, restoration, electricity and water costs, etc.	:	P5.52 million
Radio station license fee, etc.	:	P0.10 million
Counterpart staff & supporting services	:	P14.74 million
Contingencies	:	P5.66 million

(3) Conditions for estimation

1) Time of estimation : July 2006
2) Foreign exchange rates : 1 US$ = 116.72 Yen
   : 1 Peso = 2.39 Yen
3) Procurement period : Detailed design, equipment procurement and installation periods as shown in Table 2-2-12
4) Others : Estimation was carried out in accordance with relevant rules and the guideline of Japanese Grant Aid.

2-5-2 Operation and Maintenance Cost

Although the amount of maintenance cost depends on maintenance service level and skills of maintenance staff, it is generally estimated by the percentage of approximately 2.5% to 5.0% of the Initial Investment Cost (FOB prices of equipment) in case of communication projects.

1) Maintenance Contract Cost

The Study Team recommends to utilize an agent authorized by manufacturer or a repair business for maintenance of the equipment provided by the Project. Required amount for such maintenance contract is estimated at about ¥7.83 million (P3.28 million) based on following assumption of maintenance services;

Scope of Maintenance Services (Assumption)

Subject of Service:	VSAT communication system (include IP network and telephone exchange system), Microwave communication system, GMDSS system and equipment
Site:	PCG Headquarters, Operation Center, Tx and Rx Stations, Sangley Point, H1CGD, H2 through H10CGDs
Contents of Service:	Annual inspection, and service on demand (3 times/year at CGDs in average)
Organization:	2 number of local engineers (stationed at Manila), 24 hours stand-by
Transportation Cost:	Inclusive
Others:	Testing equipment and tools other than special testing equipment, should be provided by PCG. Cost of parts and equipment replaced by the Service should be covered by PCG. Cost of miscellaneous materials should be included in the Services.

2) Parts and Equipment Cost in Repairing

Parts and equipment cost in repairing is estimated at ¥8.67 million (P3.63 million) by approximate 2.5% of initial equipment cost of the Project (¥346.7 million, excluding steel towers).

3) Summary of the Costs

Table 2-5-2 shows estimated amount of operation and maintenance cost of the equipment under the Project considering the maintenance contracts.

Table 2-5-2 Operation and Maintenance Cost

Operation and Maintenance Cost (annual) :	**Total ¥21.1 million**	**(P8.8 million)**
Communication Equipment Maintenance Cost:	¥16.5 million	(P6.9 million)
Cost for Maintenance Contract:	¥7.8 million	(P3.3 million)
Cost for Parts and Equipment in Repairing:	¥8.7 million	(P3.6 million)
Satellite Circuit Lease Fee (annual):	¥4.6 million	(P1.9 million)

Table 2-5-3 shows annual budget of PCG and budget for maintenance related to communication, respectively.

Table 2-5-3 PCG's Annual Budget and Com. Related Budget

(Unit: million Pesos)

	2001	2002	2003	2004	2005
PCG's Budget	1,117	1,177	1,185	1,223	1,354
Personnel Expenses	718	N.A.	N.A.	N.A.	898
Operation and Maintenance	310	N.A.	N.A.	N.A.	430
Furniture, Fix, Equipment & Books Outlays	89	N.A.	N.A.	N.A.	26
(Com. related Budget among the above O&M)	(-)	(8.1)	(12.12)	(12.85)	(14.36)

The operation and maintenance cost of the equipment under the Project; P8.8 million is equivalent to 2.0% of the PCG's operation and maintenance (O&M) budget (P430 million in year 2005). This cost inclement seems a slight compared to the amount for O&M, and will not be a burden to PCG's budget in future.

Owing to improvement of government financial situation in recent years, annual budget for PCG in year 2005 was increase by 10.7% against the previous year. And telecommunication cost, which is disbursed to telecom carrier companies such as PLDT (estimated as P5 million per year), will be decreased by introduction of VSAT system. Considering above, substantial increment of PCG's O&M cost is estimated less than 2.0%.

2-6 Other Relevant Issues

To undertake smooth execution of Japan's Grant Aid Project, sound implementation progress of Recipient Country's obligation is essential. Especially, (1) Obtaining radio frequency license (radio station license), and (2) Negotiation and contract of satellite circuit to be leased, that agreed to carry out by Recipient Country on explanation of Draft Basic Design Report, should be securely implemented without delay.

Chapter 3

Project Evaluation and Recommendations

Chapter 3 Project Evaluation and Recommendations

3-1 Project Effect

Following effects are expected by implementation of this Project;

Table 3-1-1 Effects Expected by Project Implementation

Current Problem	Measures taken by the Project	Direct Effect and Degree Improved	Indirect Effect and Degree Improved
1. Telecommunication between Headquarters and Coast Guard Districts • Unstable telecommunication by HF Transceivers • Limited information of SMS by personal mobile phones	Development of VSAT and microwave communication systems for all 10 Coast Guard Districts	• Stable and sufficient capacity link is realized. • Dedicated communication link secures encrypted communication. [100% improved]	1) Improvement of command and control systems for SAR and counter-terrorism operations Response Time Before Project: 2 days After Project: 1 -2 hours 2) Improvement of lifesaving rate, mitigation of property loss 3) Cost saving for SAR and counter-terrorism operations 4) Protection for expansion of environmental pollution
2. Telecommunication between Coast Guard Districts and Coast Guard Stations • Unreliable telecommunication by obsolete VHF/HF transceivers • No radio communication equipment at some CGS • Unable to transmit intelligence and security information due to unsecured radio link	Introduction of heavy duty VHF/HF transceivers with antennas	• New equipment provides stable and clear communication. • Encrypted function is enable to transmit all required information. [38% improved (procured to 20 CGSs among 52 GSSs)]	
3. Manila Coast Station • Malfunctioned 2GHz microwave links between Operation Centre and Tx/Rx stations due to radio-wave interference problem • Unserviceable condition of Manila Coast Stations by equipment failure • Incompliance with the Global Maritime Distress and Safety System (GMDSS)	Development of 7.5GHz microwave communication system Rehabilitation and upgrade of existing MF/HF equipment by GMDSS equipment	• New microwave system provides voice, data and control signal communication between Manila Coast Stations. • Manila Coast Stations is enable to serve sufficient communication for Search and Rescue operations. [apprx. 10% improved] • GMDSS becomes in operational. [50% improved for NAVEX service]	

3-2 Recommendations

3-2-1 Recommendation for Implementing Agency

Following are recommended for PCG to enhance benefit and sustainable utilizations of the systems provided by the Project;

- To properly maintain the telecommunication systems and its equipment with contracted third-party specialist (Maintenance Contract);
- To develop human resources for operation and maintenance of the telecommunication systems and its equipment;
- To perform periodical exercise for operation of the telecommunication systems and its equipment (especially for portable VSAT system); and
- To execute continuous security patrol to prevent squatters from intruding into antenna yard at Tx Station.

3-2-2 Technical Assistance and Cooperation with Other Donors

For proper operation and maintenance of the systems provided by the Project, especially VSAT communication system and GMDSS system, appropriate training program for PCG staff is essential. It is recommended that Japan or Other Donors dispatch O&M training experts by Technical Assistance scheme, which country has long-term experiences for operation of those systems. An example of Technical Assistance program is shown in Table 3-2-1.

Since, there is no on-going or succeeding project executed by other donors for PCG at present, the Project will require no special interface to other project/system in terms of both physical and electronic aspect.

Table 3-2-1 Example of Technical Assistance Program

System	Establishment of Operating System	Maintenance Management & Technology
VSAT System	• Establishment of a organization to operate Security Communication Network using VSAT system • Establishment of operating system (Circuit operation method and responsible person in normal and emergency periods) • Establishment of organization for maintenance and periodical check-up • Education for usage of VSAT circuit • Exercise of Transportable VSAT setup and operation	• Theory of satellite communication • Features of IP VSAT system • System/equipment operation procedures • Emergency corresponding technique • Measuring theory and measuring technique • Repair and safekeeping technique • Regular inspection (Items and records)
Microwave System	• Establishment of maintenance organization	• Digital microwave communication theory • Features of PCG's microwave communication system • System/equipment operation procedures • Emergency corresponding technique • Measuring theory and measuring technique • Repair and safekeeping technique • Regular inspection (Items and records)
Manila Coast Stations (GMDSS System)	• Establishment of a organization to operate the system for maritime security and safety using GMDSS (Restructuring of organization and relevant rules. Operation method of GMDSS functions and each sub-system. Information collecting system and Commanding system vs. roles of each position) • Restructuring of SAR organization (National system and international cooperation system) • Practical training of SAR communication (operation of DSC, NBDP, NAVTEX. Communication record keeping) • Establishment of maintenance system	• HF/VHF communication theory • Features of GMDSS • System/equipment operation procedures • Emergency corresponding technique • Measuring theory and measuring technique • Repair and safekeeping technique • Regular inspection (Items and records)